NR 2006:10

Occupational Health and Public Health

Lessons from the Past – Challenges for the Future

Marie C. Nelson (Ed.)

Editorial committee:
Svante Beckman, Jan Sundin and Marie C. Nelson

ARBETE OCH HÄLSA | VETENSKAPLIG SKRIFTSERIE

ISBN 13: 978-91-7045-810-1 ISSN 0346-7821

ISBN 10: 91-7045-810-3

Arbetslivsinstitutet
National Institute for Working Life

Arbete och Hälsa

Arbete och Hälsa (Work and Health) is a scientific report series published by the National Institute for Working Life. The series presents research by the Institute's own researchers as well as by others, both within and outside of Sweden. The series publishes scientific original works, dissertations, criteria documents and literature surveys.

Arbete och Hälsa has a broad target-group and welcomes articles in different areas. The language is most often English, but also Swedish manuscripts are welcome.

Summaries in Swedish and English as well as the complete original text are available at www.arbetslivsinstitutet.se/ as from 1997.

ARBETE OCH HÄLSA

National Institute for Working Life,
S-113 91 Stockholm, Sweden

ISBN 13: 978-91–7045–810–1
ISBN 10: 91–7045–810–3
ISSN 0346–7821
http://www.arbetslivsinstitutet.se/
Printed at Elanders Gotab, Stockholm

Preface

About a hundred years ago occupational and environmental health became an increasingly urgent topic in Western societies. Today's perceptions and organisation for the prevention and treatment of occupational health problems are to a great extent historical products of a specific regime of work during the classical industrial era. For several reasons occupational health and safety became a field of its own, involving medical and technical expertise, politicians, public administrations, trade unions and employers associations. Its roots, however, are also to be found in the general history of public health. In the context of the evolving welfare state the two fields of occupational and of public health have developed as overlapping, though separately organised, social and scientific concerns. The affinity of the histories of the two fields was the main reason for organising "The 2nd International Conference on the History of Occupational Health and Environmental Prevention" and "The 4th International Conference of the International Network for the History of Public Health" as a joint effort with a view toward casting light on their relationship and to promote collaboration between the two.

The conference under the title *Occupational Health and Public Health: Lessons from the Past – Challenges for the Future* took place in the old industrial city of Norrköping in southern Sweden in September 2001. It was organised by the Swedish National Institute for Working Life (NIWL) in co-operation with the Clinica del Lavoro Luigi Devoto, Italy, the ICOH Scientific Committee on the History of Prevention of Occupational and Environmental Diseases, the International Network for the History of Occupational and Environmental Prevention (IHOEP), International Network for the History of Public Health (INHPH), The National Institute for Occupational Safety and Prevention (ISPESL), Italy, the National Institute of Public Health, Sweden, the Wellcome Trust and the Swedish Council for Work Life and Social Research.

The members of the organising committee were Svante Beckman (chair), Gunnel Färm, Antonio Grieco, Bengt Knave, Antonio Moccaldi and Inger Ohlsson. Members of the scientific program committee were Jan Sundin (chair), Giovanni Berlinguer, Bernadino Fantini, J. Malcolm Harrington, Sergio Iavicoli, Dietrich Milles and Annette Thörnquist. The conference secretariat comprised Anita Andersson, Maria Arvidsson, Daniela Fano, Gudrun Jungeteg and Margareta Lensell. Marie C. Nelson has been responsible for the editing and the introduction of this conference volume and Eric Elgemyr of NIWL for the production of the book. We warmly thank all sponsors, partners, collaborators and contributors to the Norrköping conference and to this book.

On April 30, 2003 one of the key figures in promoting the international scientific interest in the history of occupation health, Professor Antonio Grieco of Milan, died. He was also an enthusiastic co-organiser of the Norrköping conference and has made a prominent contribution to this book. In honour of Antonio

Grieco a short obituary written by former ICOH President Bengt Knave has been added to this preface.

Svante Beckman	Jan Sundin
Chair Organising Committee	Chair Scientific Program Committee

In memoriam

Antonio Grieco
1931–2003
Professor, MD, PhD
Clinica del Lavoro Luigi Devoto, Milan University, Italy

Professor Antonio Grieco spent his entire professional career at the Clinica – the oldest institution in the world for the diagnosis, treatment and prevention of work-related diseases – finally as its Director 1985–2001. A vast and internationally appreciated scientific production included studies on respiratory and lung diseases, ergonomical prerequisites for different occupations, ageing at work, and work organisation. With his knowledge and experience he was appointed member of many international bodies in the field, such as, WHO, EU, ICOH (The International Commission on Occupational Health) and IEA (International Ergonomical Association).

In the 1990's Antonio Grieco felt the need for an increased focus on the history of occupational and environmental prevention and started an international network entitled The International Network for the History of Occupational and Environmental Prevention (INHOEP), that included historians, architects, ergonomists and psychologists. The main outcome was a founding seminar (Milan, 1996) and a book on the historical development in Italy (1997). This network initiative called for a pendant "oriented to occupational medicine", and in 1996 the ICOH Scientific Committee "History of Prevention of Occupational and Environmental Diseases" was founded with 52 members from 12 countries and with Antonio Grieco as chairman. The INHOEP network and the ICOH Scientific Committee then jointly organised two International Conferences, the first in Rome (1998), and the second in Norrköping (2001).

Antonio Grieco died on April 30, 2003, at a time when he was still actively engaged in different projects and plans. His interests and activities in history were unbroken. He spoke from this conviction: "He who ignores the past has no roots and he who has no roots has no future."

Bengt Knave
President of ICOH 2000–2003

Content

Introduction

Marie C. Nelson, University of Linköping

Recent decades have seen an explosion of interest in the area of the history of medicine in the broadest sense of the word. The field has grown to include a multitude of disciplines and orientations. Not least, studies now routinely include the social and political context, and questions are approached from a variety of disciplines. It is these very qualities that make the field dynamic and lend it a sense of exploration. At the same time the high profile of health questions in today's world gives the field an actuality and a sense of urgency. Many argue that the historical perspective may provide a base for a better understanding of today's world.

In the recent volume *Locating Medical History* Frank Huisman and John Harley Warner have discussed the character and nature of the field, both in light of its history and its current diversity.[1] They eloquently plead for tolerance in an "eclectic" field, arguing that the opportunities for productive and open debate are often lost in the simple disparagement of "other" approaches than the current vogue. These points are well taken, and something that should be kept in mind in reading this volume, the product of cooperation between a variety of organizations promoting history of public health and occupational history that came together in the September 2001 conference that bore the same name as this volume, "Occupational Health and Public Health: Lessons from the Past – Challenges for the Future". While some of the authors might identify themselves with one field or the other, it became apparent in editing the volume that erecting such a boundary would be a disservice to the authors, to their contributions and to the vitality so evident at the conference.

Seldom do circumstances become so instantly outdated as those under which that conference was held. Scarcely had the long-distance participants arrived home when the first watershed of the 21st century occurred, 9/11. The contents of some papers must be interpreted in this light; other papers were presented in preliminary form and were later substantially revised.

The papers in this volume include most of the contributions to the plenary sessions with some additions. Part I, "The Role of Health in a Changing World – Perspectives on Medicine, Politics and Society", includes the introductory and concluding lectures and addresses issues of history and its eventual relevance for politics and policy-making, while Part II, "The Growth and Definiton of Ideas of Health", provides historiographic glimpses of varying depth into the growth of the field. Part III, "Health and Industry: Politics and Practice", contains three chapters dealing with the growing awareness of industrial hazards and the power struggles between various groups of actors in the process of developing policy and making

[1] Frank Huisman and John Harley Warner, "Medical Histories," pp. 1–30 in Frank Huisman and John Harley Warner (eds.) (2004) *Locating Medical History: The Stories and Their Meanings*. The Johns Hopkins University Press: Baltimore and London.

industry safe for the workers and the rest of society. The section concludes with a personal portrait of one of the Swedish pioneers of occupational health and an early international figure in the field. The final section is entitled “Global Perspectives on Health, Old and New” and is indicative of much work being done today that crosses international borders, looking at health from an international perspective. In this sense, the contributions to this volume provide a good overview of work in the field past and present and points toward the future.

Part I
The Role of Health in a Changing World
– Perspectives on Medicine, Politics and Society

1: Politics as a Tool of Public and Occupational Health Practice

Daniel M. Fox, Milbank Memorial Fund, New York, NY

I make four points as a result of listening to as many papers as I could during this meeting. The first three points explain why the quality of the scientific papers and discussion were so satisfying to a speaker who has spent thirty-five years as both a public official and counsellor to officials and a student of history and political economy. The final point is a challenge to professionals in public health and perhaps – I know less about occupational health – to persons in that field as well.

The challenge is this: Professionals in public and occupational health who want to improve the health of populations must become sufficiently expert in the politics of policy making to communicate with persons who stand for public office and their closest staff members.

The first point: The authors of many papers presented at this meeting appreciate the problems of making policy in government and in the institutions of the economy. More than a few authors addressed these problems as well as appreciated them. This embrace of the politics of policy is, in my experience, unusual at meetings about research in public health.

Moreover, and to the credit of the authors, I heard very little advocacy. The word advocacy has many meanings. People in high public office in the United States usually define advocacy as special pleading on behalf of a particular group. Advocacy in public health is the righteous advice that many public health officers bestow on elected officials and members of their staffs, whom they mistakenly believe to be, as a group, under-informed, and short-sighted and crass. The absence of such advocacy at this meeting is evidence of respect for the frustrating if sometimes satisfying responsibilities of governing.

The second point: Your appreciation of the analytic work as well as the art of policy making demonstrates growing international support for a critique of dominant themes in public health theory and practice during the last half century. Many speakers at this meeting contributed to the critique and offered persuasive evidence in support of it.

According to the critique, many public health researchers and practitioners, worldwide, have made over-simple assumptions about the process of adapting the findings of science and technology to the economic, political, and social systems in which they work. Foremost among these over-simple assumptions has been insistence that health is an absolute goal, perhaps the foremost goal of public policy. A goal that is absolute cannot be compromised. However, negotiating compromises – that is, the engineering of equal sharing of disappointment – is the basic method for solving political problems in democracies.

Moreover, maximizing health status for everyone cannot be the highest priority of public policy makers because most citizens of most countries prioritize health only when they or someone they love is desperately sick or when many people seem to be at risk of severe illness. Because most citizens accord higher priority

most of the time to peace, economic security, improving their incomes, education, and recreation sometimes to revenge and war over health, the people whom these citizens choose or permit to govern them do not accord the highest priority to health. That is, not giving absolute top priority to health is a rational decision for politicians to make. They have learned that effective leadership requires them to remain, at most, only a small distance ahead of their constituents.

Another major point in the critique is that many public health researchers and officials have ignored the lessons of historical research. Not paying attention to history creates three impediments to making policy that improves the health of populations.

The impediments: (1) People who disregard history are frequently impatient with the contingency of health status; that is, with how health status is effected by the culture, economy, society of every country and region within countries, as well as by interventions intended to improve the health of individuals and populations. (2) They underestimate the difficulty of interpreting data about the determinants of health of any population and then of acting on those interpretations. (3) They are naïve about the difficulties of intervening in the lives of individuals and institutions of the economy and society to improve health.

The third point: The purpose of the critique of public health research and practice to which many of you are contributing is to achieve better health status for populations. Speculating about policy that is not feasible wastes time and effort. Improving health status requires tough-minded analysis of what policies can be made in a particular country or subunit of it at a particular time, and then arraying the best possible evidence about which of these policies are likely to contribute to the greatest improvement in health status.

Discovering what policy is practicable requires many tools, among them, the methods and findings of historical research. Competent action in the future is rooted in competent analysis of the past. I heard many talks at this meeting in which speakers analyzed the past in order to make and implement more effective policy for population health.

The fourth and final point: I urge you to find ways to make your critique of public health practice, your sensitivity to contingency in history, and your evidence about effective interventions convincing to leaders of government and the economy. I call government officials who make policy leaders of general government; these officials either run for office or report directly to elected officials. Public (and occupational) health officials are, in contrast, members of specialized government, like their colleagues in, for example, agriculture, education, housing, or transportation. Leaders of general government decide how to allocate resources among the competing units of specialized Government. Persons in general government have expert knowledge about the interests of the many groups that promote the interests of each area of specialized government.

There is a private sector analogue to general government that I call general economic life. The leaders of this sector are senior managers of corporations and elected officials of labor unions. The former are accountable to shareholders to

maintain and increase earnings; the latter to their members for job stability, and for maintaining and improving wages, benefits and working conditions. Within private corporations there are also analogues to specialized government.

Leaders general government are hardly ever accountable for the health status of individuals. They are very clear about their accountability because they are expert consumers of the contemporary techniques of communication that have been described so lucidly in talks at this meeting. As a result of applying these techniques, these leaders know how most voters rank priorities. I spoke earlier of citizens' priorities. Because they are important to understanding what policies can and cannot be made, I restate them more in the language of polls and focus groups rather than of policy analysis: the top priorities for most people most of the time are jobs and prosperity, peace and public safety, housing, education, and roads.

These preferences also drive the priorities of generalists in economic life, though in slightly different ways. The top priority for generalists who manage business corporations is almost always assuring the highest earnings for shareholders in the short term. The highest priority for labor union generalists is maximizing job security and achieving gains in wages and working conditions. Achieving and maintaining earnings targets, job security, and better wages often requires attention to some of the same issues that voters tell politicians they care most about. Health is always on the list of concerns of leaders of business but it is rarely on top of their lists.[2]

Am I offering you an impossible challenge when I urge you to involve leaders of general government and economic life in defining the future of public health and occupational health? Not at all: I know from long experience that generalists respond positively to good evidence that better health leads to social stability, higher productivity, or sustained profits. Persons in specialized government are understandably disappointed when generalists respond positively to evidence but then refuse to risk their political capital in a losing cause. But generalists are paid to understand political timing better than specialists do.

Here is an historical analogy in point: about a century ago generalists in government and economic life in most industrial countries became convinced that there was evidence that education improves social stability, productivity and profits. Evidence only drove policy for education when the persons to whom the generalists were accountable became convinced of its validity.

A word of caution: Generalists frequently formulate issues differently than specialists do. For example, some recent efforts to shift the boundaries of public health policy to "population health" use the concept of multiple determinants of health. Advocates of a population health perspective often accord particular

[2] Note to Readers: I gave this talk on September 9, 2001 and returned from Sweden to New York City on September 10th. Since September 11th, the highest priorities in my country have changed; I suspect temporarily. The priorities are now preventing biological, mechanical and chemical terrorism, protecting and creating jobs during a recession, and taking revenge on religious totalitarians who commit and condone murder. In New York City, and especially in Lower Manhattan where I live, the list of priorities includes rebuilding at Ground Zero and recreating the downtown economy.

emphasis to the determinants of health disparities by socio-economic status and race.

Most leaders of general government and economic life think, however, that they already know something about multiple determinants of health. To them the determinants of health are whatever their constituents, employees and members say they are. The most important determinants to generalists are, therefore, economic security, health care, violence, clean water, safe food, land use that doesn't kill by increasing danger from vehicles or toxics, and the safety of travellers.

Many specialists in population health have told me that this definition displeases them. These specialists want generalists to address inequality in wealth and class that seems to be correlated with disparities in health status. Most generalists understand, however, that a politics of redistribution is also a politics of disruption; and they are convinced that a politics of disruption is rarely in the public interest.

In summary, I have made four related points. I praised the participants in this meeting for their serious and sophisticated embrace of the problems of governing political and economic institutions. I acknowledged the constructive critique of public health theory and practice that was a text or a sub-text of many of the papers. I noted that historical science is an essential source of the insights on which to create a theory and practice of population health that is appropriate for our new century. Finally, I encouraged you to share your work and your wisdom with generalists in government and economic life, with, that is, the only people who have the authority to allocate resources to maintain and improve the health of populations.

2: Public and Private Collaboration – A Necessary Way Forward

Brian K. Atchinson, Executive Director, Insurance Marketplace Standards Association, Chevy Chase, MD, USA

The conference presented a fascinating array of topics, interwoven like a tapestry of many colors. The complimentary roles of public health and occupational health were readily apparent. However, the perspectives varied greatly among those from different professional disciplines. Each forum represented a unique and often compelling exchange of information and experiences. In many respects, the conference represents a continuing dialectic that serves to advance the exploration for innovative solutions to shared challenges in many different places occurring at varying degrees of intensity.

The many lessons shared and learned throughout the conference extended beyond convenient categories and often defied neat compartmentalization, as illustrated in discussions so diverse they extended from asbestos and carbon disulfide to banana harvesting to seafaring Liverpudlians of past centuries.

One participant noted, "Equality in health is the goal". The meaning of this statement changes significantly depending on whether it is "Equality" around the world, within a region, a nation, or a community. The demographic, economic and political pressures are forcing vigorous debate in many places around the world regarding the best approaches to address these pressures and, in some instances, redefine concepts concerning health. The debate has clearly commenced between what is desirable versus what is practical and possible. If the focus is to be on healthy populations, there may be inherent tensions where the interests of the public good and the public sector meet the private marketplace. There are many variations on this theme currently occurring, including the debate about social security systems in the many countries. (One acknowledges that the United States' system is a different model from that in most countries.) Incrementalism is the common approach in most countries. Nonetheless, the debates raise fundamental issues concerning "values" that necessarily confront systemic integrity in public health policy towards populations. This conference has presented numerous examples of this dialogue occurring around the globe.

The lessons to be learned are not simple, but some general themes emerged. The marketplace fixation on profit margin maximization sometimes can impede or prohibit the delivery of optimum occupational health. As a natural consequence, public health can only then react in an imperfect manner. We have learned how occupational health professionals are a growing and significant presence in much of the world, particularly in certain countries that have established credible and transparent certification processes. The enhanced credibility of health professionals that accompanies certification or licensure is generally a positive development in discussions and negotiations intended to bring about better outcomes in both occupational and public health. During the conference there emerged a shared realization in the almost unique ability of health professionals to advocate

for those dependent on others to make informed decisions. Though advocacy itself was never the catalyst or goal, the need for those credible voices in decision making is key.

Occupational health takes many forms – changing as the world changes. The emerging recognition of "life long employability", as reflected in the work of the International Institute of International Insurance Economics, will dramatically alter the terms and scope of discussion in the future. Many of the challenges confronting governments and individuals are premised on arguably antiquated definitions of the nature of the problem. Redefining the scope of the challenge is a broadly shared undertaking in both developed and emerging economies around the world. As public health officials and experts debate and occasionally celebrate the many advances in demographic sustainability, the role of individuals in the workplace may be extended and modified while moving away from the long held perspective that one works until one retires – when one ceases to work. Partial productivity may become an essential part of many societies and public policies as the concept of "middle age" evolves beyond the ages of 45 and 55 to 65, 75 and beyond. Much of the world will be challenged by changing demographic conditions. This conference touched on this topic in many ways but may wish to explore it further in the future.

The wonderfully inclusive approach in Sweden towards defining the scope of public health is not emulated in many countries, yet most aspire to a similar, less refined vision. The conference did demonstrate that for every enthusiast, there is a countervailing skeptic. The foundation of our public health and social security systems will be under siege in many countries that will find it difficult (and occasionally impossible) to sustain these systems. This conference has demonstrated that this forum has the capability to serve as a significant positive force in the multidimensional effort to confront this challenge.

Around the globe, there is significant concern that some of the advances of the past one hundred years may be compromised in light of projected demographic trends. Yet, some believe that a solution is within reach once a problem has been identified and defined. For those, there can be cautious optimism as a result of the melding of theorists, analysts, participants and leaders in Norrköping.

In the United States, there exist certain distortions in the health system(s), occupational and generally, when contrasted with other countries. These aberrations in the United States are partially the result of the federal – 50 state – government structure, the free market economy, as well as, the hyper-litigious nature of persons in the United States. Many issues in the US are framed as "legal," often prompting differences of opinions and curious public policies concerning public health and private interests. These debates may resonate for those in other countries who find themselves in the future debating and discussing these same thorny issues. In the United States' fragmented health care system, most people receive their health insurance coverage through their employer as a benefit, as part of a compensation package. Most do, but many do not. Individuals whose incomes are below a certain low annual salary level are eligible for government-sponsored

medical care. However, in the middle of the US population economic stratification there are approximately 50 million US citizens with no health insurance. Many of these uninsured work for employers that choose not to provide health insurance. The public health issues are enormous and, because of its employer-basis, the occupational issues are equally daunting.

The US federal system often results in inconsistent approaches among the different states, but also allows for the sharing of "best practices" among those who share similar responsibilities and common goals. One example of systemic tension exists in the United States where the workers' compensation system is designed to compensate injured or disabled employees. Its design is intended to limit the legal exposure and liability of employers. In recent years, there has been more emphasis on the health workers within the workers' compensation system. This is another example of the importance of being an informed participant in the health care delivery system. For the past six (6) years in the United States, the Robert Wood Johnson Foundation Workers' Compensation Health Initiative has undertaken a program to promote the improvement of health outcomes and contain costs by promoting innovative initiatives to better collect and use data. This is merely one example of a country struggling to establish a semblance of organization in an area that is a creation of circumstances – not a product of inspired policy making.

The challenge of Norrköping is to share insights, experience, and best practices so that we may all view our own world through another's eyes and examine the worlds of others from different perspectives. The participants in Norrköping have demonstrated that there is no monopoly on enlightened public policy making. This conference has demonstrated that there are major limitations to insular policy making and implementation. The study and crafting of future solutions to occupational and public health challenges need to embrace all those who are affected or can affect the process or outcomes. This should necessarily lead to some challenging areas of exploration where long held beliefs need to be revisited, old alliances questioned and presumed opponents reexamined.

Good public policy cannot be made in a vacuum. Occupational health is a key component within the overall public health. This conference demonstrated the essential nexus between these disciplines. For those confronting these challenges around the world, it may be helpful to weave into this tapestry additional perspectives that can meaningfully contribute to the search for solutions and make the tapestry even more bright.

3: The History of Public Health in Industrial and Post-industrial Societies

Dorothy Porter, Department of Anthropology, History and Social Medicine, School of Medicine, University of California, San Francisco, California, USA

Populations were industrious long before the period identified by historians as the modern industrial revolution and the consequences of industry for the health of workers have been observed from antiquity. As the great historian of public health George Rosen pointed out, Ancient Greek flute players wore leather mouth bands to protect their facial muscles from becoming too relaxed, and even though very few Hippocratic references to occupational health exist, some observations were made about a possible relationship of lead poisoning to pneumonia experienced by miners (Rosen 1958, p. 13). During Roman times Galen observed the suffocating conditions in which Cypriot copper sulfate miners tried to protect themselves with primitive respirators (Rosen 1958, pp. 21–22). However, concern for workers' health did not figure significantly in an epoch of public health administration that was largely orientated to the creation of salubrity for the comfort of patrician élites (Porter 1999a, pp. 19-20). The health of workers became a far more pressing issue for collective action regarding health when the economic value of labor power exponentially increased with the development of mechanized factory production at the end of the eighteenth and beginning of the nineteenth century (Porter 1999, pp. 49–52).

Public health actions undertaken from the late medieval to the early modern period had been largely concerned with the control of epidemic diseases – or rather one disease, i.e. plague – but by the end of the eighteenth century new efforts were being made regarding the chronic illnesses developed by workers in a variety of new working conditions. Eighteenth century collective efforts regarding occupational health were not undertaken by political states but by the people most affected by the cost of occupational diseases, employers and workers. Recent work by Brian Dolan has highlighted the efforts made by pioneer employers of the English industrial revolution, Josiah Wedgwood and Matthew Bolton, to organize systems of health insurance amongst their workers for the purchase of medical services both for themselves and their families (Dolan 2004). Being true believers in Enlightenment science and members of the little club of natural philosophers, the Luna Society, Bolton and Wedgwood also experimented with the idea of providing bottled pure oxygen within their factories to ensure their workers breathed "good" air. They believed that if their workers breathed pure oxygen it might prevent some of the respiratory diseases that increasingly claimed workers as victims. Of course, another member of the Luna Society, Thomas Beddoes, was experimenting at the same time with the use of nitrous oxide for the cure of consumption offered freely to the poor in a public dispensary set up in Bristol (Porter 1992). But perhaps Wedgwood and Bolton foresaw the kind of problems that might be created for productivity if their workers were belly laughing all day!

These early efforts made by English industrialists and workers were independent initiatives that did not involve central or local governments. Occupational health did not figure as an issue for state legislation in England until the first factory acts were passed in the 1830s. However, for contemporary historians collective action in the context of mutual aid organizations, the voluntary sector or commercial enterprise is an equally important source for reconstructing past relationships of population health (Porter 1998, pp. 83–93). Because, contemporary historians of public health are interested in collective action in relation to the health of populations, whether this was undertaken by local or central political states, by voluntary organizations or the commercial market place. And collective action in relation to occupational health is likely to be found in many more historical arenas than public administration because of its central role in the reproduction of economic structures and relationships (Porter 1999a, Introduction).

It was for this reason that George Rosen, in an article published in the *Bulletin for the History of Medicine* in 1937, emphasized the singular importance of occupational health within the history of public health (Rosen 1937, pp. 941–46). Rosen argued that occupational health highlighted the centrality of economic structures in historical transformation. As Ed Morman has pointed out, for Rosen the history of occupational health was pivotal to the establishment of medical history as a discipline of social history, because occupational diseases were so evidently caused by social circumstances (Morman 1993). More recently social historians of medicine and public health, such as Charles Webster and Virginia Berridge, have echoed Rosen's concerns in focusing on the extent to which political states and public administrations have considered or have ignored the role that economic inequality plays in determining population health (Berridge & Blume 2002). Contemporary historians focus on issues such as health inequalities because, as the recent book by John Welshman on *Municipal Medicine* in twentieth century Britain points out, the history of public health policy making, especially of the recent past, has significant implications for policy making in the present and for the future (Welshman 2001). I would argue that the recent concern amongst public health historians with the relationship between the history of public health and contemporary policy making marks a return, to some extent, to the values which underlay an earlier historiography.

After the Second World War public health historians examined the role that public health policy had played in the administrative growth of modern states and the development of social welfare systems. Historians and practitioners of social medicine such as René Sand, professor of social medicine at Brussels University, George Rosen from Yale and Thomas McKeown, professor of social medicine in Birmingham, used history as part of their mission to identify the role that comprehensive economic planning and preventive medical administration could play in creating not only healthier but also more egalitarian societies. Sand and Rosen incorporated the growth of the administrative state into grand narratives of progress, arising from the technological advance of science and medicine and its capacities to combat endemic and epidemic disease (Sand 1952; Rosen 1958).

This vision was reinforced in 1976 by the conclusions of Professor of Social Medicine Thomas McKeown. Clinical medicine, he claimed, had played no part in the *Modern Rise of Population,* which had largely resulted from improved nutrition that was a consequence of the broader distribution of higher standards of living and environmental reforms such as the creation of clean water supplies (McKeown 1976a, b). Sand, Rosen and McKeown linked historical transformation to increased social and health egalitarianism to what they believed was the emancipatory power of positivist knowledge. Like the Marxist historian of medicine, Richard Shryock, Rosen and Sand considered the vital role played by the impact of laboratory and experimental science on the understanding of disease (Shryock 1979). Thomas McKeown shared the belief of his mentors, Lancelot Hogben and Francis Crew, in the power of quantitative methods for revealing the relationship between economic inequalities upon the differential relationships of health, morbidity and mortality (Crew & Hogben 1947).

A new generation of public health historians in the 1960s and 1970s may have shared some of the political values of the post-war historiographers of health and practitioners of social medicine but challenged their faith in scientific progress and the politically emancipatory power of positivist knowledge.

Between the 1960s and 1980s a wealth of new historiography on the role of epidemics in social transformation appeared, perhaps stimulated by Asa Briggs' suggestion that the story of cholera had been overlooked as a major factor in historical change in Victorian society (Briggs 1961, pp. 76–96). But the work of Margaret Pelling (1978), William Coleman (1982), Charles Rosenberg (1962), Carlo Cipolla (1979), Paul Slack (1985) and Richard Morris (1976), to name but a few, highlighted the historical contingency of rationalism and mirrored what their contemporary historians of science were arguing about the social construction of knowledge (see also Barnes & Shapin 1979; Barnes & Edge 1982). The work of the Marxist William McNeill and the historian Alfred Crosby stimulated the investigation of the role of disease in imperial expansion (McNeill 1976; Crosby 1986), a theme explored further in an examination of the migration of peoples, diseases and cultural exploitation by Philip Curtin (1989). In the historiography of epidemic disease the role of rationalism in the re-enforcement of political domination was being examined both in the context of class and racial relations in domestic and imperial theatres of power (Porter 1999b).

The collected essays in Kenneth Kiple's huge edited encyclopaedia, *The Cambridge World History of Human Disease*, reflect the intellectual route taken by a generation of historians from the history of bacteria in social transformation to the anthropology of belief (Kiple 1993). When Irwin Ackercknecht argued that a clear dichotomy between contagionist and miasmatic theories of disease determined the quarantine and sanitation policies of early nineteenth-century European state, he launched a significant interrogation of the relationship between the operation of political and epistemological power (Ackerknecht 1948). Margaret Pelling, however, led the way to a more challenging view of the contingency of rationalist theories and social policy-making by illustrating the pluralistic and protean-like

nature of disease theory within the context of shifting social, economic and demographic circumstances. Her arguments about *Cholera Fever and English Medicine* in the early nineteenth century echoed what Carlo Cipolla had pointed out when he argued that the apparent triumph of reason over faith in the operation of plague controls in seventeenth century Florence was inherently bound to changing relations between ruling élites (Pelling 1978; Cipolla 1979).

Exploration of the relationship between knowledge and social power expanded significantly in the 1980s, stimulated by the work of earlier twentieth century philosophers such as the Hegelian-Marxists of the Frankfurt School and the French "archaeologist" of knowledge, Michel Foucault. Both the Critical Theorists of the Frankfurt School and Foucault highlighted the authoritarian potential of Enlightenment rationalism and its offspring, positivism, as an inherent contradiction within the liberal tradition in Western thought (Foucault 1970; Horkheimer & Adorno 1972). Historians influenced by these theoretical perspectives cross-examined the ways in which public health regulation contributed to the rise of a "disciplinary culture" which Foucault argued was the defining characteristic of modern society (Armstrong 1983). At the same time the impact of rationalist knowledge on the development of the modern bureaucratic state was interrogated by Marxist historians who questioned the role played by public health administration in the growth of government and the rise to power of what Harold Perkins had called "professional society" (Porter 1994; Weindling 1989). These concerns fed into a wide variety of new perspectives that began to redefine the parameters of what constitutes the history of public health, which now includes a hugely rich diversity of subjects and inquiries from the multicultural politics of the body to the changing structure of modern welfare states and social policies.

A recent illustration of this new diversity is the volume of essays on urbanism and public health edited by Sally Sheard and Helen Power (2000). The essay collection represents many of the new discourses within the history of public health. The collection includes demographic studies, histories of local and central governance, the historical anthropology of public health rituals and languages of disease and the history of experience, or public health from below. As Sheard and Power point out in their introduction, these new approaches emerge out of a multiplicity of new historiographical definitions of what constitutes the "urban" and what constitutes "public health" in different periods and cultural contexts. If, as Sheard and Power suggest, the establishment of cities from earliest times was only made possible through a tacit agreement by urban dwellers to "living in proximity by consent", then they are right to promote a definition of urban public health as the relationship between *Body and City* (Sheard & Power 2000, pp. 1–17). Because as one of their contributors, Gerry Kearns, has pointed out elsewhere, the relationship between health, disease and urbanization reveals the way social conflict permeates the biological basis of society and also promotes a biological view of social and political relations (Kearns 2000). Examining the history of urbanization and public health from this perspective makes Kearns, Sheard and Power argue, together with Andrew Lees, that towns, like E.P. Thompson's con-

ception of classes, are perhaps best perceived as happenings, rather than things, with a momentum that is in a constant state of flux between biology and culture (Sheard & Powers 2000).

The relationship between biology and culture has led the historiography of public health to explore the effects of collective action upon individual lives and bodies. The work of Flurin Condrau and Jakob Turner has begun to construct a history of public health from below by examining working class experiences of cholera and public health reforms in nineteenth-century Switzerland (Condrau & Turner 2000). Amongst my own research students, some are beginning to investigate the impact of public health reforms on the lives of communities through an examination of working-class biographies and working class political literature. The recent investigations by Susan Lederer, Mark Parascandola and Alan Brant into mid-twentieth-century health education campaigns to prevent venereal disease and promote the Salk vaccine in the United States reflect, on the one hand, the actions of the state but also offers a chance to read the responses of individuals and of communities to state action (Lederer et al. 2001).

The extensive new historiography on the "body" unpacks some of these relationships at a more intimate level. According to the Foucaultian inspired arguments of the historical sociologists David Armstrong and Bryan Turner, the public health "body" is one which is determined by the rise of a disciplinary rationalist culture (Armstrong & Turner 1997). It is controlled, cajoled and constrained by the logic of domination into the service of the efficiency of production. Being fit to live in advanced or post-industrial societies involves the adoption of a set of cultural pejoratives that define the healthy life-style which characterizes a post-modern agenda for the care of the self. Elsewhere, I have agreed with Armstrong and Turner that a newly defined somatic citizenship is a critical qualification for entry and participation in the cosmopolitan heart of post-modern society (Porter 2000). The dialectics of somatic citizenship, however, is that the rationalist culture of the healthy life-style produces irrational health obsession and neurosis. Edward Shorter has described this as a late-twentieth century disease of somatization. Elaine Showalter has identified health neurosis as a set of new hysterias (Shorter 1986; Showalter 1997). Both would agree with the journalist James Le Fanu when he argues that a new culture of health obsession has produced a worried well society (Le Fanu 1999). Michael Fitzpatrick, a general practitioner from Stoke Newington in London, suggests that the worried well society has resulted from public health becoming a new form of political tyranny, not only over the lives and consciousnesses of the well but also as a new form of authoritarian governance of the lives of medical practitioners (Fitzpatrick 2000).

David Armstrong was the first to suggest that public health began to expand the social space of illness when it turned into a form of social scientific management of risk, making everyone a potential patient and creating a culture of patienthood (Armstrong 1997). Along the same lines, I have argued that the rise of new academic disciplines such as social medicine and medical sociology shifted the focus of collective actions in relation to health from structures to behavior, re-enforcing the

belief in disease as deviance carrying the social stigma of disobedience (Porter 2000), disobedience, that is, to the political directive to be well. The cultural imperative to be well has been engendered, not only by the collective actions of the state or even voluntary organizations. It has also been a commercial enterprise throughout the twentieth century which has often represented imperialist notions of racial supremacy as muscular strength and physical fitness and making health a commodity fetish (Porter 2000).

Full social status in post-industrial society requires you to strive for health. The directive of both the state and the commercial health-promotion industries is that achieving health, beauty and desirability is your own responsibility *and* your social duty. The responsibility to remain well has always been part of the social contract of health citizenship ever since the French revolutionaries invented the idea at the end of the eighteenth century. However, the social responsibility to be healthy has taken on a new urgency and a new political authoritarianism at the beginning of the twenty-first century because the economic élites of the most affluent societies in history and their political servants can, or will, no longer pay for health for all. As demographic shifts in post-industrial societies produce ever greater proportions of unproductive populations dependent upon the wealth produced by a shrinking productive majority, the modern state is redrawing the boundaries of its obligations to provide health as a social right of citizenship especially to its most vulnerable populations. "Be well or go to the wall" is relentlessly communicated through the political scaling down of public health care and service provision (Porter 2000).

The redrawing of the boundaries of health citizenship is one reason perhaps why it is time for public health historians to revisit some of the politicized intellectual goals of that early post-war generation of historians, such as Rosen, Sand, Shryock and McKeown, and their focus on the economic distribution of health and wealth. There has never been a more appropriate time for making public health history politically relevant both at the level of policy-making and in terms of the politics of knowledge, belief and culture as the definition of health citizenship remains open to question in the midst of rapid economic, social and cultural transformations. Beginning with the engine of economic and social reproduction, that is *work,* and its consequences for the health of workers, is an excellent place to start, regardless of whether it is work in manufacturing or the service industries or whether sociologists identify the workers as blue or white collared, laborers, artisans – if there are any of those left – or professionals. The history of occupational health and public health offers a wide canvass of opportunity for exploring the history of public health as everything from a tool of public policy to a determinant of the somatic experience and the social and cultural status of individuals.

References

Ackerknecht E.H. (1948) "Anti-Contagionism Between the Wars" *Bulletin of the History of Medicine,* 22:562–93.

Armstrong D. (1983) *The Political Anatomy of the Body. Medical Knowledge in Britain in the Twentieth Century*. Cambridge: Cambridge University Press.

Armstrong D. (1997) "The Social Space of Illness" In: Porter D. (ed.) *Social Medicine and Medical Sociology in the Twentieth Century*. Pp. 165–175. Amsterdam and Atlanta: Rodopi.

Barnes B. & Edge. D (eds.) (1982) *Science in Context: Readings in the Sociology of Science*. Milton Keynes: Open University Press.

Barnes B. & Shapin S. (eds.) (1979) *Natural Order: Historical Studies of Scientific Culture*. Beverly Hills and London: Sage Publications.

Berridge V. & Blume S. (eds.) (2002) *Poor Health. Social Inequalities Before and After the Black Report*. London: Frank Cass.

Briggs A. (1961) "Cholera and Society in the Nineteenth Century" *Past and Present,* 19:76–96.

Cipolla C. (1979) *Faith, Reason and the Plague. A Tuscan Story of the Seventeenth Century*. Brighton: Harvester Press.

Coleman W. (1982) *Death is a Social Disease*. Madison: University of Wisconsin Press.

Condrau F. & Turner J. (2000) "Working-class experiences, cholera and public health reform in nineteenth-century Switzerland" In: Sheard S. & Power H. (eds.) *Body and City. Histories of Urban Public Health*. Pp. 109–123. Aldershot: Ashgate.

Crew F.A.E. & Hogben L. (1947) "Notice to Contributors" *The British Journal of Social and Preventive Medicine,* 1:1.

Crosby A. (1986) *Ecological Imperialism. The Biological Expansion of Europe. 900–1900*. London: Cambridge University Press.

Curtin P.D. (1989) *Death by Migration: Europe's Encounter with the Tropical World in the Nineteenth Century*. Cambridge: Cambridge University Press.

Dolan B. (2004) *Wedgwood*. London: Harper Collins and New York: Viking.

Fitzpatrick M. (2000) *The Tyranny of Health*. London: Taylor Francis.

Foucault M. (1970) *The Order of Things. An Archeology of the Human Sciences*. London: Tavistock.

Horkheimer M. & Adorno T. (1972) *Dialectic of Enlightenment*. trans. John Cumming. London: Heinemann.

Kearns G. (2000) "Town Hall and Whitehall: Sanitary Intelligence in Liverpool 1840–63" In: Sheard S. & Power H. (eds.) *Body and City. Histories of Urban Public Health*. Pp. 89–109. Aldershot: Ashgate.

Kiple K. (ed.) (1993) *The Cambridge World History of Human Disease*. Cambridge: Cambridge University Press.

Le Fanu J. (1999) *The Rise and Fall of Modern Medicine*. London: Little, Brown.

McKeown T. (1976a) *The Role of Medicine – Dream, Mirage or Nemesis*. London: Nuffield Provincial Hospitals Fund.

McKeown T. (1976b) *The Modern Rise of Population*. London: Arnold.

McNeill W. (1976) *Plagues and Peoples*. New York: Doubleday.

Morman E.T. (1993) "George Rosen and Public Health History" In: Rosen G. *A History of Public Health*. Pp. lxix-lxxxviii, Expanded Edition with Introduction by Elizabeth Fee and Biographical Essay and New Bibliography by Edward T. Morman. Baltimore: Johns Hopkins.

Morris R..J. (1976) *Cholera 1832. The Social Response to an Epidemic*. London: Croom Helm.

Pelling M. (1978) *Cholera Fever and English Medicine 1825–1865*. Oxford: Oxford University Press.

Porter D. (ed.) (1994) *The History of Health and the Modern State*. Amsterdam and Atlanta: Rodopi.

Porter D. (1998) "New Approaches to the History of Health and Welfare" *The Bulletin for the History of Medicine*, 83:83–93.

Porter D. (1999a) *Health, Civilisation and the State. A History of Public Health from Ancient to Modern Times*. London and New York: Routledge.

Porter D. (1999b) "The History of Public Health: Current Themes and Approaches" *Hygeia Internationalis. An Interdisciplinary Journal for the History of Public Health,* 1:9–21.

Porter D. (2000) "The Healthy Body in the Twentieth Century" In: Cooter R. & Pickstone J. (eds.) *Medicine in the Twentieth Century*. Pp. 201–206. Amsterdam: Harwood Academic Publications.

Porter R. (1992) *Doctor of Society*. London: Routledge.

Rosen G. (1937) "On the Historical Investigation of Occupational Diseases: An Apercu" *Bulletin of the History of Medicine,* 5:941–46.

Rosen G. (1958) *A History of Public Health*. New York: MD Publications.

Rosenberg C. (1962) *The Cholera Years 1832, 1849 and 1866*. Chicago: University of Chicago Press.

Sand R. (1952) *The Advance to Social Medicine*. London: Staples Press.

Sheard S. & Power H. (eds.) (2000) *Body and City. Histories of Urban Public Health*. Aldershot: Ashgate.

Shorter E. (1986) *Bedside Manners: The Troubled History of Doctors and Patients*. Harmondsworth: Viking.

Showalter E. (1997) *Hystories: Hysterical Epidemics and Modern Media*. New York: Columbia University Press.

Shryock R. (1979) *The Development of Modern Medicine. An Interpretation of the Social and Scientific Factors Involved*. Madison, Wisconsin: University of Wisconsin Press.

Slack P. (1985) *The Impact of Plague in Tudor and Stuart England*. London: Routledge and Kegan.

Warner J.H. & Tighe J.A. (eds.) *Major Problems in the History of American Medicine and Public Health*. Boston and New York: Houghton Miffin Company.

Weindling P. (1989) *Health, Race and German Politics Between National Unification and Nazism 1870–1945*. Cambridge: Cambridge University Press.

Welshman J. (2001) *Municipal Health*. London: Peter Lang AG.

Part II
The Growth and Definition of Ideas of Health

4: Demography and Health: A Long History

Patrice Bourdelais, Directeur d'études, Ecoles des Hautes Études en Sciences Sociales, Paris, France

What patterns can be seen in the disappearance of the great epidemics? Did the poor die younger than the rich, the men more frequently than the women, the townsmen more often than the inhabitants of the countryside? Historically, at which ages did mortality first decline? These are some of the questions for which the demographic approaches in particular and quantitative methods in general provide the possibility of advancing precise answers. Although often at the price of reducing the choice of the indicators of health to mortality alone, such studies nevertheless resulted in the painting of a first preliminary factual picture from which it was possible to seek more relevant causes for the evolution observed. It might even be said that the factors associated with the true revolution of mortality and health have developed in the rich countries since the eighteenth century. Since the eighteenth century the complex bonds between demography and health questions have been brought closer. Initially, it appears significant to return to this exceptional characteristic of such long duration. Work of the last forty years in historical demography has made it possible to better understand the breach in the field of health which separates the present from the past. Lastly, the new dialogue that has recently opened among demographers, historians, sociologists and anthropologists seems favorable for a better analysis of the logic of the formation of health inequalities.

The Measurement of Mortality and the Royal States

One of the initial works in demography related to the measurement of mortality is found in John Graunt's *Natural and Political Observations upon the Bills of Mortality* (Graunt 1661), as well as in the development of enumerations in many European countries (Italy, France, Great Britain) or in their colonies in European colonial territories (the Antillas, Guyana, Quebec, Capetown) (Bourdelais 1997). The centralized states subsequently showed great interest in the characteristics and status of their populations. The first, Sweden, after 1749 required the clergy to submit the annual data concerning baptisms and deaths, as well as the age structure, by sex, marital status and profession to the central level, the *Tabellkommission*. Thus in 1766 P. Wargentin could construct the first mortality table by sex, founded on the relationship between deaths and groups of corresponding ages.

At the end of eighteenth century, Moheau was very sensitive to differential mortality according to occupational categories (Moheau 1778). This tract devotes one of the longest "questions" in the chapter on mortality to this topic, and the injustice in the "sharing of the most invaluable of all the goods is strongly underlined, that by which one enjoys all the others, duration of the life". This may also be interpreted as a secularization of the attitudes toward life. The long chapter on

mortality explored in detail, above all, differential mortality. Eight of its nine sections relate to variations in mortality according to age, sex, country, climate, month of the year and social classes, as well as causes of death. One innovation should be emphasized: throughout this chapter, Moheau stresses the diversity of the conditions of mortality and not, as was often done in the eighteenth century, its supposed uniformity at all times and in all places. In contrast to Buffon and Süssmilch, Moheau did not subscribe to the illusion of a "universal" or "general" mortality table applicable to all humanity.

On the contrary, Moheau gathered as much data as possible and as varied as possible and presented them in the form of comparative tables. The remarks that follow these tables underline the inequality everywhere observed concerning people faced with death, but the work does not propose any new measuring instrument.

For Moheau, the interest was not purely scientific. The knowledge on mortality he considered as useful for "the individual as for the State". He thought that better knowledge of mortality conditions would be useful before taking measures to prolong life. Moheau specified the questions on mortality that he addressed:

> precisely, what is the age, the time when the services [works] of the man must be spared, and even means of prolonging his existence by the improvement of its treatment and the healthiness of his lodging (Moheau 1778, p. 154).

As regards the vicissitudes of the human life, "to know them is the first means of preventing them" (Moheau 1778, p. 211). Knowledge of mortality was thus of public utility. The answers to the questions which he raised on mortality well provide "some information on its random convention where the play is established over a person's lifespan" (Moheau 1778, p. 154). But Moheau wanted the results used "less for financial goals and more for respectable ones" (Moheau 1778, p. 154). He marked his disapproval of the use of the data on mortality for actuarial or financial aims. He felt reluctant to see these essential truths concerning the human lifespan used for gain. This may also be seen in the extreme care that he took to stress their lack of representativity each time that it was necessary to do so in the chapter on mortality, and to use as well the implications that data had for groups of *rentiers* or the subscribers to tontines. Within the framework of the political philosophy of eighteenth century, when the richness of a State was still measured by the number of its inhabitants, he clarified the very harmfulness that misery exerted on the mortality of the very young in particular. Moreover, the knowledge of mortality by profession would allow the State, he wrote, to have knowledge of the healthiness of each trade and to decrease as much as possible the number who worked in the most unhealthy trades.

Environmental Conditions or Wealth?

This question of the unhealthiness of the working conditions becomes one of the essential stakes of the development of the new system of the factories, first in England, and then on the European continent. In England, the medical and social

situation had degenerated before the arrival of the cholera. Many doctors who were politically very radical and sometimes close to the Chartists brought to light the harmful consequences of the new industrial engineering on the health of children as well as on that of adults. During the 1830s, several commissions were charged with studying the reasons for the "fevers" that became prevalent endemically in certain districts, in particular those that were populous. In a complex social and political context wrought with conflict, Chadwick explained the persistence of the epidemic fevers by a unique cause: filth, the absence of draining of ponds, and the absence of draining of waste and wastewater. The medical thought of Chadwick, formerly secretary to Jeremy Bentham, was that of a hygienist of the end of eighteenth century: it was a question of making significant flows of water circulate in the city in order to remove filth. Thus the gigantic effort to route clean water toward the cities and the construction of sewerage systems was justified, making it possible to eject sewage at a distance, charged with all the urban refuse and effluents. This project, which appealed to political leaders, led to the creation, in 1848, of the first central institution in charge of the questions of public health in Europe, the *General Board of Health*, that Chadwick directed for six years. By that time accumulated enmities, the technical difficulties involved in the realization of these networks and the fast clogging of many sewers that had been built according to the instructions of Chadwick's official engineers caused him to leave that position in 1854.

It is certainly wise, however, to integrate this medical project within a broader political framework. If one follows the interpretation of Christopher Hamlin, Chadwick provided the Royal Commission with an additional opportunity to seek an outlet from their policies and from the social crisis then shaking England (Hamlin 1998). The medical reform made it possible to ameliorate the frontal shock of social contradiction, very sharp since the reform of the *Poor Law* in 1834. This reform removed any possibility for help at home and forced the poor to enter *workhouses*, whereas the opinion spread among many doctors that, although temporary, unemployment, malnutrition and indigence could cause disease. In 1838, Chadwick, secretary of the *Poor Law Commission*, together with two of his friends, doctors from Bentham's network and a police chief, requested permission to carry out an investigation into the causes of the epidemic which had raged in the poor East End of London for a year and emptied the coffers of the relief institutions. The report of Neil Arnott, Southwood Smith and Philipp Kay confirmed that stagnating water ponds, filth that had not been removed, and rubbish were the origins of the epidemic. Following this report, Queen Victoria asked that a national survey be undertaken. Chadwick, who was charged with this task, then systematically joined the documents of the investigation to the local scale Arnott-Smith-Kay report and directed it toward the expected conclusion: the correlation of the fevers with the dirtiness of the zones that were not drained. Moreover, in his summary he eliminated the medical considerations of the local reports and of the industrialists, who did not abound in his organization. He insisted on their lack of statistical rigor, certain statements in particular, as well as the inaccuracy of the

evaluation of the populations at risk used in each situation, a condition that was, of course, very difficult to fill. Lastly, in a systematic way, the richness and the variety of the medical theories are used in order to emphasize, within each report, the parts that highlight the medical aspects rather than those placing blame on the working conditions. Many small "offences" are thus put at the service of the greatness, not only of medical theories, but also the economic intentions and policy of Chadwick. His quarrel with another significant character of English statistical and medical history, William Farr, illustrates the roughness of the fight. Farr, in the service of the recently established *General Registrar*, retained "hunger" as a cause of death, whereas Chadwick disputed the relevance of such a cause of death and detailed the causes of the 63 cases allotted to hunger. Farr answered that, as a cause of death, "hunger" represented a broad economic category because, when one lacked food, one also lacked heating, clothing and all that is necessary to life. Everything is abandoned in the search for food, an interpretation that implicitly affirmed the failure of Poor Law Commission! Nevertheless, Chadwick succeeded in reducing the policy of public health to "cleansing," using the argument of the bad quality of the statistics to invalidate certain local contributions to his national report!

Thanks to the political operation led by Chadwick, which reduced various dimensions of the public health to only one, that of the cleaning up the cities, the *General Board of Health* was created. The French configuration was very different. During the same period, the Medical School of Paris experienced one of the famous periods of its history. The professors, specialists in anatomic pathology, made profitable the concentration of patients in vast public hospitals to multiply their observations of corpses by practicing systematic autopsy. The consequent leap in knowledge of the human organism and the seat, or the causes, of diseases, attracted many foreign students to their dissection amphitheatres. The *Ecole numérique*, inspired by Dr. Louis, argued in favor of the statistical processing of the symptoms and effectiveness of treatments, which caused the theoretical and practical debates to become more and more complex. In addition, even if the chronology and patterns of French industrialization are different from those of the industrial pioneer, England, the social question was broached in France, both by reformers and by those who never accepted the French Revolution and swore by a return to the old agricultural mode of production. Among the reformers, the socialist Catholics counted on benevolence and private initiatives in contacts with the poor, whereas economists turned to the State for control of social conditions associated with industry. In this debate, the demographic data gathered (vital statistics and quinquennial censuses) made it possible to test some of the assumptions advanced by neo-Hippocratic medicine as well as by the Republicans concerned with the fate of the poorest. The Academy of Medicine, very interested by the results of the shift in population from 1817 to 1821 worked out by the statistician Villot, entrusted a report on this subject to Villermé.

Villermé tried to classify districts according to their mortality and the proportion of poor families in order to compare the classifications by location. The diffi-

culty was to find a suitable indicator of poverty and wealth: he chose the proportion of non-taxed rented flats in each district. This first exercise led to comparisons with other populations that formed the starting points of the Academy of Medicine *Report on the mortality in the leisure class and the poor class* in 1828 and the *Report on mortality in France*. Thanks to the new documents produced by the administration, he could devote himself to detailed analyses which exploited a scaling of observation. He compared mortality in two Parisian districts (the 1st and the 12th , and two streets of the 9th district) with 27 French departments (Villermé 1828). After having scrupulously reconstructed mortality in residences and in hospitals using explicitly clarified assumptions (the deaths in the hospitals and old people's homes would be, for each district, proportional to the number of patients sent to the hospitals, and the number of the old men of the old people's institutions would be proportional to that of the patients), he showed that between 1817 and 1822 mortality was one person per 58.24 residents living in the 1st district and one person per 42.63 inhabitants in the 12th district. If one takes into account mortality in the hospitals and old people's institutions, the figures become 1 per 42.20 and 1 per 24.21, respectively. It was possible to make the objection that the variation that Villermé found was simply a difference in "healthiness" in the districts as much as social inequality.

He thus undertook the comparison of two districts whose "healthiness" was analogous, but where "the ease" of the inhabitants differed; thus, two streets were compared, one exclusively inhabited by poor families and the other by rich families. In the rich district of Saint-Louis Island, he obtained a figure of one death per 46.04 inhabitants, and in the poor district of Arsenal, the result was one per 38.36. Healthiness being identical, argued Villermé, it was really "the ease" of the inhabitants that made the difference. He forgot the effects of age structures, which were undoubtedly different. It is not the exactitude of calculations that counts here, but rather their reception at the time. He also compared mortality in Mortellerie Street and the four embankments of Saint-Louis Island. Inequality in the face of death was found wherever human groups had different resources; it became as obvious as the misery was enormous. The example of mortality in the prisons in 1819 reinforced the established fact: there was one death per 40.88 inmates in the prison of the Great Force, where the prisoners almost all had a fortune and help from the outside, while the death rate was one per 3.45 in the depository established in Saint-Denis for the repression of begging and vagrancy.

Villermé tried to find some relationship for the whole scale of the French departments. After having excluded those in which migration was too significant and those with extensive unhealthy marshy zones, he found 13 "wealthy" departments and 14 "poor" departments. (The departments were categorized according to the average territorial income per hectare land, the personal and movable average contribution per capita, and the distribution of wealth.) The comparison provided very clear results: mortality proved, again, more prevalent in the group that was characterized by the opposite of ease.

When he received information on the death rates of the Parisian districts for the years 1822–1826, he endeavored to highlight the agreement of the classification with the period 1817–1822 and published his study in the new *Annals of Public Health and Forensic Medicine*. He showed there that none of the reasons to which the observed differences in mortality between the districts were commonly attributed actually played an essential role.

He argued that inequality in the face of death depended neither on the proximity of the Seine, the height of the land, nor its nature, a view contrary to the accredited opinions of the eminent doctors, all adherents of the neo-Hippocratic school. Neither could these differences be attributed to the concentration of buildings nor population density. For him, the principal cause lay in the unequal distribution of wealth. His studies on mortality by occupation supplemented his demonstration (Villermé 1830).

Villermé was a pupil of Dupuytren, one of the founders of the French "anatonopathologic school". Significant for the formation of this school was the eleven years spent in the service of the armies of the Empire on all the battlefields, from Spain to Central Europe. Villermé focused the direction of its observations, adopted an experimental step, and showed himself attentive to the effects of living conditions on illness and death. This organization succeeded in diffusing the thesis that social disparities are essential factors in accounting for the differences in mortality among politicians as well as among those in charge of the economy. It was thus not enough to bring water into the city and to multiply the sewers to solve the severity of urban epidemics. The 1850 law on unhealthy residences stated that property owners could not lease buildings that would be detrimental to the maintenance of the good health of the occupants.

But in England as in France or in the Germanic regions, "the rise of statistical thinking" characterized the nineteenth century in the field of the public health (Ted Porter), so much so that even local initiatives were affected. For example, the creation of a municipal office of hygiene at the end of the 1880s in Grenoble was based on the statistical report that epidemic mortality was declining in the cities equipped with offices of hygiene (Paquy 2001).

Moreover, at least in France, the anguish over the demographic decline of the country caused by reduced fertility due to birth control, led the elites to try to implement policies of reduction of mortality and infectious diseases. Thus *casiers sanitaires* of the houses allowed not only supervision of the extension of the epidemics in the city, but also, in Paris, the declaration of houses as *meurtrières* as soon as the number of cases of tuberculosis among the residents exceeded a given threshold. The observation of several contiguous or neighboring *maisons meurtrières* led the authorities to declare the entire area *îlot insalubre* (an unhealthy block), and it was designated for destruction (Fijalkow 1998). In the program of urban restoration, demography was used as a tool first of an epidemiologic approach. The fight against tuberculosis or syphilis was founded on the quantified estimate of their devastation. It is also known that from the moment when the

systems of social security were set up, epidemiology tried to test the reigning epidemics, as well as the effectiveness of the drugs administered to the patients.

Demographers, Historians and Health

During the last twenty years thousands of articles have been published by historians and demographers on these questions of mortality, morbidity and health, calling for increasingly refined methods. It is only possible to mention some of the principal results here.

First of all, at the very start of twentieth century, focusing on the connections between the mortality levels and the birth rate in the various European countries, Adolphe Landry formulated for the first time the idea that a new demographic regime had succeeded a traditional regime (Landry 1934). Among the various theses then current on the relations between the level of the population and subsistence, he chose that of Cantillon which stated that, in order to judge adequacy of the relationship between manpower in the population and the volume of subsistence, it was necessary to take into account the way of living of each population (Cantillon 1755). So, for him the variable of adjustment was not mortality, but the marriage rate, which made it possible for each generation to preserve the usual way of life. Landry noticed at once that this theory was not verifiable in all societies:

> it is enough to compare the French society of the eighteenth century – to which the theory of Cantillon applied and contemporary French society to which it no longer applies,

to be convinced. For Landry the characteristics of the two populations differed on three points. First of all, the independence that the demographic variables acquired compared to production, the improvement in the fate of the greatest number of the people allowed by population movements, and finally the change in the means of the regulation, that is, the restriction of births having succeeded the prolongation of the celibacy. Landry concluded, “Here are thus two demographic regimes, if one can employ this expression, which followed one another in France [...] as in many other countries”. The expression *régime démographique* was born, and its success is well-known. In his conclusion, he stressed that a new demographic regime called for a new theory of the population which “will aim to summarize and to explain what occurs before our eyes”. This new theory was that of the “demographic transition” developed after the Second World War by Blacker and Notestein (Blacker 1949; Notestein 1945, 1953). Demographers then analyzed the elements of this great general theory. One proposed modification was to speak about the “epidemiologic transition”, which stressed the point at which mortality changed, not only in level, but also by causes. After this shift, in the rich countries deaths from infectious diseases or epidemics declined and were much more often from diseases related to advanced age (cardiovascular diseases and cancers) and way of life (Omran 1971).

From this point of view historical demographers took part in understanding the process that developed in Europe between the end of the eighteenth century and today. They brought to light the progressive attenuation of the mortality crises which, in the old regime, carried off a large part of the population, and which in their extreme form were no longer visible beyond the end of the nineteenth century. They were gradually modulated, before disappearing in the 1960s, marked by the last great epidemics from fatal influenzas (before vaccinations of the weakest people began). Often starting from the study of mortality or statistical series of causes of death, historical demographers could show that, overall, the earliest progress concerned young people, and that as one moves toward the present day, groups of more advanced ages profited, making more spectacular progress (Bourdelais 1998).

Historical demographers have taken part in many controversies where the stakes have been significant for the public health policies. One of the foremost has been the reaction against the theses advanced by McKeown (McKeown 1976, 1979). This English professor of social hygiene is famous for having argued that medicine and medical policies were not at all responsible for the disappearance of the great infectious diseases, showing, for example, that mortality among tubercular patients decreased before treatment by antibiotics was made available after the Second World War (Bourdelais 2003). Much research has made it possible to show the errors made by McKeown in the treatment of causes of death. For historians diseases related to a bad environment and water (typhoid, gastro-enteritis, cholera) became much more significant than respiratory diseases, which were the dominant diseases for McKeown. Analyses relating to various age groups also made it possible to better understand what became called the "urban penalty" (Kearns 1986, 1993). In the English cities, the growth of the population, its accumulation, its poor conditions of habitat and the great number of children led to a rise in mortality, in particular up to age ten. The years of whooping-cough succeeded those of measles, scarlet fever and the epidemics of mumps so that the level of mortality was high every year (Woods & Shelton 1997). In the rapidly growing industrial towns the same phenomenon was observable throughout Europe. Control of the environment, collection of wastewater, education of the population and construction of housing managed to restore the initial situation (which had not been good) in a twenty-five year period for a French industrial city (Bourdelais & Demonet 1996). The importance of the medical and social municipal policies was stressed for England, Germany or France (Szreter 1988). It has even been possible to confirm that local municipal policies constituted many laboratories for experimentation before laws were passed on the national scale (Bourdelais 2003).

Little by little, the historians and demographers have examined various elements of extreme mortality in the past, the causes for its decline and those of its aggravation. In the often discussed question of the effectiveness of smallpox vaccination, multiple observations have been made concerning the retreat of the epidemics during the nineteenth century in areas where the population was largely

vaccinated, as well as the gravity of smallpox mortality in the years 1860–1870. Most now plead in favor of the practical effectiveness of vaccination rather than the thesis that argues for decreased virulence of the virus (Sköld 1996).

For certain Swedish areas, it has been shown that the foundry communities had lower infant mortality than the surrounding countryside, because the women, not finding work there, could breast-feed their children. Moreover, the employment of the men was more stable there than among landless rural males, and a strong religious paternalism was exerted as well. The excessive mortality of the smiths between 30 and 50 years of age compared to the other categories of workers employed in these foundries was also discovered (Sundin & Tedebrand 1981). Complex mechanisms were at work in which the stability of the incomes of the family, the better availability of the mothers, but also all the lodgings and living conditions intervened. A lot of work has been done, with positive results.

Health at the Crossroads of the Social Sciences

The demographic approaches, however, have been criticized by sociologists and anthropologists who argue that quantitative analyses and qualitative approaches are two methodological choices leading to a focus on different levels of social reality (Fassin 2000). These critics emphasize that the efforts made to find correlation between variables have resulted in the selection of indicators that are easy to measure and the neglect of others, especially the process causing domination of the poor. It has been argued that, regarding the behavior of workers or social inequalities in health, the most sophisticated questionnaire is not able to trace what is usually invisible or hidden and what is immeasurable. Because the psychological dimension is one of the main factors in health inequalities, as shown recently by Brunner and Marmot, it is very important to know how we have to understand these categories health and inequalities (Brunner & Marmot 1999). For instance, in France, a survey, conducted by S. Paugam, of people who received unemployment compensation from the state pointed out that the number of persons saying that they have health problems that constitute a handicap in finding a new job is twelve times higher than the number given by medical and social institutions. He showed, after long interviews with these people, how unemployment leads to the social "disqualification," which amplified their own judgment about their bad health and led them to think that they had real incapacities. On the other hand, employers use the manifestation of the incapacity to push them outside of the labor market. For the official institutions, they have no incapacity. The position of unemployed persons is as real as a pathogenic one. The subjective dimension has now been recognized as a very important health component, but it is very difficult for demographers to integrate it into the quantitative data (Aiach & Curtis 1990; Elstad 1998).

Another criticism is that, in the epidemiological and demographic surveys, the social variables are simplistic and static, especially the processes of the inscription of social context and position, the social world, in the bodies that underlie the variables and the models, are too often a space for the interaction of individual

experiences. For instance, how would it be possible to build data and tables to take into account Norbert Elias' theory: what is the social significance of each individual characteristic in a dynamic perspective, the individual trajectories, and the contextualization? Moreover, an occupational category does not have the same place in society today as it did twenty years ago.

It has been suggested that three notions are more efficient for understanding how inequality is incorporated in the body. First, the "defensive ideology" in the occupations when the constraints or the risks are very high and when the denial of illness symptoms is a way to expel anxiety (Dejours 1993). The concept of "habitus" developed by Pierre Bourdieu defines the complex social cultural links that explain how the social category of a person determines her/his social behavior (Bourdieu 1979). Finally, there is the interactionist approach: the individual arrangements are non-permanent and dependent on the context. Here, subjectivation finds a place (Lahire 1998). It is probably a major point, because we also have to understand the meaning of the facts for the people themselves, how they use the "objective" data, how they live their personal history, and how they include it in collective history.

These criticisms are not of such recent vintage, and historical demographers have tried to take into account a multitude of different dimensions and theories in their works. For a couple of decades they have criticized the categories used in the archives. They have modified their methods, using the individual and nominative scales to look for their different characteristics and by using longitudinal analysis, following trajectories. Some sophisticated methods, such as event history analysis, allows the testing of many factors and their part in a situation, building a link between individuals and the context. Health is a very attractive field for multidisciplinary collaboration, and one where it is possible to have a genuine dialogue between quantitative and qualitative approaches.

References

Aiach P. & Curtis S. (1990) "Social Inequalities in Self-Reported Morbidity: Interpretation and Comparison of Data from Britain and France" *Social Science and Medicine,* 31:267–274.

Blacker C.P. (1949) "Stages in Population Growth" *The Eugenics Review,* 39:3, 88–101, 122–126, 129–134.

Bourdelais P. (1997) *L'âge de la vieillesse. Histoire du vieillissement de la population*. Paris: Odile Jacob.

Bourdelais P. (1998) "L'homme nouveau du XXe siècle" *L'Histoire*, special number *Bilan du siècle*. Nov:46–55.

Bourdelais P. (2003) *Les épidémies terrassées. Une histoire de pays riche*. Paris: Editions de La Martinière.

Bourdelais P. & Demonet M. (1996) "The Evolution of Mortality in an Industrial Town: Le Creusot in the Nineteenth Century" *The History of the Family,* I (2):183–204.

Bourdieu P. (1979) *La distinction. Critique sociale du jugement*. Paris: Editions de Minuit.

Brunner E. & Marmot M. (1999) "Social Organization, Stress, and Health" In: Marmot M. & Wilkinson R. (eds.) *Social Determinants of Health*. Pp. 17–43. Oxford: Oxford University Press.

Cantillon R. (1755) *Essai sur la nature du commerce en general*. London.

Dejours C. (1993) *Travail, usure mentale. Essai de psychopathologie du travail*. Paris: Bayard.

Elstad J.-J. (1998) "The Psycho-Social Perspective on Social Inequalities in Health" *Sociology of Health and Illness,* 20(5):598–618.

Fassin D. (2000) "Qualifier les inégalités" In: Leclerc A., Fassin D., Grandjean H., Kaminski M. & Lang T. (eds.) *Les inégalités sociales de santé*. Pp. 125–144. Paris: Inserm-La Découverte.

Fijalkow Y. (1998) *La construction des îlots insalubres, Paris, 1850–1945*. Paris: L'Harmattan.

Graunt J. (1661) *Natural and Political Observations upon the Bills of Mortality … of the City of London*. London.

Hamlin C. (1998) *Public Health and Social Justice in the Age of Chadwick, Britain, 1800–1854*. Cambridge: Cambridge University Press.

Kearns G. (1988) "The Urban Penalty and the Population History of England" In: Brändstrom A. & Tedebrand L.-G. (eds.) *Society, Health and Population during the Demographic Transition*. Pp. 213–236. Stockholm: Almqvist and Wiksell International.

Kearns G. (1993) "Le handicap urbain et le déclin de la mortalité en Angleterre et au Pays de Galles (1851–1900)" *Annales de Démographie Historique*, Editions de l'EHESS:75–105.

Lahire B. (1998) *L'Homme pluriel. Les ressorts de l'action*. Paris: Nathan.

Landry A (1909) Les trois principales théories de la population. *Scientia*. (Reprint (1934) in *La révolution démographique*. Pp. 169–192, Paris: INED.)

McKeown T. (1976) *The Modern Rise of Population*. London: Edward Arnold.

McKeown T. (1979) *The Role of Medicine. Dream, Mirage or Nemesis*. Oxford: Basil Blackwell.

Moheau J.-B. (1778) *Recherches et Considérations sur la population de la France* (reprint INED 1994, (ed.) Eric Vilquin). INED.

Notestein F.W. (1945) "Population, The Long View" In: Schultz E. (ed.) *Food for the World*. Pp. 36–57. Chicago: Chicago University Press.

Notestein F.W. (1953) "The Economics of Population and Food Supplies. Economics Problems of Population Change" In: *Proceedings of the 8th International Conference of Agricultural Economists*. Pp. 13–31. London: Oxford University Press.

Omran A. (1971) "The Epidemiologic Transition" *Milbank Memorial Fund Quarterly*, 49:509–539.

Paquy L. (2001) *Santé publique et pouvoirs locaux. Le département de l'Isère et la loi du 15 février 1902*. Ph. D. Diss. University of Lyon.

Sköld P. (1996) *The Two Faces of Smallpox: A Disease and its Prevention in Eighteenth- and Nineteenth-Century Sweden*. Report from the Demographic Data Base. 12. Umeå: Umeå University.

Sundin J. & Tedebrand L.-G. (1981) "Mortality and morbidity in Swedish iron foundries, 1750–1875" In: Sundin J. (ed.) *Tradition and Transition*. Pp. 105–159. Umeå: Demographic Data Base.

Szreter S. (1988) "The Importance of Social Intervention in Britain's Mortality Decline c. 1850–1914: A Re-Interpretation of the Role of Public Health" *Social History of Medicine,* I (1):1–37.

Villermé L.-R. (1828) *Mémoire sur la mortalité dans la classe aisée et dans la classe indigente*. Paris: Mémoire de l'Académie de médecine.

Villermé L.-R. (1830) "De la mortalité dans les divers quartiers de la ville de Paris, et des causes qui la rendent très différente dans plusieurs d'entre eux, ainsi que dans les divers quartiers de beaucoup de grandes villes" *Annales d'hygiène publique et de médecine légal,* 3:294–341.

Woods R. & Shelton S. (1997) *An Atlas of Victorian Mortality*. Liverpool: Liverpool University Press.

5: Occupational Health and Public Health: Analogies and Discrepancies

Antonio Grieco, Department of Occupational Health, "Clinica del Lavoro Luigi Devoto", Milan University
Giuseppina Bock-Berti, Department of Medical Sciences, Section of History of Medicine, Milan University
Daniela Fano, Department of Occupational Health, "Clinica del Lavoro Luigi Devoto", Milan University

Introduction

With this conference the networks dealing with occupational health and public health have started for the first time to jointly outline a common scenario at the international level in order to analyze, discover and interpret analogies, discrepancies and possible synergies between them. This was an opportunity not provided by the *First International Conference on the History of Occupational and Environmental Prevention* (Grieco et al. 1998) in which researchers from the International Network for the History of Public Health also participated. In all likelihood, *it is the historical perspective that allowed this confrontation and gave birth to a common venture*.

Historical Method

We have recently encountered a small book on historical knowledge by a great author (Marrou 1954) that provides useful spurs in considering historical method as a tool to achieve knowledge of the human past. Such knowledge is not a tale of the past, perhaps it is not even study or research or erudition. It is the scientific processing of relationships between two planes of mankind: the past lived by human beings a long time ago, and the present lived by the historian who may recall this past so that it may be of help to forthcoming generations.

These levels are obviously far distant from one another, two detached realities. This should not be considered as an "empty gap", but as something likely to be filled by the "historical sense", that is by the capability of feeling, in an equally alive way, "reality" and "distance". Marrou, by an analogous extension of the term, proposed the concept of the "evolution" of historical knowledge, that is, the total of causal relationships chronologically connecting human beings.

This approach is particularly suggestive and useful for analyzing the occupational health-public health binomial (similarities and discrepancies) which should not neglect historical reflection, or, better still, the historical knowledge of the two concepts and the two related areas, that have changed fundamentally over time. Then we have to fill the distance between past reality, as lived by our forerunners, and the present reality, as it is lived by us, trying to outline those evolutionary lines that allow faraway and present times to seem equally alive. Thus, we can

escape the obsolete and anachronistic research of differing priorities of occupational medicine and public health, which, especially in this case, have no historical sense whatsoever. *Where are the origins of occupational medicine and of public health to be found?* We also refer to the traditional principles of heuristics (Artelt 1949).

Occupational Medicine

We will start first from the sources dealing with occupational medicine, which is more appropriate, historically speaking, as it was the first to appear on the stage as a discipline. Illness, which was born with human beings, has always had a close relationship with working conditions (Busacchi et al. 1967). It is worth recalling the major clues in *Corpus Hippocraticum* concerning skin diseases of washmen and dyemen (Vegetti 1976) and in several classical authors, such as Caius Plinius Secundus, Claudius Galenus, Decius Junius Juvenalis and Titus Lucretius Carus (Penso 1985, p. 436). In modern times the remarks made by Paracelsus and Agricola (Buess 1961), as well as a whole series of notations on occupational diseases published in the first editions of *Philosophical Transactions of the Royal Society* are worth mentioning (Wightman 1961). They are, however, just anecdotal descriptions. It is then of utmost importance to again state here that occupational medicine as a scientific and modern discipline has it origins in *De Morbis Artificum Diatriba* by Bernardino Ramazzini (1700).

All researchers at the international level identify this book as the source of modern occupational medicine, including all the specialties of occupational medicine: observation and clinical description of diseases; analysis of working conditions related to the disease/work connection, and therefore etiological diagnosis and etiopathogenetic interpretation of diseases; the preventive mission and relevance of workers' information; relationships between workplaces and the surrounding territory in connection with the origin of environmental pollution.

The scientific path that Ramazzini's book and the ensuing debate of his theses within the medical community of the time had their origins within internal medicine. So, too, did the research and actions of occupational physicians during the centuries that followed, especially the twentieth, first in the field of occupational medicine and later occupational health. It was this thoroughly original field of scientific research, sprung from internal medicine, that the physician of internal medicine, Bernardino Ramazzini, opened in the second half of the seventeenth century. This research path, lasting over three centuries and going through countless stages, has produced a common goal promoted by hundred or even thousands of researchers in the interim. This goal has been proving to other physicians that some diseases, not very different clinically speaking from similar ones, are not of unknown origin, but rather are directly produced by work-related chemical, physical or psychosocial agents. Here are a few examples: the chronic bronchitis that may affect a welder who extensively inhales irritating fumes and dusts is similar to the one found in a strong tobacco smoker from clinical, radiological and spirometric viewpoints. The same can be said for lung fibrosis caused by silica,

hemolytic anemias from lead intoxication, leukemias from benzene, etc. What we can do now is just suggest that the "empty gap" does not exist and emphasize that the medical, humanitarian and social intentions of Ramazzini are still relevant.

Public Health

Let us now consider the origins of public health. In the case of both public health and hygiene concepts we have to go back to remote times, especially when referring to health as a "right" of the citizen. It brings to mind even the motto "ubi societas, ibi jus" or, vice versa, "ubi jus, ibi societas" (Romano 1951, p. 25). It is even possible to start from Hammurabi's Code (Castiglioni 1948, p. 37) or *Salus populi suprema lex esto* (Guarino 1987, p. 34). Nor should monastic medicine and medieval religious orders, corporations in the Age of Communes, and "confraternities" in the Renaissance (Park 1985) be forgotten. The attention paid by "authorities" to the health problems of citizens progressively increased with the approach of the modern era. The existence of, albeit primitive, health organization is evidenced by some magistracies in Italy: for example, in Venice, Turin and Naples (Alessi 1967). Their measures were often *ad hoc*, mainly aimed at preventing the spread of epidemics of infectious diseases and ensuring, through appropriate provisions, the good quality of food, for example. Health organization that included the social concept of health appeared on the stage only during the Enlightenment, the ideas coming from various sources and for numerous reasons (Cassirer 1932).

This era was an extremely original period in which new social models were born. The human being – in a biological sense – required new evaluation and new attention. The necessity and urgency to make human beings healthy and protect them from illnesses prevailed, a concept derived from confidence in spiritual and material forces. This led to the establishment of the close connection evident in the relationships between the historical era and the development of medical science.

Some scientific and social outcomes in the service of the collective good and, following the conception of "hygiene from below", the "ideas" of occupational medicine (Carnevale 1986) have chronological origins: orthopedics in the etymological sense of the term (Valentin 1961), psychiatry (Berti Bock 1971–72) and vaccine prophylaxis (Belloni 1980).

Finally, let us consider Johann P. Frank, *Stadtarzt* in Rastatt, *Landphysicus* in Bruchsal (qualifications of significance), and professor of practical medicine, first in Pavia and then in Vienna (Lesky 1973). He was author of *System einer Vollstaendigen Medicinischen Polizey,* a huge work written between 1779 and 1819. It is worth recalling Frank's mission to investigate the nature of places, the status of illnesses, going back to causes and calculating their incidence. This amounted to nearly drawing a geographical map!

Here is the first public health "manifesto" with the intent, as was the case of Ramazzini, of starting a new and independent discipline. But nearly one century had elapsed. At a first glance, the two works show several similarities, at least as

regards methodology. Despite the century separating the two publications, in both of them clinical observation, a scientific approach and means prediction are basic issues. In the broad introduction by Frank, the concept of "medical police" is placed in focus and identified as part of a "universal police science". It was not sufficient to entrust the care and "well-being" to a given category of people (statesmen), but there should be wise laws, regular orders of service, and the possibility for any operation to be easily and practically be executed.

The content of *System…* covers subjects and problems which are now all included in public health. These problems can be solved (at least theoretically) by means of general norms involving the whole community and health education of the population. The topic "work" or, better, "work-related pathology", appears only in the quite general framework of hygiene in relation to the physical and social environment and all is components in healthiness of residences and work-places: the primary ones (atmosphere, soil, climate) and the more specific ones associated with causes of "air confined corruption". On the other hand, even at first glance, the occupational medicine and public health literature illustrates the dividing line between the two sectors. For example, a highly reputed historical-medical bibliography, such as that of the Wellcome Institute, is definitely in line with this rationale. On the one hand, the topic of occupational medicine (where the figure of Ramazzini fills three closely printed pages), while, on the other hand, there is public health (where the figure of Frank fills an equal number of pages) (Wellcome Institute 1980). Let us now consider more in detail the similarities and differences that emerge when these two disciplinary areas are compared.

Similarities and Differences – Occupational Health and Public Health

Similarities

Both occupational health and public health appear to comply with the definition stated in 1920 by Winslow:

> Public health is the science and art to prevent illnesses, prolong life and improve individuals' health and mental and physical vitality through an ordered collective action, aimed at healing the sick, struggling against social diseases, teaching individual hygiene care, organizing medical and nursing services in view of early diagnosis and disease preventive treatment as well as implementing social measures in order to provide a life standard in accordance with health maintenance to all community members, the final aim being to allow each individual to enjoy the natural right to health and old age (Viseltear 1982).

Both occupational health and public health show the same strong objective of unveiling the social matrices and environmental constraints that facilitate the onset of individual and community diseases. This global approach goes beyond the mere physician-patient relationship that generally inspires measures derived from internal medicine. In both disciplinary areas, attention is focused on groups of risk subjects and less wealthy social populations, taking into account their

vulnerability in the aims of preventive actions. Actions that support social movements for the improvement of living and working conditions are constant and lasting, as well as the proposals for issuing laws and regulations in order to establish such improvements as acquired rights.

Differences

The first stage of the development of occupational medicine lasted up to the end of the 1950s, and during this phase the interpretation of etiopathogenesis of work-related diseases was nearly totally governed by the mono-factorial model, according to which one cause produces one effect, and only one. This conceptual model gained strength throughout the nineteenth century, the era of the great bacteriological discoveries that provided the scientific ground for the development of a nosology of infectious diseases. Some well-known examples are abdominal typhus/*salmonella typhi*, lung tuberculosis/*mycobacterium tuberculosis*, cholera/*choleric vibrio*. Thus, following a similar neo-positivistic philosophical strain, "infectiously oriented" occupational medicine was developing that produced similar mono-factorial causes: silicosis/silica dust, asbestosis/asbestos fibers, lead poisoning/lead vapor or fumes, etc. Starting from the early 1960s, this conceptual framework has been progressively enriched with the transition towards a more coherent multi-factorial model to interpret the origin of widespread diseases, from occupationally specific diseases to work-related diseases. To illustrate this point it should suffice to mention muscular-skeletal disorders, chronic bronchitis, cancer and stress.

Major differences between occupational medicine and public health have their origins in past centuries, but also today various social reactions give rise to the formulation of which goals should characterize the preventive actions of occupational medicine and public health. Since infectious and contagious diseases may affect all social classes, rich and poor, society has always been extremely willing to identify and eliminate the sources of contagion. Even today the periodical programs for distribution of anti-influenza vaccine, aimed at reducing sick-leaves in winter, are readily accepted by working communities. Instead, in the past as well as the present, attempts by occupational medicine to identify and prevent occupational hazards and diseases are often followed by strong conflicts that cause delays in the implementation of appropriate preventive measures. It is common knowledge that most hygienic and ergonomic deficiencies that affect the workplace today could be prevented by correctly using the scientific know-how already provided by occupational medicine. The most relevant discrepancies that have emerged in the second half of the twentieth century are concerned with two major cultural and social aspects: first, the theoretical and methodological approach for describing and interpreting working conditions and, secondly, workers' participation.

Let us look at the theoretical and methodological approaches. Throughout history in different countries public health measures have paid attention to and made interventions aimed at identifying and assessing the quality and magnitude of risks in bacteriological and/or physical working environments (climate, noise, ionizing

radiation, etc.), as well as the consequent effects on workers' health. Thus, proposed measures have been primarily aimed at prevention. However, men's and women's relationship to work and their working conditions have been always described and interpreted with positivistic and neo-positivistic theories and conceptual frames, often borrowed from other disciplines, especially from the field of engineering. In various countries policies have also been influenced by cultural issues associated with the Industrial Revolution and, at a later stage, by social psychology.

Research within ergonomics directly implemented at workplaces (e.g., the metal, mechanical and electronic sectors), starting in the 1960s in France and then, independently, in Italy, since the 1980s have led to an interdisciplinary confrontation between organizational knowledge and knowledge of occupational health. This has provided a remarkable turning point both culturally and in its application, making contributions that are now peculiar to the occupational health area.

If special attention is paid to Italian research contributions, it can now be said that occupational health avails itself of an original multidisciplinary method for analyzing working conditions. This Method of Organizational Congruencies (MOC) was launched by Bruno Maggi in the early 1980s and is an original elaboration of the theory of organizational action. The different biomedical, social, economic, psychological and polytechnic disciplines involved for this analysis are integrated into the MOC after an inter-theoretical exchange of organizational knowledge on an interdisciplinary basis.

There have been significant cultural and methodological differences as regards workers' participation in various countries in the second half of the twentieth century (with particular reference to Italy, France, Scandinavia, and, in some respects, the USA). In Italy, although the public health school of Perugia has produced valuable results, it has been mainly in the area of occupational health that cultural and methodological innovations have been assimilated since the 1960s. Workers' and trade-union initiatives have underlined the importance of workers' participation in identifying and preventing risks at workplaces. Recent health regulations in Italy (in the 1990s), adopted in accordance with European directives in the field of occupational health and safety, have led to a widespread mobilization of occupational health in defence of workers' participation in the program for accident and work-related disease prevention.

Future Challenges and Perspectives

It is highly desirable for the future that closer contacts or better synergies are developed between public health and occupational health. Without going into further details, we will just mention three areas of intervention and research where synergic actions of occupational health and public health would be extremely useful and desirable.

At the Workplace

The interest and willingness of entrepreneurs and trade unions to implement health promotion initiatives in medium and large enterprises of developed countries have increased remarkably in the past ten years, thanks to the progressive decline of risks and of traditional occupational diseases. Valuable contributions in theory and application of health promotion program implementation and the training of skilled personnel (not only health specialists) were provided in the 1980s and 1990s by the European Foundation for the Improvement of Living and Working Conditions of Dublin. This program proves that such initiatives are more effective when a multidisciplinary approach and direct implementation at workplaces are involved (Wynne 1994). Well-established know-how has provided positive results for prevention of health damage from obesity (Tsai et al. 1988; Hennrikus & Jeffrey 1996; Muto & Yamauchi 2001), arterial hypertension (Fogari et al. 1995; Fouad et al. 1997), dyslipidemias (Wilson et al. 1992; Rudd 1994; Glanz et al. 1996), and neoplasias of the female genital apparatus (Nedic et al. 1999; Ku 1999; Zanotti & Kennedy 1999).

Collaboration – Occupational and Environmental Health

There has been some overlapping between occupational and public health in dealing with problems such as outdoor air pollution produced by the presence of asbestos fibers, pesticides and noise. Such issues have been scientifically investigated and results applied at workplaces. On the other hand, public officers charged with inspection and regulations concerning air, water and food pollution often have a public health oriented professional background. Both fields use an epidemiological approach to these problems, and therefore their mutual collaboration could provide valuable contributions in terms of application and research.

Migration

Migration, a problem of paramount importance since globalization of the economy, productive processes and labor market, has in recent years led to significant increases in the flux of migrating workers. Multi-ethnic societies have been on the rise in several parts of the world, especially in developed countries, and the number and complexity of such societies will increase progressively in the near future. Different genetic patrimonies produce quantitative and qualitative differences among workers in their susceptibility to occupational hazards. In addition, the hygienic conditions in the workplace are generally deficient for migrated workers. This new scenario offers opportunities for relevant research and stringent preventive actions. As far as we know, it is just in Sweden, which is kindly hosting the present conference, that the SALTSA program is starting one of the first and more original multidisciplinary research projects on “migration,” an effort that we congratulate and wish the best success. In light of all that has been said, we really do believe that occupational health and public health synergies can make decisive contributions.

References

Alessi R. et al. (eds.) (1967) *L'amministrazione sanitaria*. Atti del congresso celebrativo del centenario delle leggi amministrative di unificazione. Vicenza: Neri Pozza.

Artelt W. (1949) *Einführung in der Medizinhistorik*. Stuttgart: Enke.

Belloni L. (1980) "Luigi Sacco e la diffusione del vaccino in Italia" In: *Per la storia della medicina*. Pp. 79–86. Bologna: Forni.

Berti Bock G. (1971–72) "Ancora su Vincenzo Chiarugi – Revisione bibliografica e breve analisi critica del suo pensiero" *Acta Medicae Historiae Patavina,* XVIII:17–37.

Buess E. (1961) "Paracelsus und Agricola als Pioniere der Sozial und Arbeitzmedizin" *Deutsch Med. Wochsr,* 86:2335–2340.

Busacchi V. & D'Antuono G. (1967) "La medicina del lavoro nei suoi sviluppi storici" In: *Atti XXIII Congresso Nazionale della Società Italiana di Storia della medicina. (Modena 22–24/09/ 1967)*. Pp. 329–345, Roma: Cossidente.

Carnevale F. & Moriani G. (1986) *Storia della salute dei lavoratori*. Verona: Cortina.

Cassirer E. (1932) *Die Philosophie der Aufklärung*. Tübingen: JEB Mohr.

Castiglioni A. (1948) *Storia della medicina. Vol 1* Milano: Mondadori.

Fogari R., Marasi G., Zoppi A., Malamani G.D., Vanasia A. & Villa G. (1995) "Community control of hypertension at work-site: Epidemiological data of the Agusta project" *Eur J Epidemiol,* 11(5):591–5.

Fouad M.N., Kiefe C.I., Bartolucci A.A., Burst N.M., Ulene V. & Harvey M.R. (1997) "A hypertension control program tailored to unskilled and minority workers" *Ethn Dis,* 7(3):191–199.

Frank J.P. (1779–1788) *System einer vollständigen medicinischen Polizey*. Vol. 1–4. Mannheim: Schwan & Goetz.

Frank J.P. (1813) *System einer vollständigen medicinischen Polizey*. Vol. 5. Tübingen: Cotta.

Frank J.P. (1817–1819) *System einer vollständigen medicinischen Polizey*. Vol. 6. Wien: Schaumburg.

Glanz K., Sorensen G. & Farmer A. (1996) "The health impact of worksite nutrition and cholesterol intervention programs" *Am J Health Promot,* 10(6):453–470.

Grieco A., Iavicoli S. & Berlinguer G. (eds.) (1998) *Contributions to the History of Occupational and Environmental Prevention*. Amsterdam: Elsevier.

Guarino A. (1987) *Storia del diritto romano*. Napoli: Jovene.

Hennrikus D.J. & Jeffery R.W. (1996) "Worksite intervention for weight control: A review of the literature. Review" *Am J Health Promot,* 10(6):471–498.

Ku N.N. (1999) "Automated Papanicolaou smear analysis as a screening tool for female lower genital tract malignancies" *Curr Opin Obstet Gynecol,* 11(1):41–43.

Lesky E. (1973) "Johann Peter Frank and social medicine" *Annales Cisalpines d'Histoire Sociale,* 4:137–144.

Marrou H.I. (1954) *De la connaissance historique*. Paris: du Seuil.

Muto T. & Yamauchi K. (2001) "Evaluation of a multicomponent workplace health promotion program conducted in Japan for improving employees' cardiovascular disease risk factors" *Prev Med,* 33(6):571–577.

Nedic B., Ravic J., Loncar S. & Cuk D. (1999) "Counseling protocol for early cancer detection at the Women's Health Center in Ruma" (Roman) *Med Pregl Serbo-Croatian,* 52(3–5):162–164.

Park K. (1985) *Doctors and medicine in early Renaissance in Florence*. Princeton: Princeton University Press.

Penso G. (ed.) (1985) *La Medicina Romana*. Origgio: Ciba-Geigy.

Ramazzini B. (1700) *De Morbis Artificum Diatriba*. Mutinae: Antonii Capponi.

Romano S. (1951) *L'ordinamento giuridico*. Firenze: Sansoni: 25.

Rudd C.L. (1994) "Cholesterol intervention in the workplace: successful integration with other risk reduction programs" *AAOHN J,* 42(3):113–116.

Tsai S.P., Lucas L.J. & Bernacki E.J. (1988) "Obesity and morbidity prevalence in a working population" *J Occup Med,* 30(7):589–591.

Valentin B. (1961) *Geschichte der Ortoepaedie*. Stuttgart: Thieme.

Vegetti M. (ed.) (1976) *Opere di Ippocrate*. Torino: UTET: 335.

Viseltear A.J. (1982) "C.E.A. Winslow and the early years of public health at Yale, 1915–1925" *Yale J Biol Med,* 55:137–151.

Wellcome Institute for the History of Medicine and Related Sciences, London (1980) *Subject Catalogue. Biographical Section 4*, Ramazzini: sect. 4:372–375. Frank Sect. 2, 286–288. München: Krans Intern. Publ.,

Wightman W.P.D. (1961) "Philosophical Transactions of the Royal Society" *Nature,* 192:23–24.

Wilson M.G., Edmunson J. & DeJoy D.M. (1992) "Cost effectiveness of work-site cholesterol screening and intervention programs" *J Occup Med,* 34(6):642–649.

Wynne R. (1994) "Workplace health promotion: a specification for training" Working paper: WP/94/ 22/EN. Dublin: European Foundation for the Improvement of Living and Working Conditions.

Zanotti K.M. & Kennedy A.W. (1999) "Screening for gynecologic cancer. Review" *Med Clin North Am,* 83(6):1467–1487.

6: The Role of Industrial Pathogenicity as a Causal and Final Argument for the German Social Insurance System

Rainer Müller, Centre for Social Policy Research, University of Bremen
Dietrich Milles, Centre for Public Health, University of Bremen

This is an attempt to discuss a central issue in the historic experience and future tasks of public health, and especially, occupational health. This central point concerns the responsibilities for work-induced health dangers and the workers' role in this responsibility.

Modern social security not only demands increasing responsibility from each individual citizen for his or her socialization and safety. The modern organization of work and its realization counts on both participation and an acceptance of one's own responsibility. From an historical perspective, this is a continuation and further development of the basic conceptions of work and health protection that were developed by Max Pettenkofer 150 years ago. It is therefore interesting to compare today's tasks with the positions the famous German hygienist took. When Pettenkofer died 100 years ago, however, little evidence of his work was left. The essential elements were barely discernable in work protection, bacteriology, social policy and racial hygiene. Thus his positions will be introduced and discussed in relation to important problems that are relevant today.

Max Pettenkofer and the Scientific Rationale of Work Protection

Pettenkofer stands at the beginning of public health in Germany. He focused on two basic problems of industrial development: firstly, urban development, also known as *Assanierung*, and secondly, industrial pathogenicity, mainly factory hygiene and the worker's insurance. Both problems contributed to the importance public health gained in the young German state (Pettenkofer 1871, 1873).

While *Assanierung* came into force in the cities in the first half of the nineteenth century, industrial hygiene was a neglected part of medical science. Bernardino Ramazzini's work still set the tone and was furthered by various translations, such as the one provided by Johann Christian Gottlieb Ackermann between 1780 and 1783. This work was extended by Benjamin Gottlob Hebenstreit, a physician from Leipzig, by the chapter "On the concern for the safety of means of purchase". Even A. C. L. Halfort's great work of 1844 was still based on Ramazzini.

Public health had difficulties dealing with the area of industrial productivity from the start. This area had gained in social importance and influence due to the heavy-iron industry in the late 1860s and the 1870s. Within factory walls the basic rules of public health were split into technological problem-solving, on the one hand, and individual, pedagogical rules of behavior on the other. An important factor in Prussian Germany was that the unsuccessful civil revolution of 1848 had moved the "medical revolution" of socially engaged physicians, such as Rudolf

Virchow and Salomon Neumann, close to the revolutionary movements (Milles 1991). As a consequence, medical science attempted to repudiate this political closeness and suspicions with scientific methods. Physiological conceptions, as developed by Hermann Helmholtz, were decisive in this development. According to these ideas, the human body has to be understood as being functionally analogous to a machine and therefore had to be examined in a scientific way (Rabinbach 1990).

Max Pettenkofer was born in Donaumoos in 1818 and came to Munich in 1826. In 1837 he started to study pharmacology in order to take over his uncle's position as *Hofapotheker* (pharmacist to the Court). Max Pettenkofer was educated in the era of holistic and romanticist natural science, but, at the same time, used the methodology of the emerging technological natural science. An important physiologist of that time, Johannes Müller, believed in an integrative "life ability", but demanded methodologically precise procedures. So, too, did Justus Liebig, Pettenkofer's famous teacher in Gießen. Pettenkofer himself placed emphasis on chemistry and physiology, and developed experimental hygiene. In 1847 he was awarded a chair in medicinal chemistry and, in 1883, he established hygiene as part of the requirements for a degree in medicine. He is an impressive example of the scientific view that not only included social responsibility, but also sought scientific explanation. Conclusions on public health measures were to be based on objective and analytical findings and were to be made available to the authorities.

Pettenkofer's concept, which was called "conditional hygiene", emphasized the importance of the biographical and the working environment for diseases. This included the belief that the environment was increasingly created by people who therefore had to accept responsibility for it. His scientific methodology, however, aimed at replacing political responsibility with "measurements and figures" and scientific evidence. The problems that were visible coincided with Pettenkofer's strengths: the research on the first maximum allowable concentrations for health-damaging gasses and smoke, for example, or on the pollution of rivers. What he saw as limiting regulations acted as liberating regulations. Health dangers were, to a certain extent, permissible and endurable.

This thinking influenced the early institutionalization of public health in Germany. As a result of a proposal by Max Pettenkofer, in 1867 the hygienic section of the Congress of German Natural Researchers and Physicians was founded in Frankfurt. The *Niederrheinische Verein für öffentliche Gesundheitspflege,* the most important of a string of regional initiatives, was established the same year (Fischer 1933). Prussian authorities were not very pleased about this and blocked the attempts for action because of the high costs. The early demands were often insufficiently explained and were deemed to go too far.

In the opinion of the medical professor Carl Reclam from Leipzig, the main task of health care was to provide legislators with the "missing knowledge of the extent of the natural need in measures, figures and weights". The "urge to influence public life because of the knowledge gained", as can be read in a written addition to the text of the first gathering in Frankfurt on September 15 and 16,

1873, led to the founding of the German Society of Public Health. It aimed to appeal not to the medical profession but mainly to "the civil servants and the elected representatives of large cities [...] on whom, practically, most depends concerning the improvement of the public state of health". The initiative was mainly taken by the city councils: of the 39 signatories of the "invitation for a pre-discussion on the founding of a traveling meeting on public health" in the early summer of 1873, there were 15 mayors, three senators and seven high-ranking civil servants. The driving force behind it was Berlin's town council James Hobrecht. On September 15, 1873 the founding meeting took place in Frankfurt. Among the 230 members present, there were 113 physicians (including many medical civil servants), 28 mayors and 15 high-ranking communal civil servants. Thus this public health institute, which was aimed at general (practical) experts and people with positions of responsibility, was inter-disciplinary and generally rooted in politics (Göckenjan 1985).

The main objective of the growing attempts in the early 1870s was the unification of scientific findings with its feasibility. This objective, however, had a political dimension that caused difficulties in the German Empire. Mainly due to the Social Democratic labor movements, work dedicated to the "social question" was immediately regarded suspiciously as an attempt to overthrow the state. In addition, the emphasis on scientific methods and the analytical presentation of findings in figures, professional expertise needed to be developed. These experts were to be educated at the universities and would then work for the authorities, especially in cities. This aim was related especially to the development of the *Reichsgesundheitsamt* (the pre-war German National Health Authority).

During its first meeting in 1873, the German Society for Public Health negotiated the organization of the *Reichsgesundheitsamt*. Max Pettenkofer had been asked to take on the administration of the *Reichsgesundheitsamt*, but he declined, citing his age as well as academic responsibilities. In a thesis that took stock of the development of the *Reichsgesundheitsamt* programmatically, the appointed administrator at the *Reichsgesundheitsamt*, Hermann Struck, put high demands on public health research and its practice.

In his work Struck expressed the conviction that among representatives of medical science more precise methods of research had gained in importance, but that dealing with diseases from case to case with the intention of finding a cure was insufficient. Instead, it was the causes and distribution of the determinants of general health conditions, with implications for continuing changes in people's social conditions, that demanded close examination and efficient action (Struck 1878, p. 1).

The Health Office was to provide uniform methods as well as an ensured level of knowledge and, therefore, prepare decisions regarding social policy. In addition to the standardization and processing of other research, the main independent instrument was to be medical statistics in a broad sense. People's relationships to one another, their age, their environment, their geographical distribution, the soil they lived on, the water they drank, their prosperity, their diets, etc. were to be

examined. All this was to be seen in relation to the diseases occurring in their proximity, their life expectancy and their mortality rates, so that the causes could be found which resulted in the diminished strength and health of the population and lead to a shortened life-span (Struck 1878, p. 4).

Assanierung in the Cities and Factory Hygiene

Whereas there were no significant political difficulties regarding water-supply and sewage disposal, industrial hygiene found itself wedged between the profoundly contrasting interests of industrial society (Milles 1994). Not only did Max Pettenkofer set up the glut sewage system and the central water-supply system in Munich; he also started studies into health-damaging factory work. He ensured further treatment of this problem, as, for example, during the fifth meeting of the German Society for Public Hygiene in Nuremburg in 1877. The "practical realization" was discussed in a manner which was mindful of the organized labor movement (*Die Zukunft* 1877/78, p. 88f). The first attempts at trade regulations were listed for further development. They included regulation of child labor; a ban on night labor and labor on Sunday; regulations concerning breaks, minors, women's labor, the normal workday, required licenses for facilities; inspections dealing with construction and fire-safety, etc. The meeting deemed "a certain supervision of the trade regarding hygiene as necessary", though it was "to avoid taking on the character of the police". It recommended:

- local, mixed factory commissions for the supervision and the consultation of the authority
- technical supervision associations
- "the proper organization of the medical service. It is not sufficient that the health insurance funds grant their members medical treatment in cases of disease; the physician has to be familiar with the member's kind of occupation and the resulting health risk and has to visit the workplace during a certain period of time and the like. Also, he has to be granted a sufficient prophylactic influence".

The meeting saw the employment of a few high-ranking civil servants as necessary in order to bring about the program's realization. These civil servants were to possess the appropriate technical-hygienic, medical-hygienic education in addition to the required common knowledge. They were also responsible for the realization of supervision by the state (Milles 1997).

The proximity to the labor movement and the state's control of factory inspection proved to be the decisive difficulty. Bismarck was against patronizing and burdening industry on which the state's power had become increasingly dependent. Thus the socialist law was an attempt to suppress all Social-Democratic organizations, whereas the factory inspectors received only advisory tasks.

The Contradictions of the Public Health Conception

Under Pettenkofer's influence, hygiene in Germany concentrated on two tasks which had implications for social policy: on the one hand, the support for technical measures and, on the other hand, pedagogical measures. Hygiene was to aim at the "well-being of the people" in the form of applied physiology. That well-being, however, was increasingly dependent on economic growth. This belief would lead to progress, but also to profound restrictions (Eckart 1998, p. 277ff).

Pettenkofer developed the concept of "framing" from this perspective: since nature possessed the ability to purify itself (*Selbstreinigungskraft*), it was thus necessary to determine the extent of possible health risks in regard to the pollution of rivers and the concentration of hazardous gases. Thus the frame in which economic growth could take place had to be set.

Pettenkofer understood the concept as scientific and as a way of precisely determining protection. Its consequence, in practice, meant a gradual distancing from the political implications of public health.

In industrial hygiene, Pettenkofer's students, such as Max Gruber and Karl Bernhard Lehmann, were less concerned about the attainment and extension of workers' protection than with the legitimization of non-harmful health strains. They explored "efficiency thresholds", and the proposed limits for gases and fumes had been derived mainly as levels for releasing rights. These hygienicists acted mainly as industrial lawyers, as can be seen in the so-called "zero hypothesis", according to which no health risk is assumed as long as no exact cause can be proven. Especially in regard to workers' insurance, their work blocked the opportunity for negotiation of a social agreement on reasonable health risks and on industrial pathogenicity. They were also a hinder for the teamwork between the various insurance branches in Germany, where accident insurance was ascribed a responsibility for prevention which could be largely transferred to the statutory health insurance.

The Tragic Controversy of Cholera

An especially problematic development of the connection between industrial hygiene and public health can be illustrated by another central concern of Max Pettenkofer's work: the fight against cholera. Pettenkofer's stance in this problem was also bound to the hope of economic growth and the entailing improvements regarding the prevention and cure of major health risks. Pettenkofer therefore believed that, for the sake of the development of free civil communication, even cholera and many other diseases had to be risked: "A ban on traffic up to the point where cholera cannot be spread by it would be a much bigger disaster than cholera itself." On the one hand, this understanding was quite modern and corresponds with the meaning we nowadays ascribe to the improved conditions for a healthy life. On the other hand, it subordinates itself too readily to the conditions of capitalistic interests of utilization. This conception contained a social-political dimension which cannot be traced easily during those years. Thus concepts which

appeared to reject social-political dimensions received a higher amount of benevolence from the authorities and representatives of the economy. The triumphant advance of clinics and of bacteriology fall into this period.

It is due to tragic circumstances that, at the end of his life, Pettenkofer suffered his greatest defeat concerning that aspect of his hygiene concept that is the most important for us today: the emphasis on social conditions regarding epidemics. This has been described in great detail by Richard Evans (1987) in his study on Hamburg's cholera epidemic in 1892. Thus, we will mention only some highlights.

Until the 1880s, Pettenkofer was seen as the leading expert on epidemics in Germany. Though he did not deny the existence of cholera germs, he nevertheless stressed other contexts of impact, especially the importance of the "host". After the discovery of the cholera germ by Robert Koch in 1883/84, Pettenkofer watched the triumphant advance of bacteriology with envy, as well as rejection. The cholera epidemic in Hamburg in late 1892 provided clear evidence that assured bacteriology's triumph. This unexpected and grave epidemic that caught everyone by surprise was neglected by Pettenkofer's followers and was tackled successfully only because of Koch's intervention. The boiling of water, which Pettenkofer saw as useless, turned out to be the most effective method of fighting the disease. After the epidemic faded, there was a serious controversy between the two at the *Reichsgesundheitsamt* in September 1892. Koch emerged the victor and determined "the scientific standpoint of today". Pettenkofer consequently drank a cholera culture in front of students on October 10, 1892. The culture had been obtained from the institute founded by Koch's student Georg Gaffky in Hamburg. As a result, Pettenkofer showed some symptoms of the disease, but recovered and saw this as proof of his convictions. Gaffky, however, reported that, out of consideration for the old and honorable man, he had sent Pettenkofer a mild and non-dangerous culture. Thus even this experiment did not receive the recognition that he expected from the authorities, medical science and the general public. After these events and the death of his wife, Pettenkofer became ill, was affected mentally and finally shot himself on January 10, 1901. The event was symbolic in its tragic failure to promulgate scientific arguments for measures regarding social policy and their acceptance.

Developments of Responsibility for Industrial Pathogenicity in Germany

Pettenkofer's achievement lay especially in having provided the analytical foundations of public health measures without neglecting social objectives. He targeted the responsibility of the authorities regarding the political structures, especially that of the cities' health offices and of the authorities of the German Empire. He supported economic growth and the improvement of living conditions. However, the implications of his public health concept for social reform was pushed into the background in the politics of the German Empire, and scientific methods replaced political aims.

The rising labor movement, which was seen as dangerous, contributed in some ways to the increased importance of public health in communities as well as in the central state. At the same time, however, its political treatment was strained by power interests and economics.

During the 1870s special social security systems were developed in Germany which dealt with health dangers related to workers' protection and work insurance. These political constructions came into being under the influence of a grave and long-lasting economic crisis, the threat of strikes by unified Social Democrats and the menacing ideas of the Paris *Commune*. The development of the social insurance system in the 1880s (health insurance in 1882, accident insurance in 1884, pension insurance in 1889) took place in an attempt at social and political integration and the acceleration of national efficiency in the competition with England. Security benefits had to be justified causally with industrial pathogenicity and, at the same time, with the promise of integration and strengthening of performance.

Within this social embedding, a "clinical look" in occupational medicine and a "hygenization" of work and life environment was more supportive of the state than public health care developed politically or medicine's social aspects. Yet, fatally, the distance created by scientific and analytical methods concerning the social, political and moral questions at that time led to a stabilization of the natural sciences and to practical influence as well as success. As Alfons Labisch concluded, "the ethical and political components were sacrificed willingly" (Labisch 1992, p. 122).

Security and Health Today

Today, security and health accentuate the central challenge to social policy, and, thus to the German and "European" welfare state. Because of Europeanization, the objectives are being newly focused.

Health, in other words, physical, mental and social performance capability, became the single valid constant for us humans during the development towards modern industrial societies, and especially in today's post-modern age. This is especially true in a society where the large majority no longer believe in eternal life after death. Against this background, health is seen as the highest good in the public's esteem and is undoubtedly a central value in industrial societies. Health is not only seen as an individual and private, but also as a public and common, good. This double aspect of being a private but also a public, meritocratic good makes up the basic interpretation of public health.

Public health tendentiously penetrates all social areas and cannot be reduced to scientific analysis, to treatment provision and, least of all, to medicine. Public health is implicit in all social areas, such as education, work, the family, mobility, nutrition or urban life. Health is therefore penetrated by aspects of power and control, of interests and conflicts. Thus health is subjected to political processes, arrangements and decisions. This also holds true for the area of health and work. The political interspersing of public health in private companies or, in other

words, the realization of public, social responsibility in businesses is the story of health protection.

Models of Social Development

Health protection in the German or European context, as a supplement to the citizen's civic, (economic) and political rights, is part of human rights as formulated for the first time in the UN Declaration on Human Rights of 1948 and in the EU Social Charter of 1961.

Social responsibility aims at inclusion, at social integration, at the participation of all people as members of one social context. Every person, therefore, has to have access to all areas of society's functions, such as the law, education, health care, and the opportunity to start a family as well as economic life (Kaufmann 2000, p. 176).

A new model of work has to integrate central dimensions of industrial and public health. These are:

- Reduction of work's share of life-time
- More variety in and discontinuity of *work biographies*
- Consideration for care work (such as nursing or the upbringing of children in families) as well as community and individual work in addition to paid work
- Equality for men and women (gender democracy)
- The knowledge that ecological, healthy and socially aware activities outside work are connected to corresponding experiences within the work sphere.

However, due to the dynamic changes within the work sphere, the connection between work and everyday life will become more complicated and diverse for many people, and it increasingly demands a more active individual organization of everyday life.

Chances of Politicization in the European Context

Europeanization has provided the concept of "public health" in the area of industrial businesses with an essentially stronger legitimization than previously. This is especially true concerning regulations on work protection, which follow a new model. Instead of an orientation towards technology, authoritarian control, a passive role for the employees and damages understood as accidents and occupational diseases, there is now a shift towards an industrial law where dangers are to be comprehensively understood, tackled early or prevented, and where all involved in business are to act upon the humane arrangement of work and its conditions.

Whereas work protection used to be oriented toward damages and physical, chemical and biological hazards, there is now a normative orientation in the new regulations on work protection. Health, health promotion, maintenance of pro-

ductivity and personal disposition must be compatible with the demands of work. The new regulations strengthened the rights of the employees in a civil and democratic sense. Employees have the right to information on risks and opportunities for health promotion as well as the right to advice on health problems in connection with their work. To a certain extent, the right to participation and to share in businesses has been strengthened. The extension of the principle of public health in the sphere of productivity, including the service sector, is further expressed by the extension of the EU's and thus Germany's regulations concerning work protection for the entire working population.

The new demands on work protection can be summed up as follows:

- An extended understanding of health; not only purely physical damages but also psycho-social aspects are included as well as aspects on health promotion (*holistic work protection*)
- Health policies aimed at prevention are understood as a cross-section task of business policy (*safety management*)
- Work protection is seen as a dynamic challenge. It has to adjust to the progress of technological development and to the newest findings of ergonomics (*adjustment duty*)
- Reduction of the executive deficit, especially concerning smaller businesses, employer's responsibility (*business orientation*)
- Cooperation between skilled safety experts and company medical officers (*principle of cooperation*)
- Active involvement of individual employees in the perception and management of hazards and risks as well as *healthy* behavior; employees are to be respected and accepted not only as objects of considerate protection but also as representatives of interest of their own health (*principle of participation*)
- Uniform and transparent standardization of legal demands and duties (*uniform right to work protection*) (Bücker et al. 1994, p. 43–44).

Not only the public work protection law but also the legal regulations concerning public health insurance and accident insurance in Germany outline new activities aimed at prevention and humane arrangements of work conditions. Paragraph 20, "Prevention & Self-help", of the Social Security Code, Book V may be cited. Accordingly, public health insurance funds have to cooperate with the providers of the statutory accident insurance for the prevention of work-related health dangers. They have to provide services for primary prevention in order to deliver a contribution for the reduction of social inequalities regarding health opportunities. Prevention has been extended in the new accident insurance with §1 and §14. This relates not only to work-related accidents and occupational diseases but also to work-related health danger that may threaten life and health. There must be an investigation into the causes for these dangers and cooperation with public health funds.

Thus a central element of modern labor and health policy is the promotion and the qualified organization of the citizen's participation in- and outside the workplace in the interests affecting them. This further develops a problem seized upon by Max Pettenkofer. Yet, whereas he aimed at *objectifying*, seeking mainly analytical criteria for health protection, the emphasis is nowadays on a broader politicization. Pettenkofer aimed at an official expertocracy (technicians, physicians) and pushed aside a politicization "from below"; today there is an opening towards the affected citizens and employees. To a certain extent, we are able to link up with the old positions of Pettenkofer and to develop them further.

References

Bücker A., Feldhoff K. & Kohte W. (1994) *Vom Arbeitsschutz zur Arbeitsumwelt. Europäische Herausforderungen für das deutsche Arbeitsrecht*. Neuwied: Luchterhand.

Eckart W.U. (1998) *Geschichte der Medizin*. 3rd ed. Berlin: Springer.

Evans R. (1987) *Death in Hamburg. Society and Politics in the Cholera Years 1830–1910*. Oxford: Clarendon Press.

Fischer A. (1933, 1968) *Geschichte des deutschen Gesundheitswesens*. Berlin: Herbig.

Göckenjan G. (1985) *Kurieren und Staat machen. Gesundheit und Medizin in der bürgerlichen Welt*. Frankfurt/M.: Suhrkamp.

Kaufmann F.-X. (2000) "Der deutsche Sozialstaat als Standortbelastung? Vergleichende Perspektiven" In: Leibfried L. & Wagschal U. (eds.) *Der deutsche Sozialstaat – Bilanzen-Reformen-Perspektiven*. Pp. 171–198. Frankfurt/M., New York: Campus.

Labisch A. (1992) *Homo hygienicus*. Frankfurt/M, New York: Campus.

Milles D. (1991) "'Public Health' – Konzepte und Diskussionen in der deutschen Geschichte" In: Deppe H.-U., Friedrich H. & Müller R. (eds.) *Öffentliche Gesundheit – Public Health*. Pp. 38–59. Frankfurt/Main: Campus.

Milles D. (1994) "Gewerbehygienische Aufgaben in der Geschichte arbeitsmedizinischer Professionalisierung" In Müller R. & Schulz Th. (eds.) *Betriebsärztinnen im Handlungsfeld betrieblicher Politiken. Chancen und Dilemmata beim Gesundheitsschutz*. Pp. 9–61. Bremerhaven: Wirtschaftsverlag.

Milles D. (1997) "Industrial Hygiene: A State Obligation? Industrial Pathology as a Problem in German Social Policy" In: Lee W.R. & Rosenhaft E. (eds.) *The State and Social Change in Germany, 1880-1980*. 2nd ed. Pp. 164–202, New York, Oxford, Munich: Berg.

Pettenkofer M. (1871) "Ueber die Mittel zur Förderung der Theorie und Praxis der öffentlichen Gesundheitspflege" *Deutsche Vierteljahresschrift für öffentliche Gesundheitspflege,* 3:254–259.

Pettenkofer M. (1873) *Über den Werth der Gesundheit für eine Stadt*. Braunschweig: Vieweg.

Rabinbach A. (1990) *The Human Motor. Energy, Fatigue, and the Origins of Modernity*. New York: Basic Books.

Struck H. (1878) *Denkschrift über die Aufgaben und Ziele, die sich das Kaiserliche Gesundheitsamt gestellt hat und über die Wege, auf denen es dieselben zu erreichen hofft*. Berlin: C. Heymann's.

Struck H. (1881) *Mitteilungen aus dem Kaiserlichen Gesundheitsamt*. Berlin: Norddeutsche Buchdruckerei.

Part III
Health and Industry: Politics and Practice

7: "Plastic Coffin": Vinyl Chloride and the American and European Chemical Industry[3]

David Rosner, Columbia University
Gerald Markowitz, City University of New York, New York, USA

In the mid-1960s, the international chemical industry discovered a terrifying fact: vinyl chloride monomer (VCM), the basis for polyvinyl chloride (PVC), one of the most widely-used plastics, was linked to a degenerative bone condition called acroosteolysis that was affecting workers in a number of its plants. In the early 1970s the Manufacturing Chemists Association (MCA), the industry association representing close to 200 companies, received even more troubling news: secret animal studies performed for European chemical manufacturers showed cancers at surprisingly low levels of exposure to VCM as well. Industry leaders became terrified. Industry was faced by the question of what would it mean for the vinyl industry if the public knew that vinyl chloride, the basis for Saran Wrap and hundreds of other consumer products such as hairsprays, car upholstery, shower curtains, liquor bottles, floor coverings and wiring, was linked to cancer? Would the public begin to view all plastics as threats to their health? To avoid public disclosure of industry sponsored research indicating cancers caused by vinyl chloride monomer, the chemical industry planned and executed an elaborate scheme to deceive the American government, and mislead the workforce and the public. The MCA closed ranks to protect the image of its product as safe and to hide information about its health costs. As more data emerged from European investigators, confirming and even extending the findings of cancer, the Manufacturing Chemists Association (now the Chemical Manufacturers Association) privately expressed extreme distress though it continued to show a calm and reassuring face to the government and the general public. The industry considered such deceit necessary in light of the unlimited liability it could face from lawsuits that might be brought by millions of Americans who used vinyl chloride every day.

Plastics had emerged in the 1950s as a mainstay of the petrochemical industry. In 1953 the US industry employed 200,000 people and boasted annual sales of over $23 billion. It produced 3.5 billion pounds of plastics and resins per year (Kent 1954, p. 53; "Chemical Field…", p. 90).[4] Polyethylene, polypropylene, polystyrene and polyvinyl chloride among others were all synthetic materials. But, some, particularly polyvinyl chloride, were unusual in that they were created from chemical combinations that did not exist naturally. Chlorine-carbon molecules do not exist in nature and therefore, their impact on the environment and on human

[3] This article is based on material in our book, *Deceit and Denial: The Deadly Politics of Industrial Pollution*, (Berkeley: University of California Press/Milbank Fund, 2002). We gratefully acknowledge the support of the Milbank Memorial Fund and the National Science Foundation.

[4] For the most part, this section depends upon Doniger 1979; Spitz 1989, p. 24.

health is completely untested.[5] Production skyrocketed during World War II, going from one million pounds per year to 120 million pounds per year; by 1952, production had grown to 320 million pounds (Spitz 1989, p. 24; Commoner 1977, p. 70). By 1973, 27 billion pounds of plastics were produced. Polyvinyl and vinyl chlorides accounted for 5.4 billion pounds, behind polyethylene with 8.4 billion pounds and more than polystyrene with 5 billion and polypropylene with 2.2 billion pounds.[6] With the addition of plasticizers that increased flexibility and durability, polyvinyl chloride was extremely adaptable to a variety of uses, especially in construction (40% of consumption); in wire and cable, (10%); manufacture of pipe (25%); film and sheet for packaging and coated fabrics (15%); flooring (10%).[7] Because of its low cost and great durability, it became a widely used substitute for woods, metals, glass, rubber, ceramics, and other plastics (Doniger 1979, p. 23; Blackford & Kerr 1996, p. 239). By the 1960s, VCM gas was also used as an aerosol propellant in beauty aids and cosmetics, drugs, pesticides, and a variety of other products.

There are four broad stages in the production of polyvinyl chloride plastics. First, salt is broken down through an electrolytic process to release chlorine as a greenish gas. Inherently unstable, chlorine does not naturally exist in nature; about three-quarters of all chlorine produced is presently used in the chemical industry as a feedstock (i.e., component material) in the production of plastics, pesticides, solvents, and other products unknown in the natural world (Thornton 2000, p. 3). In the second stage, chlorine, combined with a variety of hydrocarbons, produces vinyl chloride monomer. (In the late 1940s it was used as an anaesthetic, but was ultimately discarded because of dangerous side effects.) In the third stage, the monomer is formed into a polyvinyl chloride resin and finally, in the fourth stage, it is fabricated into finished products. Vinyl chloride monomer plants are often huge open-air complexes of metal and steel tubing connecting large and small tanks to one another, much like oil refineries. By and large, they are located in southern and western states, especially Louisiana and Texas. PVC plants are

---

[5] "Union Carbide Corporation Chronology of PVC Activities", in R. N. Wheeler, Jr., "Literature Survey and Engineering Options" *Peterson vs. Union Carbide Corporation*, Oct. 1989, p. 43; Blackford & Kerr 1996, p. 239. Ralph L. Harding, Jr., President, The Society of the Plastics Industry, Inc. says first production was in 1939, but he was probably referring to Dow Chemical's first entering into the field in Midland Michigan. See: Ralph L. Harding, Jr., Testimony at OSHA Hearings, "Official Report of Proceedings Before the Occupational Safety and Health Administration of the Department of Labor in the Matter of a Proposed Permanent Standard for Occupational Exposure to Vinyl Chloride, June 26, 1974, Washington, D.C. p. 330–331; See also, statement by V.K. Rowe before U.S., DOL, OSHA, "Transcript of Informal Fact-Finding Hearing on Possible Hazards of Vinyl Chloride Manufacture and Use," Feb. 15, 1974, Washington, D.C., p. 162.

[6] Ralph L. Harding, Jr., President, The Society of the Plastics Industry, Inc. "Testimony at OSHA Hearings", Official Report of Proceedings Before the Occupational Safety and Health Administration of the Department of Labor in the Matter of a Proposed Permanent Standard for Occupational Exposure to Vinyl Chloride, June 26, 1974, Washington, D.C. p. 330–331.

[5] Ralph L. Harding, Jr. President, SPI, U. S. Congress, Senate, Committee on Commerce, Sub-Committee on the Environment, *Hearing on the Dangers of Vinyl Chloride*, 93rd Cong. 2nd Sess., Aug. 21, 1974, (Serial No. 93–110, U.S. GPO, 1974).

somewhat more enclosed and are located in a variety of states in addition to Louisiana and Texas, principally New Jersey, Ohio and Massachusetts.[8]

While relatively few workers are employed in the production of VCM and PVC, the consequent fabrication processes employ many more. In the mid-1970s only about 1,000 workers were employed by the vinyl chloride industry and another 5,500 workers in the PVC industry. (In total, from 1939 through the mid-1970s, only about 30,000 were involved in VCM and PVC production.) But many more were engaged in the fabrication of finished consumer goods or construction materials. In the mid-1970s there were nearly 350,000 workers using PVC in the fabrication of the wide variety of finished products (Doniger 1979, p. 26).

The Hazards of Vinyl Chloride

For much of the twentieth century, Americans took solace in the notion that industry and science used refined methods to ensure that workers in dangerous trades were not exposed to harmful levels of toxins. Because Americans believed in the ability of technicians and scientists to understand what constitutes danger and how to guarantee safety, they did not worry much about the chemical industry. They felt assured that there were levels below which danger from exposure to chemicals and other substances did not exist – and that industry observed these strictures.

Through the 1950s and 1960s, and even into the early 1970s, vinyl chloride was said to present "no very serious problem in general handling aside from the risk of fire and explosion" but vinyl chloride monomer (VCM) was known to pose a potential danger when workers were exposed to extremely high quantities, causing faintness, disorientation, drowsiness, and other acute, but passing, effects. In 1954 the MCA set an upper limit of safety at 500 ppm (parts per million), a figure that would stand as a measure of safety for the next two decades.[9] Prior to the establishment of the Occupational Safety and Health Administration (OSHA) most standards from chemical exposure were arrived at in the same loose and often arbitrary manner that vinyl chloride standards were set. As Henry Smyth of Union Carbide stated in an internal memo, the 500 ppm Threshold Limit Value (TLV) for vinyl chloride was "based largely on single guinea pig inhalation studies by the Bureau of Mines" during World War II.[10]

The producers of vinyl chloride had a sense that vinyl chloride could possibly cause chronic conditions for the workers even before it was linked to any specific

[8] Doniger 1979, p. 26. By the 1970s there were ten companies producing vinyl chloride monomer in fifteen plants throughout the nation. Shell, Dow, and Goodrich alone controlled approximately 56 per cent of vinyl chloride monomer production. About 23 companies, operating 37 plants nationwide, controlled the production of PVC. Finally, there were about 8,000 companies of a wide variety of sizes using PVC in the fabrication of consumer goods. David Doniger explains that the highly concentrated VCM and PVC industry "has made it easy for the industries to speak with one voice in regulatory proceedings regarding the limits of their technological and economic capabilities to control VC exposures" (pp. 25–26).

[9] MCA, Chemical Safety Data Sheet, SD-56, "Vinyl Chloride," 2.3.1. MCA Papers.

[10] Henry F. Smyth, Jr. to T.W.Nale, attn: Weidlein, November 24, 1959, MCA Papers.

disease in the mid-1960s. In May 1959, Dow Chemical's V.K. Rowe worried about the fact that there was "no good toxicological data […] of the chronic toxicity of vinyl chloride".[11] In a correspondence with William E. McCormick, Manager of the Department of Industrial Hygiene and Toxicology at B.F. Goodrich, he admitted privately that the 500 ppm TLV "cannot be relied upon to [sic] strongly when considering chronic exposures". He had "been investigating vinyl chloride a bit and [found] it to be somewhat more toxic when given by repeated daily inhalations". It was "too early yet to tell what vapor concentrations will be without adverse effect". Although he did not inform anyone outside the industry, he expected that the current TLV would produce "appreciable injury" to full time workers.[12]

This study indicated that "vinyl chloride monomer is more toxic than has been believed",[13] and that repeated exposures at 200 ppm resulted in micropathological changes in the livers of rabbits. As a result of these experiments, in 1961, Dow recommended a 50 ppm TLV, but the American Conference of Governmental Industrial Hygienists (ACGIH), failed to change the TLV for more than a decade (Torkelson et al. 1961, pp. 354–361).

"Bracketing the Trouble Area"

When the industry learned in the mid-1960s about vinyl chloride workers who suffered from acroosteolysis (AOL), a strange and previously undefined condition, it developed a strategy regarding health issues that it would use over the coming decade. While privately seeking to understand the source of the problem and by funding research that would give them the information they needed to devise a response, the industry would release to the public only such information as would reassure people as to the essentially benign nature of their finished products; they would also work to forestall any regulatory action.

The industry learned that a few of their workers who entered the polymerizer vats (where polyvinyl chloride was synthesized from vinyl chloride monomer) in the Louisville, Kentucky plant of B.F. Goodrich, were developing hand and other systemic health problems. The problem was discovered in 1964 by Dr. John Creech, who conducted physical exams of the Goodrich workforce. One day, one of the workers came to Dr. Creech in the dispensary, "complaining about his tender fingers and asked me 'what's going on […] with my fingers?'" Creech noticed that the skin on the man's fingers, as well as elsewhere on his body, was thickened and he asked him "if he knew of anyone else over at the plant [who] was having this type of problem". He learned that another worker couldn't even open up his lunch box because his fingers were so tender. Subsequent x-rays and examinations of this other worker showed that he had a condition similar to that of

[11] V.K. Rowe to W.E. McCormick, May 12, 1959, MCA Papers.
[12] V.K. Rowe to W.E. McCormick, May 12, 1959, MCA Papers.
[13] Henry F. Smyth, Jr. to T.W.Nale, attn: Weidlein, November 24, 1959, MCA Papers.

the first worker. Over the next six weeks Creech accumulated a few more cases and reported his observations to the plant management.[14]

Shortly thereafter, Rex Wilson, head of Goodrich's Medical Department, wrote to the physician of another Goodrich plant asking him "to determine as *quietly as possible* whether similar disabilities" existed at his plant. It was clear that he did not want the employees to know the reason for any examinations. He told the doctor,

> I would appreciate your proceeding with this problem as rapidly as possible, but doing it *incidentally* to other examinations of our personnel. We do not wish to have this discussed *at all* and I request that you maintain this information in confidence.[15]

Monsanto sought to gather information about the extent of the disease in one of its plants without telling the workers the cause of the company's concern. The workers were to be x-rayed, but the Monsanto official wrote,

> I am sure Dr. Nessell can prepare these people with an adequate story so that no problem will exist. Depending upon what happens following this x-raying, we will have to see what our next step is.[16]

Noting that it was not just polymerization workers who were coming down with the disease, Goodrich and Monsanto worried that this issue could become public, to the detriment of the industry.

In an attempt to forestall any disclosures, a curtain of secrecy began to descend over the diseases that were appearing in the various polymerization plants around the country and around the world. In January 1966, Harry Warner, Corporate Vice-President of B.F. Goodrich, learned of a physician with the Solvay Chemical Company in Brussels who reported seeing at least two workers in a Solvay plant who exhibited the same bone destruction that was seen in the Goodrich cases and who was planning to publish a report about them.[17]

> Goodrich was concerned enough about the response to such a published article that Mr. Warner attempted to have one of [Goodrich's] representatives, who was in Europe, stop by and try to discourage or to influence the wording of such an article to ensure that it didn't condemn PVC in general.

---

[14] Deposition of John Creech, M.D., In the Matter of: Daniel J. Ross, et ux v. Conoco, Inc., et al., June 12, 2000, pp. 49, 53, June 13, 2000, pp. 12, 17, 37–39, 191, MCA Papers. Solvay, the European producer, seems to have "discovered some cases of acroosteolysis in 1963." See: "Meeting with Professor Maltoni, Arranged by Ethyl Corporation, and Held at International Hotel, Kennedy Airport, New York City, on June 5, 1974." MCA Papers.

[15] Rex H. Wilson, M.D. to Dr. J.Newman, Nov. 12, 1964, "Confidential." MCA Papers.

[16] R. Emmet Kelly to Mr. A.G. Erdman, Springfield, "PVC Exposure" Jan. 7, 1966. MCA Papers.

[17] R. Emmet Kelly to Mr. A.G. Erdman, Springfield, "PVC Exposure" Jan. 7, 1966. MCA Papers.

The attempt was unsuccessful, but Goodrich, with the help of Monsanto, which had its European headquarters in Brussels, made plans to send a team to Brussels in another effort to "discourage or edit the publication".[18]

In June, Goodrich presented its findings to representatives of six major US and European companies at a private meeting.[19] At the conclusion of this small meeting, the MCA was asked to organize a larger meeting of all the chemical companies to decide on a common course of action regarding the medical and public relations dangers that lay ahead.[20]

The growing plastics industry was terrified about the effect any public disclosure of a problem with an essential ingredient in their product would have on this market. At the meeting a representative from Airco noted what was obvious to all – namely that "any action at the plant must be properly handled to avoid labor relations and publicity problems".[21] The problem went beyond labor relations and union issues, however, and B.F. Goodrich hoped that other companies would "use discretion in making the problem public", because of the need "to avoid exposes like *Silent Spring* and *Unsafe at Any Speed*", which had publicized the worst kind of nightmare faced by major industrial executives in the mid-1960s.[22] Union Carbide's Robert "Nick" Wheeler emphasized the need for secrecy in light of the "definite health problem related to polyvinyl chloride manufacturing".[23]

While the PVC manufacturers were concerned about the potential dangers from VCM exposure to the workforce, they were more concerned about the negative publicity. In the words of Wheeler's follow-up memo relating to a meeting of the MCA's Occupational Health Committee,

> the need for bracketing the trouble area was essential. Unfavorable publicity with regard to exposure of finished products to the human anatomy could be very damaging to the industry.[24]

If plastic products, particularly those that wrapped or came in contact with food, were implicated, the industry would find itself besieged not just by workers and their unions, but by the general public and federal authorities. The MCA also

---

[18] J.V. Wagoner to Mr. Proc Avon, "Confidential," Jan. 6, 1966, MCA Papers. Goodrich's Rex Wilson went to Brussels to see if he could stop publication of paper. R. Emmet Kelly to Mr. A.G. Erdman, Springfield, "PVC Exposure" Jan. 7, 1966. MCA Papers.

[19] W.E. McCormick to Kelly, May 10, 1966,; McCormick to Kelly et al., June 10, 1966, MCA Papers.

[20] P.W. Townsend for J.A. Bourque, Jr. and Townsend, "Confidential," "MCA Medical Advisory Committee Meeting re: PVC," Oct. 17, 1966, MCA Papers.

[21] P.W. Townsend for J.A. Bourque, Jr. and Townsend, "Confidential," "MCA Medical Advisory Committee Meeting re: PVC," Oct. 17, 1966, MCA Papers.

[22] "Meeting PVC Resin Producers at Cleveland Engineering Society under the Sponsorship of MCA and B.F. Goodrich Chemical Company, October 6, 1966," October 7, 1966, MCA Papers.

[23] R.N. Wheeler to Mr. A.R. Anderson, et al., "Subject: MCA Occupational Health Committee Meeting, Oct 6, 1966," Oct. 24, 1966, MCA Papers.

[24] Wheeler, Memo, "Meeting at Ann Arbor, Michigan, MCA Occupational Health Committee, January 24, 1967, MCA Papers.

agreed to fund an epidemiological study of PVC workers to be conducted by epidemiologists at the University of Michigan's Institute for Industrial Health.[25]

Meanwhile, at the end of the summer of 1967, almost three years after the first reports of vinyl chloride-related disease had been noticed in the Goodrich plant, researchers from B.F. Goodrich published in the *Journal of the American Medical Association* a report of 31 cases of acroosteolysis among vinyl chloride workers (Wilson et al. 1967, pp. 577-581). A year and a half later, in February 1969, the results of the University of Michigan study were presented confidentially to the MCA's Medical Advisory Committee. The report acknowledged that AOL involved connective tissue as well as bony structures, and that an earlier assumption that AOL was a localized problem involving just fingers was incorrect. Up until this time it had been assumed that only when workers could smell vinyl chloride was there a possibility of overexposure. But the report indicated that the "odor threshold" of vinyl chloride was about 4,000 ppm, not 400 ppm as previously believed and well above the existing threshold limit value of 500 ppm. More importantly, the document noted that it should not be assumed that vinyl chloride workers were safe from disease even at the 500 ppm TLV. The study suggested that "sufficient ventilation should be provided to reduce the vinyl chloride concentration [to] below 50 ppm" so that workers could be protected.[26]

When the members of the MCA's Occupational Health Committee read the report, they were particularly troubled by this recommendation. To propose reducing exposure to 50 ppm implied that vinyl chloride was the direct cause of disease. The members, by a vote of 7 to 3, refused to accept the report as written and unanimously voted to accept the report only if it was changed to avoid any implication that the 50 ppm was "a threshold level for general safety when exposed to VCM".[27] The MCA's PVC resin producers agreed that the wording must be changed to read thus: "Inasmuch as the etiologic agent of the disease is unknown, a level of vinyl chloride below 50 ppm should be used as an index of adequate ventilation."[28] Their object was that there should be no implication that exposure to vinyl chloride monomer at such low levels could cause disease.

Secret Agreements: The Evolution of the Cancer Debate over Vinyl Chloride

The reactions of the industry to the link between vinyl chloride and acroosteolysis were a mere preview to how the industry would react when faced with a much larger and uncontainable problem – the link between vinyl chloride and cancer.

---

[25] William E. Nessell, M.D. [Monsanto], "MCA Meeting, Ann Arbor, Mich.: 1/24/67," January 26, 1967, MCA Papers.

[26] Institute of Industrial Health, University of Michigan, *Epidemiological Investigation of the Polyvinyl Chloride Industry in Reference to Occupational Acroosteolysis*, "Confidential Report to the Medical Advisory Committee, Manufacturing Chemists Association," February, 1969, p. 104, MCA Papers.

[27] George Ingle, Monsanto, to W.E. Nessell, May 8, 1969, MCA Papers; MCA, Occupational Health Committee, Minutes of Meeting, April 30, 1969, MCA Papers.

[28] Frank Carman, "Report of Meeting," PVC Resin Producers Representatives, May 6, 1969, MCA Papers.

When cancer became an issue, industry took more extreme and potentially explosive actions to cover up the danger. Industry moved from denial and obfuscation to outright deception. Motivated by money and power rather than health, the industry was largely successful in hiding its information about cancer from the government and in deflecting national attention away from the potential hazards of thousands of mostly untested new chemicals and of vinyl chloride in particular. In the years to come the nation would learn the serious pitfalls that result when regulation of an industry is left in the hands of that very industry.

In 1970, the American industry learned that an Italian researcher, Dr. Pierluigi Viola from the Regina Elena Institute for Cancer Research in Rome, had presented a paper on the carcinogenic effects of vinyl chloride exposure in animals at the International Cancer Congress in Houston. Dr. Viola reported that rats exposed to 30,000 ppm of vinyl chloride monomer gas developed tumors of the skin, lungs and bones and that his research would soon be published.[29] In May 1971, the same month that Viola published his paper in the journal *Cancer Research* (Viola et al. 1971), he was invited to Washington by the MCA's Occupational Health Committee to present a summary of his work. While executives were upset by his findings, they hoped that his results would be deemed not applicable to other animals or to humans who were exposed to far lower levels of vinyl chloride. As a result of the meeting, the MCA began to develop a research protocol aimed at evaluating the carcinogenicity of vinyl chloride and to consider conducting an epidemiological study.[30] They hoped that, since the cancers showed up in the rat's zymbal gland, a gland in the animal's ear that did not exist in humans,[31] the cancer might not show up in humans. Industry decided not to make any revisions to the Chemical Safety Data Sheet, the document used by producers to establish safe practices in their plants.[32]

A few months later the MCA learned that "further studies [by Viola] on the toxicity of vinyl chloride have confirmed the carcinogenicity of this monomer" even though it "has not been confirmed in the human body". Viola suggested, on the basis of his research, that a safer TLV would be 100 ppm, for he found that the "danger of a toxic action of the monomer on nervous apparatus, bones and liver is negligible if concentrations are no more than 100 ppm".[33] Viola also reported to the MCA that he had found tumors in 10 to 15 per cent of rats at 5,000 ppm.[34] He suggested that animal studies of vinyl chloride's carcinogenic properties be

---

[29] [Walter D. Harris], Handwritten Notes, "Given to R.J.O.[D]?, 5/17/76." MCA Papers. It is unclear from the documentation whether or not Dr. Viola actually delivered this paper. See, George Roush to Richard Henderson, June 24, 1970, MCA Papers.

[30] MCA Occupational Health Committee, Minutes of Meeting, May 6, 1971, MCA Papers.

[31] MCA Occupational Health Committee, Minutes of Meeting, May 6, 1971, MCA Papers.

[32] MCA Occupational Health Committee, Minutes of Meeting, Sept. 20, 1971, MCA Papers.

[33] Viola to Kenneth D. Johnson, Oct. 29, 1971, MCA Papers.

[34] Union Carbide Memo on the "Manufacturers Chemists Association Occupational Health Committee VC Conference," Nov. 23, 1971, MCA Papers; S.F. Pits to D.O. Popovac, CONOCO Interoffice Communication, "On MCA VCM Toxicity Subcommittee," Nov. 18, 1971, MCA Papers.

conducted at low concentrations, down to 50 ppm.[35] Union Carbide's Robert Wheeler understood that "Publishing of Doctor Viola's work in the U.S. could lead to serious problems with regard to the vinyl chloride monomer and resin industries…". Wheeler was concerned about this link to cancer because "the Delaney amendment bans the use of any material in food that can cause cancer" and, more broadly, that "the present political climate in the U.S. is such that a campaign by [Ralph] Nader and others could force an industrial upheaval via new laws or strict interpretation of pollution and occupational health laws". [36]

Viola's finding of tumors at 5,000 ppm, and his recommendation that a 100 ppm threshold would probably avoid future problems, were tough enough for the industry to swallow. But the reports of research done in 1972 by another Italian researcher represented a potential catastrophe. PVC was now central to the economic viability of a number of critical American chemical companies. Between 1966 and 1971, PVC production in the United States doubled from 1.2 billion to 2.4 billion pounds; in the case of B.F. Goodrich, for example, their chemical division was replacing rubber as the most profitable sector, and PVC accounted for half of the chemical division's sales (Blackford & Kerr 1996, pp. 321, 324). Late in 1972 the American chemical industry received a series of reports from European vinyl manufacturers who had, in the wake of Viola's reports, hired Cesare Maltoni, Director of the Bologna Centre for the Prevention and Detection of Tumours and Oncological Research, to investigate whether Viola's findings had any merit. During the summer of 1972, the Europeans began receiving preliminary results of Maltoni's confidential work that indicated cancers appearing in rats exposed to lower levels of vinyl chloride than in Viola's studies and in sites other than their zymbal gland. Almost immediately, the European producers began to enlist their American counterparts in participating in secrecy agreements aimed at preventing any public discussion of this work.[37] According to the Americans, the European chemical companies were especially insistent on the need for a secrecy agreement. "[A]pparently, Dr. Viola's presentation at Houston about 2 years ago was made without Solvay's permission", reported Allied Chemical's W.A. Knapp to his superiors.[38]

The secrecy agreement demanded that

> the members of our task group as listed on the attached sheet, are the *only* ones entitled to receive information about the European project. In turn, they should feel honor bound to make sure that such information remains within their own

[35] Viola to Kenneth D. Johnson, Oct. 29, 1971, MCA Papers.

[36] Robert Wheeler, Memorandum, to Dernehl, Eisenhous, Steele, et al., Union Carbide Memo on the "Manufacturers Chemists Association Occupational Health Committee VC Conference," Nov. 23, 1971, MCA Papers.

[37] See, Imperial Chemical Industries, Ltd. To MCA, August 16, 1972; George Best to Prospective Sponsors of Research, Sept. 1, 1972, George Best to Lindsell, ICI, Sept. 20, 1972, MCA Papers; Mehlman 2001 p. A201.

[38] W.A. Knapp to J.C. Fedoruk and A.P. McGuire, Allied Chemical Corporation Memorandum, Nov. 20, 1972, MCA Papers.

companies unless and until formal permission has been granted for its release.[39]

Dow felt "honor-bound to make sure that information received from the European producers remains within our own company until formal permission has been granted for its release". To accomplish this, Dow instructed that no one "discuss the European work", even within the company, unless such persons "have a need to know". Even then, such discussion should be cleared in advance.[40] While it is common practice for researchers to jealously guard their findings until they are published, in cases where human lives are at stake, most researchers accept that they have an obligation to share knowledge about potential harm. Further, the insistence on confidentiality was not coming from the scientific researcher, but from the vinyl manufacturers. The secrecy was not entered into at the beginning of the experiments, but only when it became apparent that vinyl chloride monomer was carcinogenic at half the accepted TLV. Secrecy, in this case, was not to protect product information, patent secrets, or even innovative experimental procedures. Rather, its sole aim was to avoid a public relations and legal nightmare.

In October 1972 Dr. Walter Harris, representing the MCA, visited Maltoni in Bologna, and concluded that the MCA's plans to study high dosage exposure were irrelevant since Maltoni was already finding carcinogenicity at lower levels of exposure.[41] Maltoni's results were revealed to American producers of PVC and VCM at a confidential meeting at the MCA headquarters in Washington on November 14, 1972. Members at the meeting were requested not to take notes; in fact, the European representative, D.M. Elliott of the British vinyl manufacturer, ICI, "insisted that the work tables be swept clear of paper for note taking before he would discuss anything regarding the European group's efforts. Such was done…".[42] The most disturbing fact that Duffield presented to the group was that Maltoni had discovered "the occurrence of primary cancers in both liver and kidneys with one positive at 250 parts per million," half the long held 500 ppm threshold value that ostensibly protected workers from AOL and other toxic effects of vinyl chloride. [43] By January 1973, company representatives were given a chart that showed that angiosarcomas of the liver were reported at as low as 250

[39] Kenneth Johnson to Technical Task Force on Vinyl Chloride Research, Oct. 19, 1972, MCA Papers.

[40] D.A. Rausch, Dow, Inorganic Chemicals, "Confidential Treatment of European Study on Vinyl Chloride", Dec. 15, 1972. MCA Papers.

[41] Walter Harris to George Best, October 20, 1972, MCA Papers.

[42] W. Mayo Smith, Air Products and Chemicals, Feb. 6, 1974: "This writer made a memo to file with no copies of the meeting in Washington at the MCA 14 November 1972."

[43] W. Mayo Smith, Air Products and Chemicals, Feb. 6, 1974: "This writer made a memo to file with no copies of the meeting in Washington at the MCA 14 November 1972." See also, W.A. Knapp to J.C. Fedoruk and A.P. McGuire, Allied Chemical Corporation Memorandum, Nov. 20, 1972; See also, Shell Memo, "Private and Confidential," Memorandum of Discussion at MCA, Nov. 14," Nov. 17, 1972, MCA Papers.

ppm. Maltoni was finding cancers in a variety of sites and at very low dosages. The MCA did not doubt the accuracy of this data.[44]

By the early 1970s it was becoming more difficult for the industry to keep information about carcinogens secret within the industry than it had been earlier. Previously, what happened in the workplace remained largely a private matter, of concern to the employer, the employee and, perhaps, a union. Only when a problem escaped the private sphere of the factory and ended up as an issue in a liability lawsuit or on the front pages of a newspaper did an occupational health issue become a source of potential harm to a company's well-being.

Growing environmental awareness among consumers in the late 1960s and early 1970s resulted in new liability issues. Because of workers compensation, it was extremely difficult for workers to sue employers who had exposed them to dangerous chemicals. Workers Compensation had been enacted in the early twentieth century as a means of providing workers with compensation for injuries incurred on the job – and, later, for work-related health effects. But it also was a means of protecting industries from lawsuits brought by injured or diseased workers. Workers were assured a small sum of money, but in return they gave up the right to sue their employer in court. Industry was not protected, however, from *consumers* who could, under product liability laws, sue manufacturers for defective products. The need to protect industry from suits by *users* of vinyl chloride products was foremost in the minds of executives as they considered the implications of Maltoni's, Viola's, and even their own research. What was the potential exposure for their industry from possible suits by consumers? Which products were worth continuing to produce and which were too risky? Which products could be abandoned without financial loss to the growing plastics industry? From the minutes of a December 1971 "planning group", we learn that this *ad hoc* body developed a set of "principles" for its research in which the search for truth was secondary to protecting the industry: First, there was "the need to be able to reassure the public that polyvinyl chloride entails no risk to the user". Second, that workers needed to be reassured "that management was concerned for, and diligent in seeking, the information necessary to protect their health". Third, research had to serve the purpose of developing "data useful in defense of the industry against invalid claims for injury for alleged occupational or community exposure".[45]

In the aftermath of Maltoni's research discoveries, industry had to do something about its potential liability if its products were proven dangerous. The industry's actions with regard to aerosol propellants are an interesting case in point. Vinyl chloride monomer was used not only to create polyvinyl chloride plastics but also as an aerosol propellant in a variety of consumer products. Vinyl chloride was

[44] "Notes from Meeting of Representatives of MCA (Gasque (Olin), Kociba (Dow), Torkelson (Dow)) ICI, Montedison, Solvay et Cie, Rome-Progil, University of Bologna (Maltoni), "Conclusions from European Information," Jan. 17, 1973,; See also, MCA, Minutes of Meeting, Vinyl Chloride Research Coordinators, Jan. 30, 1973, MCA Papers.

[45] MCA, Ad Hoc Planning Group for Vinyl Chloride Research, Minutes of Meeting, Dec. 14, 1971, MCA Papers.

first used as an aerosol propellant in Japan in 1958.[46] By 1959, the Dow Chemical Company was considering using VCM as a propellant in hairsprays, insecticides, room deodorants, and spray paints. Dow expected that its market for vinyl chloride monomer in aerosols to be about 10 million pounds annually and did not believe that the current TLV of 500 ppm would be problematic for them.[47] But, ten years later it was becoming clear that 500 ppm could pose a danger. B.F. Goodrich, after the experience with acroosteolysis, acknowledged privately that "the people in the cosmetics trade have been concerned about the possible toxicity" of vinyl chloride propellants. Measures of vinyl chloride in the air of hair salons had indicated that the "average concentration of VCl monomer is 250 ppm by volume". While this was bad enough in light of earlier recommendations by Dow that the TLV be lowered to 50 ppm, Goodrich worried that "in some cases where the duration of spraying is long (3 minutes) the concentration may be as high as 1,400 ppm". The implication was frightening. Both beauticians and their customers were being "exposed to concentration of VCl monomer equal to or greater than the level in our [polyvinyl chloride plants]".[48]

Nonetheless, vinyl chloride was used as an aerosol propellant at least until sometime in 1974. Only then, after Maltoni's research, did the MCA's research coordinators argue that "serious consideration should be given to withdrawal from this [aerosol] market since value of the product was limited and potential for liability great".[49] One participant at the meeting stated the issue succinctly:

> If vinyl chloride proves to be hazardous to health, a producing company's liability to its employees is limited by various workmen's compensation laws. A company selling vinyl chloride as an aerosol propellant, however, has essentially unlimited liability to the entire U.S. population.[50]

Awareness of evidence of the dangers of chemicals to the broader public was becoming more widespread as reflected by actions on the part of the government. In May 1973, the Food and Drug Administration (FDA) suspended approval of the use of PVC bottles for packaging whiskey and wine. Because of the Delaney clause, the FDA, which had previously not regulated the use of vinyl chloride in food packaging, was forced to address the issue posed by the Viola studies and their indication of carcinogenic and other health effects.[51] In January 1973, the FDA obtained information that the Treasury Department's Bureau of Alcohol,

---

[46] Statement of Andrea Hricko and Bertram Cottine, Testimony at OSHA Hearings, "Official Report of Proceedings Before the Occupational Safety and Health Administration of the Department of Labor in the Matter of a Proposed Permanent Standard for Occupational Exposure to Vinyl Chloride, July 9, 1974 Washington, D.C. p. 1556.

[47] Dow Chemical Company, Midland, Michigan, "Evaluation of Vinyl Chloride as a Propellant for Aerosols," July 29, 1959, MCA Papers.

[48] L.B. Crider to W.E. McCormick, Goodrich Memo, "Some New Information on the Relative Toxicity of Vinyl Chloride Monomer," Mar. 24, 1969. MCA Papers.

[49] W.A. Knapp, Allied Chemical, to W.S. Ferguson, Memorandum, "Vinyl Chloride Monomer, Mar. 1, 1973, MCA Papers.

[50] R.N. Wheeler, Jr. to Eisenhour, et al., "Confidential," Feb. 13, 1973, MCA Papers.

[51] FDCA 409(c)(3) (A), 21 U.S.C. 348 (c)(3)(A) 1970.

Tobacco and Firearms, which had been testing liquor bottles since November 1968, had found that plastic bottles were leaching vinyl chloride monomer, creating an unpleasant taste in alcohol products. When the FDA followed up with more sophisticated tests, they confirmed that "vinyl chloride monomer migrates to alcohol in PVC bottles used to package distilled spirits and wine".[52] In the end, the FDA established a much more stringent safety standard for consumer food products than existed for the safety of workers in the factory or among community residents subjected to environmental pollution. The FDA's regulation placed the burden of proof on industry to show that food additives were non-carcinogenic. In the case of the workplace and in the case of toxins released into the ground, air, and water, industry was held to no such standard. Workers and neighborhood residents had to prove a substance dangerous. The FDA ultimately banned the use of vinyl chloride for liquor bottles because it knew "of no studies which establish a safe level of consumption when this monomer is leached from containers into alcoholic foods".[53]

The chemical industry's commitment to objective science and public access to information was tested in January 1973 when the National Institute for Occupational Safety and Health (NIOSH) published a "Request for Information" on the potential hazards of vinyl chloride in the *Federal Register*. NIOSH was preparing a document on the appropriate and safe exposure levels to vinyl chloride and sought information about the potential health hazards of this product from all quarters – scientists, corporations, public health officials, and others.[54] This request for information put tremendous pressure on the MCA members as they sought to develop a common position concerning the health risks of vinyl chloride. NIOSH was a relatively new government agency and its mandate to establish "Criteria Documents" that would guarantee a safe work environment meant that safety and health standards, previously a private matter for individual companies and their trade association, were now in the public sphere. Industry faced a serious dilemma over NIOSH's request for information. In order to maintain its influence with the agencies that regulated it, industry would need to comply with the request but would be providing NIOSH with information that would lead the agency to recommend regulations that were anathema to industry. In this context, Dow's vice-president, George J. Williams, believed that the information should be revealed to the government because

[52] Federal Register, v. 38, #95, May 17, 1973, Department of HEW, Food and Drug Administration, "Prior Sanctioned Poly Vinyl Chloride Resin," Notice of Proposed Rule Making, p. 12931.

[53] Federal Register, v. 38, #95, May 17, 1973, Department of HEW, Food and Drug Administration, "Prior Sanctioned Poly Vinyl Chloride Resin," Notice of Proposed Rule Making, p. 12931.

[54] RFI, *Federal Register*, Jan. 30, 1973.

it would be extremely damaging to the chemical industry reputation if someone should discover that we have this information and have not disclosed it to the government.[55]

The MCA, as an organization, even acknowledged that it had a "moral obligation not to withhold from the government significant information having occupational and environmental relevance", specifically Maltoni's new findings, in a detailed memo to all its management contacts on March 26, 1973. It also recognized that by taking the initiative in sharing information the MCA could forestall the embarrassment that would result if the information eventually became public and caused a scandal.[56]

But the MCA also recognized that the confidentiality agreement it had recently made with the Europeans inhibited any free interchange of scientific findings with government. This posed a moral and political dilemma for the industry. Would the American industry be willing to fulfill what they considered to be their moral obligation by revealing Maltoni's findings to the United States Government, even if it meant violating the trust between the American chemical companies and their European brethren?[57] Or would it keep vital information secret from the government and the public, and thus prevent public health authorities from having the information they needed to pursue a rational public policy?[58]

In the Spring of 1973, the MCA agreed on a plan that would both maintain their secrecy agreement with the Europeans while, at the same time, giving the appearance of responding to NIOSH's request for information. Rather than waiting for NIOSH to contact the organization, the MCA called to set up a meeting with Marcus Key, NIOSH's new administrator, whose role was to provide OSHA with state-of-the-art scientific information that could be used to establish regulations to insure safe and healthy working conditions.[59]

In May 1973, the MCA began to plan for its meeting with Key and the NIOSH staff, now scheduled for July. The pressure on the MCA was enormous because at that very moment OSHA was announcing emergency standards for fourteen other potential carcinogens, and industry had initiated a suit to forestall its implemen-

---

[55] G.J. Williams to C.A. Gerstacker, Dow, March 5, 1973. MCA Papers.

[56] George Best, MCA, to John D. Bryan, CONOCO, March 26, 1973, MCA Papers.

[57] George Best, MCA, to John D. Bryan, CONOCO, March 26, 1973, MCA Papers.

[58] In April 1973, Cesare Maltoni gave a paper at the Second International Cancer Conference in Bologna on occupational carcinogenesis, which, according to Sir Richard Doll, included information on the carcinogenic properties of vinyl chloride. Deposition of William Richard Shaboe Doll, January 26, 2000, London, England, in Carlin David Staples et al. vs. Dow Chemical, p. 27. The data seemed to have little impact on an audience that was not aware of the significance of the information that low-level exposures could cause cancer. Surprisingly, with the exception of Sir Richard Doll, it appears that no one remembers hearing this information. One American, representing the National Cancer Institute, does not recall that the information was presented to the meeting. Indeed, at the time, the MCA never remarked on the incident and subsequent events indicate that they believed that the information was still secret in the United States. Testimony of Cesare Maltoni, 1999, Venice, Italy, Tape 1067, p. 2, Transcript courtesy of Judith Helfand. Doll Deposition, 1999, Scafiati Deposition, 1999.

[59] R.E. Sourwine to W.P. Lawrence, PPG, Confidential,, March 30, 1973; Vinyl Chloride Research Coordinators, Minutes of Meeting, April 4, 1973, MCA Papers.

tation.[60] From the first, its Task Group on Vinyl Chloride Research and the Vinyl Chloride Research Coordinators were aware that

> a significant element for consideration […] was the development of an alternate presentation in the event that the release of European data cannot be negotiated with reasonable dispatch.[61]

The MCA lawyers briefed the members "on their responsibilities and obligation under the confidentiality agreements…". The lawyers' "admonishments" were that the American companies "should not volunteer reference to the European project or substantive data derived therefrom", but if asked a direct question, they should answer it.[62] Given that the European experiments were not known to NIOSH, there was little danger that a question could be formed that required such an answer. They also decided that the MCA Research Group would not volunteer information regarding "potential hazards" that involved consumer safety since NIOSH was "concerned with employee health matters" alone.[63] It appears that all references to consumer safety issues, particularly aerosol propellants, were removed "at the insistence of UCC [Union Carbide] and Allied [Chemical] because it was not 'a worker-exposure problem except for beauticians and can-fillers'".[64] As Robert Wheeler of Union Carbide explained:

> Hazard to UCC's interests exists if vinyl chloride is declared to be a carcinogen or if vinyl chloride monomer is detected by FDA in food exposed to vinyl chloride monomers as film, coatings, or gasketing.[65]

Perhaps most troubling to the MCA representatives was the realization that the March 26th MCA letter "to Company Contacts" which acknowledged "a moral obligation" to inform NIOSH about Maltoni's studies was a legal minefield. They feared the letter could be interpreted to indicate that the industry was planning to mislead the Government. According to Wheeler, the memo "could be construed as evidence of an illegal conspiracy by industry if the information were not made public or at least made available to the government".[66]

The industry was not only concerned about Maltoni's results leaking out. They also planned not to tell NIOSH about their own information that indicated that the threshold limit should be reduced well below the 500 ppm recommended in the Material Chemical Safety Data Sheet, and even below the 200 ppm level recommended by the American Conference of Governmental Industrial Hygienists. At the meeting the MCA decided to remove references to Dow's recommendation that the TLV be reduced to 50 ppm for fear that the government would reduce the TLV even further.[67]

---

[60] "Industry's Latest Cancer Scare", *Business Week*, February 23, 1974, p. 100.
[61] MCA, Vinyl Chloride Research Coordinators, Minutes of Meeting, May 21, 1973, MCA Papers.
[62] MCA, Vinyl Chloride Research Coordinators, Minutes of Meeting, May 21, 1973, MCA Papers.
[63] MCA, Vinyl Chloride Research Coordinators, Minutes of Meeting, May 21, 1973, MCA Papers.
[64] R.N. Wheeler to Eisenhour et al., May 31, 1973, MCA Papers.
[65] R.N. Wheeler to Eisenhour et al, May 31, 1973, MCA Papers.
[66] R.N. Wheeler to Eisenhour et al, May 31, 1973, MCA Papers.
[67] R.N. Wheeler to Eisenhour et al, May 31, 1973, MCA Papers.

The policy to keep quiet about Maltoni's studies influenced the plastics industry's public statements as well as their private preparations for the NIOSH meeting. As these preparations were in progress, *Modern Plastics*, the industry trade magazine, published an article about the potential problems that industry could face from NIOSH's program to develop new criteria for testing the dangers posed to workers by various chemicals. In a long review of potential problems for the chemical industry, the article noted that vinyl chloride monomer had come under new scrutiny as a result of "recent animal studies conducted in Italy (at an elevated exposure level of 30,000 ppm)" that had led the MCA to study VCM's "potential hazards". Nowhere in the article is there reference to Maltoni's discoveries of angiosarcomas in animals at 250 ppm ("What's next…" 1973, p. 56).

Throughout the early summer of 1973, the Americans continued to meet among themselves and with the Europeans to plan the presentation to NIOSH, scheduled for July 17th. On June 15, 1973, the Europeans met and "agreed that the MCA would be given permission to reveal to NIOSH data arising from the Bologna study". But, three weeks later, Montedison, the Italian producer of vinyl chloride, let its European counterparts know that this was unacceptable.[68] Dr. David P. Duffield of Imperial Chemical Industries (ICI) came to the United States to inform the American producers that the Europeans decided to keep the information secret. Whatever moral qualms some of the American vinyl producers had had, evaporated. The Europeans and Americans decided on a much more pragmatic plan for protecting the industry. They would "comply" with NIOSH's request for information but do so in a way that was less than thorough and diverted attention from the seriousness of what was known. If pressed by the NIOSH people, they should "acknowledge Maltoni's data" but point out that "Maltoni had done his work only with rats, whereas [future research by] the MCA […] calls for mice and hamsters as well". The American chemical industry planned to provide NIOSH only with information about what they were finding in their own animal and epidemiological studies "in very general terms without leaving any written information".[69] The goal of the meeting was to make sure that the agency would "take no precipitous action now". Furthermore, "We should recommend no shift in priorities" and at the meeting "our people [should] get off the topic of animal work as quickly as possible".[70]

The July 17th meeting took place at 1 p.m. at the NIOSH offices in Rockville, Maryland. Five industry representatives met across the table from five government scientists. Dr. V.K. Rowe of Dow, Dr. William E. Rinehart, of Ethyl, Robert N. Wheeler of Union Carbide, and George E. Best of the MCA represented the US industry. Dr. David P. Duffield of ICI represented the Europeans. (Dr. Tiziano Garlanda of Montedison, the Italian vinyl producer, was unable to attend.) Dr. Marcus M. Key, the Director of NIOSH, and members of his staff, Dr. Keith

[68] D.P. Duffield, "Vinyl Chloride Toxicity – Meetings Held at MCA Headquarters, Washington, D.C. and National Institute of Occupational Safety and Health, Rockville, Maryland, on 16th and 17 July 1973," July 20, 1973. MCA Papers.

[69] Kusnets, Shell, to Files, "Private and Confidential," July 17, 1973, MCA Papers.

[70] Kusnets, Shell, to Files, "Private and Confidential," July 17, 1973, MCA Papers.

Jacobson, Richard B. James, Dr. Donald Lassiter and Dr. Frank Mitchell represented the US government. The meeting was polite, collegial, and seemingly open. The American and European vinyl producers presented an apparently complete and forthright description of the industry and any potential problems. In fact, only the industry knew how skewed, deceptive and distorted the presentation was. Dr. Rowe made the formal presentation, speaking from pencilled notes. He began by emphasizing the size and scope of the vinyl chloride industry and described the industry's efforts to address the health concerns about acroosteolysis and cancer. Dr. Duffield went on to describe the "exhaustive" studies of vinyl chloride and polyvinyl chloride workers at ICI's European plants that revealed no "indication of hazard". He also described Dr. Viola's published research that had identified cancers in the rat's zymbal gland – a gland that did not exist in humans – and in the lung; he reassured NIOSH that "none of the observed lung tumors were primary tumors". He also referred to other on-going research that confirmed Viola's studies while pointing out that "the program is still in progress and no firm conclusions [were] yet drawn". No mention was specifically made of Maltoni and no mention was made of kidney or liver cancers. According to the MCA, when NIOSH's Lassiter asked about the lowest concentration at which tumors had been observed, Duffield answered that nothing had been found below 250 ppm.[71] According to the notes taken by NIOSH's Richard James, however, although the industry told of Viola finding cancers at 30,000 ppm, there was no mention of tumors at 250 ppm.[72]

Of special note was a question raised by Dr. Jacobson of NIOSH. Jacobson had received a phone call asking him why it seemed so hard "to purchase vinyl chloride for use as an aerosol propellant". Avoiding any indication that concerns about liability from its use in consumer products like hair sprays had led to its removal, Dr. Rowe of Dow and Dr. Rinehart of the Ethyl Corporation simply stated they were "no longer selling it for this purpose". They implied that the use of VCM in aerosol cans was not very important because it had "been used in this way only in relatively small quantities in paint and lacquer spray cans" and that it was likely to be "discontinued altogether by the end of the year".[73] In truth, however, vinyl chloride was used much more widely. At least 3.5 million cans of aerosol products, including drugs, pesticides and cosmetics "containing VC [were] in the possession of manufacturers, distributors, and consumers' in January, 1974".[74]

---

[71] "Notes on Meeting Between Representatives of MCA Technical Task Group on Vinyl Chloride Research and NIOSH," July 17, 1973, and R.N. Wheeler to Carvajal, et al., July 19, 1973, MCA Papers.

[72] Richard B. James, untitled notes of NIOSH-MCA Meeting [July 17, 1973], in possession of Peter Infante. Keith Jacobsen's handwritten notes also do not mention cancers at 250 ppm. See Keith Jacobsen, handwritten notes, 7-17-[73], in possession of Peter Infante.

[73] "Notes on Meeting Between Representatives of MCA Technical Task Group on Vinyl Chloride Research and NIOSH," July 17, 1973, and R.N. Wheeler to Carvajal, et al., July 19, 1973, MCA Papers.

[74] Doniger 1979, p. 103. Doniger's analysis of the vinyl chloride story was published in 1978 and is revealing as a primary source of information not only because of its legislative and administrative history, but also because it reflects the state of understanding of the crisis among

Although the manufacturers did not admit it to NIOSH, they understood that the potential liability problem was truly immense. True to their earlier plan, the companies left little other than previously published or reported materials: a single sheet summary of the vinyl industry; the single sheet ACGIH TLV report; the MCA's Material Safety Data Sheet for vinyl chloride (an 18-page booklet); the condensed protocols for the MCA's animal and epidemiological studies; and the MCA's news releases on these studies.[75]

At the close of the meeting, Dr. Rowe went off to a separate office and spoke with Marcus Key. According to Wheeler, "this private discussion of the carcinogen problem was worth the whole effort".[76] NIOSH asked "to be kept fully appraised of the on-going work both the US and the European industries have in progress" believing that they had been brought up to date on the status of knowledge up to that point.[77]

At the end of the day, the MCA and its various companies were ecstatic about the meeting and reported that "the chances of precipitous action by NIOSH on vinyl chloride were materially lessened".[78] The word that spread to member companies whose representatives had not attended the meeting was that "no problems were encountered" and the "presentation was well received and appreciated".[79] Leaving the government with the impression that the companies were on top of the issue and that research up to that point had not indicated any serious problem with cancers among workers, the industry had accomplished its most difficult objective. It had appeared forthcoming and responsible to NIOSH officials without violating the agreement of secrecy with their European counterparts regarding the Maltoni studies. The industry had avoided the issue of environmental danger in consumer products, remained silent on the primary liver and kidney cancers observed in the European experiments, and not mentioned the industry's own concern that the 200 ppm threshold value for vinyl chloride exposure was not adequate, while raising questions about the significance and even the integrity of Viola's work and reassuring NIOSH that there was no indication of danger to workers. In short, the industry had managed to completely pull the wool over the eyes of NIOSH regarding the dangers to workers and consumers alike from vinyl chloride.

Almost immediately following the meeting, however, the industry's position that vinyl chloride was safe began to erode. Newspapers in Europe, and later in the United States, spoke of a very different reality. An article published in an

---

informed persons of the time. Not having access to the MCA's records, Doniger incorrectly asserts that "there is no evidence that any company's cessation of VC use before the Goodrich disclosure in January 1974 was motivated by insider's information about the cancer hazard" p. 103, footnote 551.

[75] "Notes on Meeting Between Representatives of MCA Technical Task Group on Vinyl Chloride Research and NIOSH," July 17, 1973, MCA Papers.

[76] R.N. Wheeler to Carvajal, et al., July 19, 1973, MCA Papers.

[77] Flynt Kennedy (Conoco) to R.W.G., et al., "VCM," July 19, 1973, MCA Papers.

[78] R.N. Wheeler to Carvajal, et al, July 19, 1973, MCA Papers.

[79] Flynt Kennedy (Conoco) to R.W.G., et al., "VCM," July 19, 1973; George Best to Management Contacts of Companies, July 20, 1973. MCA Papers.

Italian newspaper quoted Dr. Caputo, one of Dr. Viola's collaborators in the original cancer studies, as saying that vinyl chloride was responsible for the recent concerns among some 40,000 workers in European vinyl chloride plants. Caputo said that dozens of workers had already died as a result of exposure and that it was potentially a huge environmental as well as occupational hazard. Responding to the view that "only" 40,000 workers were at a small risk of developing disease, Caputo had replied that "the menace applies to everybody […] and [is] particularly hazardous in containers for foodstuffs […] in filters for artificial kidneys, in cardiac valves". The MCA translated the article and circulated it to its Task Force on Vinyl Chloride as a way to alert the industry to the fact that information about the dangers of vinyl was leaking out.[80]

Around this time the MCA, recognizing that the issues of occupational and environmental cancers were not going away and that it was only a matter of time before events might occur which could threaten the industry's careful management of the problem, wrote to its member companies that a greater level of coordination of the entire industry, both American and European, was necessary.[81]

"Plastic Coffin"

In January 1974, the nation learned that vinyl chloride monomer, an essential gas used in the production of polyvinyl chloride, had been implicated in the deaths of four workers. A rare cancer, angiosarcoma of the liver, had struck down the workers at the B.F. Goodrich plant in Louisville, Kentucky. Throughout the nation, newspapers reported that polyvinyl chloride, a seemingly benign and inexpensive replacement for wood, metal, and even wax paper in the homes and workplaces of millions of Americans, was now a possible deadly threat. Joe Klein, writing on the discovery of angiosarcoma in *Rolling Stone*, called the PVC plant a "Plastic Coffin" (Klein 1976).

Dr. John Creech, who was still doing exams at the plant where he first identified acroosteolysis, had reported his concern over employee liver problems to Dr. Maurice Johnson, Goodrich's Director of Environmental Health.[82] After reviewing plant records, Creech discovered that four workers had died from angiosarcoma of the liver, among the rarest of cancers, a disease previously associated with heavy metal poisoning and arsenic. Usually accounting for fewer than two dozen deaths in the entire United States in any given year, the occurrence of four deaths from angiosarcoma of the liver in a population of less than a few hundred workers at one plastics plant was truly alarming. These deaths were especially worrisome because this rare cancer was "identical to that seen in the European rat feeding studies" conducted by Maltoni, something that the industry

[80] MCA to Technical Task Force on Vinyl Chloride Research, [translated by Dow], Sept. 26, 1973, MCA Papers.

[81] Albert C. Clark, Vice President, Technical Director, MCA, to the Management Contacts of Companies Sponsoring the [Blacked-out] , Confidential, December 7, 1973, MCA Papers.

[82] J.T. Barr, Air Products and Chemicals, Inc., to T. L. Carey, Interoffice Memo, Jan. 29, 1974, MCA Papers.

had failed to let NIOSH, or even Dr. Creech, know about. Dr. Creech and Dr. Johnson met with Dr. Tabershaw of Tabershaw Cooper Associates, then in the midst of an epidemiological study of vinyl workers for the MCA.[83] The information that Creech had revealed was terrifying to Goodrich's management. On a Sunday afternoon, top executives met in Akron in what was described as "absolutely [a] crisis". All day lawyers, management, and physicians discussed the vast implications of the medical findings, including the company's liability. Finally, at 7 PM, President Thomas of Goodrich decided that the only thing to do was to let the information out immediately (Blackford & Kerr 1996, p. 333). According to a private memo by another company's official, "At the insistence of Dr. Creech, [they] decided to reveal the information [about the angiosarcoma deaths] to the authorities and the industry".[84] On January 22, Goodrich informed NIOSH of the deaths, and NIOSH then informed OSHA.[85] In all, Creech and his associates documented eleven cases of hepatic disease, including seven cases of angiosarcoma of the liver identified among the men employed at the plant, with the earliest diagnosis dating to almost ten years earlier, in April, 1964.[86] Four of the workers died between 1968 and 1973, the very period when the decision to mislead the government was taking shape.[87] All the victims had been "pot cleaners" in their careers at Goodrich. Pot cleaners climbed into tanks no more than six feet across and ten feet high "to chip polymer residue off the inside surfaces. Their only source of fresh air was a 2-foot opening at the very top of the deep tanks" (Schanche 1974, p. 19).

The industry responded to the crisis by preparing "a low key statement for the press", to be released if pressed, and drafting a letter to Marcus Key of NIOSH "reaffirming industry support and cooperation as offered in the meeting with NIOSH last summer". [88] Initially, the reaction of Goodrich was to report that their practices at the Louisville plant were unexceptional and that the air in the plant and, hence, the exposures to vinyl chloride, were "generally 15-20 ppm with excursions above 50 ppm", levels well below the existing TLV.[89] Later this estimate would change dramatically.

---

[83] J.T. Barr, Air Products and Chemicals, Inc., to T. L. Carey, Interoffice Memo, Jan.29, 1974, MCA Papers.

[84] J.T. Barr, Air Products and Chemicals, Inc., to T. L. Carey, Interoffice Memo, Jan.29, 1974, MCA Papers.

[85] MCA, "Meeting of Technical Task Group on Vinyl Chloride Research," Jan. 25, 1974, MCA Papers.

[86] Falk, Creech et al., "Hepatic Disease Among Workers at a Vinyl Chloride Polymerization Plant," *JAMA*, Oct. 7, 1974. vol. 230, 59-63.

[87] "B.F. Goodrich (Louisville) [Seven Cases of Angiosarcomas]," n.d. Vinyl Chloride Docket, H-036, Ex. 189F, Dept. of Labor Docket Office, Washington, D.C.

[88] MCA, "Meeting of Technical Task Group on Vinyl Chloride Research," Jan. 25, 1974; George Best to Marcus Key, January 25, 1974, MCA Papers.

[89] Flynt Kennedy to Gamblin, Smith and Tillson, Jan, 31, 1974, MCA Papers. See also, "Angiosarcoma of the Liver among Polyvinyl Chloride Workers – Kentucky," Center for Disease Control, *Morbidity and Mortality Weekly Report for Week Ending February 9, 1974,* 23 (February 15, 1974), p. 49.

But within three weeks, the vinyl chloride producers gathered together in Cleveland under the auspices of the Vinyl Chloride Safety Association to assess the problems facing the industry.[90] According to Goodrich's officials, other chemical companies were not pleased with the company's decision to reveal the information to NIOSH. One official recalled that "Goodrich was not a hero in the chemical industry" and was "given a fair amount of harassment".[91] The companies discussed means to limit the amount of VCM workers were exposed to and to more closely monitor VCM levels in the air of its plants.[92]

It would not be until months later that the hint of scandal and cover-up would be raised. Six months later, government officials came forward with information that they had been deceived by the industry in its meetings the previous July. NIOSH Director, Marcus Key, reported that he had personally been misled by the MCA at the critical July 1973 meeting set up by industry to appear compliant with NIOSH's request for information. The MCA had led him to believe that the only information it possessed regarding cancer was that derived from the Viola studies which indicated that tumors were only "induced at very high levels of vinyl chloride" and primarily affected "the Zymbal gland", which did not exist in humans.

> At this meeting, [Key asserted] there was no mention of angiosarcoma of the liver in humans or animals, no reference to production of liver tumors in animals by another Italian investigators and no reference to Professor Cesare Maltoni by name.[93]

Industry knew that Key's statement could mean that the industry would lose any influence it had in the developing controversy over the angiosarcoma deaths. The statement implicitly accused the MCA of having conspired a year earlier to deny critical information regarding vinyl's toxicity to NIOSH, the federal agency responsible for establishing safe work practices. Although members of the vinyl industry wanted to refute and argue with Key about the meeting, they feared such a debate would bring attention to the issue. They decided to avoid a fight and hope it would just go away. A.W. Barnes of ICI was explicit in not wanting "any more public commotion over this…".[94]

But NIOSH officials were unwilling to let the matter drop, for with the Watergate scandals and the impeachment hearings of Richard Nixon playing out in the background, the public was more than ready to see corruption and scandal at every level of government. According to J. William Lloyd, NIOSH's Director of Occupational Health Surveillance and Biometrics, there was a pervasive "questioning [of] the integrity of our public officials and scientists who are deeply

---

[90] R.E. Laramy to Flynt Kennedy, "Subject: Trip to Attend Meeting of the Vinyl Chloride Safety Association," Feb. 11, 1974, MCA Papers.
[91] Quoted in Blackford & Kerr 1996, p. 333.
[92] R.E. Laramy to Flynt Kennedy, "Subject: Trip to Attend Meeting of the Vinyl Chloride Safety Association," Feb. 11, 1974, MCA Papers.
[93] Marcus Key, Letter to ed. of *Chemical And Engineering News*, June 10, 1974.
[94] J.T. Barr, Air Products to R. Fleming, Air products. July 16, 1974, MCA Papers.

dedicated to protecting the health of the worker". Lloyd believed that industry took advantage of the public's heightened skepticism about government to attempt to deflect attention from themselves by circulating rumors that government officials had kept secrets. In an angry letter to A.W. Barnes of ICI, Lloyd accused the chemical industry of misstating the facts regarding the meeting with NIOSH on July 17, 1973. He was particularly irked that the British chemical trade association maintained in a press release that "American industry and government (NIOSH) were told" of Maltoni's work. He argued that

> as best as I could determine no representative of NIOSH was ever made aware of these findings prior to January 22, 1974, and even on that date, they were transmitted with the stipulation that they be kept confidential.

He believed that the British chemical industry release had been "intentionally misleading since it was at variance with the facts as I knew them". Further, he believed that the MCA was also trying to avoid responsibility by releasing a "chronology of events that also inferred that NIOSH had been given the same information". He was, "to say the least, very upset", and when asked by a British television interviewer his "reaction to the [British] statement that NIOSH had been informed", he responded "I would characterize those making such statements as 'damn liars'".[95]

Because of continuing pressure from Key and Lloyd, Barnes finally responded privately to Dr. Lloyd with a long, convoluted argument. He acknowledged that the industry had not revealed the critical information from the Maltoni studies, but insisted it had acted in good faith. He asserted that the British had gone to the NIOSH meeting fully intending to reveal any information they had about Maltoni's studies, but since NIOSH had not asked about the studies, they assumed that NIOSH was not interested. Barnes maintained that Duffield, the European representative at the meeting,

---

[95] J. William Lloyd to A.W. Barnes, July 19, 1974, in possession of Peter Infante. In August, appearing before the Senate subcommittee on the environment, in a hearing about the "dangers of vinyl chloride," Key reiterated his charges of deception and laid out the fateful consequence of the industry's actions. "I would like to reemphasize that no information about liver cancers was given," he maintained. "If there had been, I think we would have taken an entirely different course of action in view of the widespread use of this material." Despite NIOSH's call in the Federal Register "for information on potential hazards associated with occupational exposure to vinyl chloride […] from its 1972 Priority List" for "developing criteria documents," the industry had misled him and his agency. See: Marcus Key, in U.S. Congress, Senate, Committee on Commerce, Sub-Committee on the Environment, *Hearing on Dangers of Vinyl Chloride,* U.S. Senate, 93rd Cong. 2nd Sess. Aug. 21, 1974, Serial No. 93–110, Washington: GPO, 1974, p. 40. Privately, the industry acknowledged the truthfulness of Key's statement, while trying to qualify the fabrication it had promoted. "It is certain that the MCA group plus Dr. Duffield of ICI informed NIOSH that Maltoni had observed tumors at 250 ppm without specifying that they were angiosarcomas of the liver." See: Zeb Bell to R.E. Widing, PPG Inter-Office Correspondence, August 26, 1974, MCA Papers.

was a guest at a formal meeting between NIOSH and MCA and, as such, it would have been improper to force the meeting into detailed discussions which it appeared not to want.[96]

Barnes rejected Lloyd's assertion that anybody had knowingly misled the US government and insisted it was all a big misunderstanding. Barnes asserted that the Europeans had "attempted to get the right actions taken throughout Europe and the USA as soon as the possible significance of Maltoni's findings were appreciated",[97] although he offered no explanation of what the Europeans had done to accomplish this. Whatever his intent in sending this response to Lloyd, Barnes' letter was an admission that the vinyl industry had failed to mention at the meeting with NIOSH what it knew from Maltoni's studies – that primary angiosarcomas and other tumors had been caused by vinyl chloride.

The story of vinyl chloride is a cautionary tale of industry's duplicity and manipulation. It shows that only after the issue had become national news did the industry act to protect workers by reducing their exposure to vinyl chloride monomer. At last the story is out. But it is unfortunate that it took almost thirty years for the true dimensions of its history to emerge.

References

Blackford M.G. & Kerr K.A. (1996) *B.F. Goodrich: Tradition and Transformation, 1870–1995*. Columbus: Ohio State University Press.

Chemical Field Expands Vastly (1956) *NY Times*. Jan. 5:90.

Commoner B. (1977) "The Promise and Peril of Petrochemicals" *NY Times Magazine,* Sept. 25:70.

Doniger D.D. (1979) *The Law and Policy of Toxic Substances Control: A Case Study of Vinyl Chloride*. Baltimore: Johns Hopkins University Press.

Kent J. (1954) "Plastics in Your Future" *Science Digest,* (Feb.):53.

Klein J. (1976) "The Plastic Coffin of Charlie Arthur" *Rolling Stone,* (January 15).

Mehlman M.A. (2001) "In Memoriam: Professor Cesare Maltoni (1930–2001)" *Environmental Health Perspectives,* 109 (May):A201.

Schanche D.A. (1974) "Vinyl Chloride: Time Bomb on the Production Line" *Today's Health,* (September): 19.

Spitz P. (1989) "The Rise of Petrochemicals" *Chemical Week,* 151 (Aug. 2):24.

Thornton J. (2000) *Pandora's Poison: Chlorine, Health and a New Environmental Strategy*. Cambridge: MIT Press.

Torkelson T.R., Oyen F. & Rowe V.K. (1961) "The Toxicity of Vinyl Chloride as Determined by Repeated Exposure of Laboratory Animals" *American Industrial Hygiene Association Journal,* 22:354–361.

What's Next from OSHA? Keep and Eye on NIOSH (1973) *Modern Plastics,* (June):56.

Wilson R., McCormick W. et al. (1967) "Occupational Acroosteolysis" *JAMA*, 201(Aug. 21):577–581.

Viola P., Bigotti A. & Caputo A. (1971) "Oncogenic Response of Rats, Skin, Lungs, and Bones to Vinyl Chloride" *Cancer Research,* 31(May):516–522.

[96] A. W. Barnes to J. W. Lloyd, 9 October 1974, in possession of Peter Infante.
[97] A. W. Barnes to J. W. Lloyd, 9 October 1974, in possession of Peter Infante.

8: The Identification and Regulation of Asbestos as a Hazard of Insulation Work in the USA

Peter Bartrip, Centre for Socio-Legal Studies, Wolfson College, Oxford, UK

In recent years, a number of myths have held center stage in the history of occupational health in the asbestos industry. For example, some observers have suggested that the danger of asbestos was obvious even before the material came into widespread use (Kotelchuk 1987; Castleman 1996). It has also been claimed that obvious hazards were ignored because industry sought commercial success heedless of the cost to workers' health. Business was allegedly aided in this endeavor by unscrupulous doctors and incompetent, if not callous, regulators and politicians (Greenberg 1994). Furthermore, such were the profits to be derived from asbestos that the industry supposedly could not be bothered to develop substitutes even though it was well aware of the havoc wrought by its raw material (Jeremy 1995). Without claiming that all companies and individuals behaved impeccably at all times, this chapter maintains that the version of history outlined above deserves to be regarded as little more than a caricature. Although this argument cannot be fully developed and documented in the space available here, it is one of the main themes of this chapter. The other is to demonstrate that the USA, though often considered slow to introduce occupational health reform, was actually a trailblazer in some areas.

In order to provide an international context for American developments, the chapter begins by summarizing the history of asbestos-related disease and its regulation in the United Kingdom. First, though: what is asbestos? Such is the extent to which the material has been demonized that it might be thought that it could only be a product of the laboratory. In fact, although it exists in several different forms, all are naturally occurring minerals. These minerals possess many unique properties, including resistance to water, heat, fire, corrosives and electricity. They can be spun into thread and woven into cloth. Above all, asbestos is a superb insulator, fire retardant and ingredient of many automobile components, including brake linings. Consequently, for much of the twentieth century it was a highly useful, not to say indispensable, material that found its way into literally hundreds of different products. Consumption rose accordingly including in the USA (Table 8.1).

Table 8. 1. Raw Asbestos Consumed in the USA (short tons, ten-year intervals) 1919–79.

Year	Consumption
1919	139,312
1929	264,873
1939	255,547
1949	532,708
1959	754,045
1969	784,321
1979	560,600

Source: US Department of Commerce. Bureau of Mines Minerals Yearbooks.

Although repeated suggestions have been made that the ancient Romans knew about the danger of asbestos, such suggestions have been shown to be fanciful (Browne & Murray 1990). In reality, the first suspicion that asbestos dust might be hazardous to the health of workers in asbestos factories arose in a few reports of the British factory inspectorate in the late nineteenth and early twentieth centuries. Subsequent inquiries failed to substantiate these suspicions. As a result, it was only in the mid-1920s, with the publication of a handful of articles in the medical press and the occurrence of several fatalities that the possibility of an occupational health problem for asbestos factory workers was seriously entertained (Bartrip 2001). In 1928–29, an inquiry undertaken by two British factory inspectors found that exposure to high concentrations of asbestos dust over a protracted period could produce a fatal form of pulmonary fibrosis known as "asbestosis." One of these inspectors, Charles Price, proposed a range of engineering solutions to prevent such exposure. After consulting asbestos manufacturers and the Trades Union Congress, the British government enacted the Asbestos Industry Regulations in 1931. These regulations, which remained in effect until 1970, sought to ensure that workers deemed to be at risk, that is, asbestos factory workers whose employment regularly brought them into contact with high dust concentrations, were safeguarded (Bartrip 1998). Some observers have alleged both that these regulations were introduced after protracted delay and that they were almost worthless because manufacturing interests unduly influenced them (Wikeley 1992; Greenberg 1994).

In fact, for many years it appeared that the 1931 Regulations had effectively "solved" the asbestosis problem in Britain. In 1955 Donald Hunter, one of the leading figures in occupational medicine in the second half of the twentieth century, wrote that the 1931 Regulations had "been effective in controlling" asbestosis (Hunter 1955). In the same year, the medical statistician, Richard Doll (now Sir Richard), wrote of the "infrequency" of asbestosis and of the "great reduction in the amount of dust in asbestos works" since the regulations were implemented (Doll 1955). Also in 1955, Georgiana Bonser et al. pointed to the impact of the 1931 Regulations and recorded their expectation that severe cases of asbestosis, and perhaps associated cancers, would cease to occur (Bonser et al. 1955).

The year 1955 was significant in the history of asbestos related-disease, because it was then that Doll established that a second disease, lung cancer, could be a consequence of asbestosis (Doll 1955). Although there had been suggestions of a causal link between lung cancer and asbestosis before this date, Doll's study provided confirmation. This was alarming, for it now appeared that not one but two diseases were associated with asbestos work. However, Doll's paper was also reassuring for it pointed out that in the asbestos factory studied it was "clear […] that the incidences both of asbestosis *and lung cancer* [author's emphasis] have become progressively less" since introduction of the 1931 Regulations. Doll thought this especially significant given the huge growth in lung cancer rates in the general population in the course of the twentieth century (Doll 1955).

In the late 1950s and the 1960s, two new variables entered the asbestos/health equation. First, it began to appear that the population at risk included not only people who worked in dusty occupations in asbestos factories but other workers, including those who did not work in factories at all, for example, shipyard workers (Selikoff et al. 1964; McVittie 1965–6). Although there had previously been isolated suggestions that such workers might be at risk, only towards the end of the 1950s did the evidence begin to look persuasive. Then, in the 1960s it was shown that even members of the public who lived close to asbestos factories faced an excess risk of incurring an asbestos-related disease (Newhouse et al. 1965). Therefore, it became clear that the 1931 Regulations did not go far enough.

This brings us to the second of our new variables, for in the 1960s it was also established that asbestos dust was causally linked to a third disease, mesothelioma, a cancer of the pleura or peritoneum (Bartrip 2001). Painful and always fatal, mesothelioma may be associated with brief and light exposure to asbestos dust.

Because of these developments, the British government set about revising the 1931 Regulations with a view to protecting all workers – principally by seeking to reduce dust exposure to safe levels. Although one scientist described the resulting Asbestos Regulations, 1969 as "the strictest in the world", asbestos regulation was extended in the 1980s and 1990s – partly in response to media pressure. By the end of 1999 virtually all remaining uses of asbestos had been banned in Britain (Bartrip 2001).

In Britain, central government regulation of occupational health and safety goes back at least as far as the first half of the nineteenth century. This long tradition contrasts with US experience. Before the passage of the Occupational Safety and Health Act in 1970, "American occupational safety and health policy […] emphasized voluntary action" (Noble 1986). Employers set standards and workers participated, if at all, by engaging in collective bargaining, taking industrial action or changing jobs. The role of labor unions was minimal. Some states intervened in matters of industrial safety as early as the nineteenth century, but "[c]overage was uneven" and "comparatively primitive." In these circumstances reliance was placed on an "insurance system [that] was supposed to create incentives for employers to prevent hazards and provide injured employees with financial compensation". It is now widely agreed that this system did not "function as intended." Anyway, in all of this, little emphasis was placed upon health, as opposed to safety (Page et al. 1973; Ashford 1976; Noble 1986; Aldrich 1997).

With some exceptions, the federal government's pre-1970 role was modest. In the 1930s, under Roosevelt's New Deal, the Bureau of Labor Standards was established to promote health and safety at work. The 1935 Social Security Act provided the Public Health Service with funds to allocate to states and cities for research and other purposes. The one example of federal regulation was the 1936 Walsh-Healey Act. Though mainly concerned with wage rates, this act specified that materials and equipment supplied for the performance of government contracts valued at over $10,000 were not to be manufactured under unsanitary or

hazardous working conditions. Dust standards were even promulgated under the Act in 1942 (Berman 1978; Corn 1988; Rosner et al. 1989). Then, in January 1943 the federal government established a set of *Minimum Requirements for Health and Safety* for civilian workers in naval and maritime shipyards. Although these requirements ended soon after the Second World War, they are important as the first major attempt by the federal government to improve occupational health and safety for a mass workforce (*Minimum Requirements* 1943).

Among other things, the Minimum Requirements addressed the question of asbestosis among insulators. The Requirements did not emphasize asbestos hazards; they placed far more stress on accidents and such dangers as welding. But they were the first regulations anywhere in the world that sought to protect workers not employed in an asbestos factory from contracting asbestosis. Before their enactment little concern had been expressed anywhere that insulation workers might be at risk of contracting asbestosis. So, why did this code include measures to protect such employees? The answer is provided by America's involvement in the Second World War.

America's war effort entailed unparalleled expansion in naval construction and an expectation that "new problems in industrial hygiene" would emerge due to the employment in dangerous trades of a vast and inexperienced workforce of some 1.75 million people or more. In some yards, 90 per cent of the workers had no shipbuilding experience; many were women who had never before worked outside the home (Drinker 1943; Selikoff et al. 1979; Corn 1992). The war also involved an enormous expansion in asbestos use – especially following the loss of the aircraft carrier *Lexington*, when it caught fire in the Battle of the Coral Sea in 1942. Efforts to improve industrial hygiene in the shipyards by means of the Minimum Requirements were motivated partly by humanitarian concern and partly by a desire to protect "human capital" at a time of national crisis.

In 1942, a hygiene survey of shipyards uncovered a number of potential health, welfare and safety problems including, in a very few cases, concerns about asbestos (Drinker 1943). Following this survey, the Maritime Commission and US Navy convened a conference in Chicago. This was attended by union officials, shipyard owners, medical experts from universities, and navy specialists (Stenographer's minutes 1942). The conference resulted in unanimous agreement on minimum requirements of health and safety for shipyards holding government contracts. One union representative termed these requirements "the finest things I ever read" (Official Transaction 1944).

A few of the Requirements focused upon asbestos. It was agreed that jobs involving use of asbestos could "be done safely" provided three precautions were observed. These suggestions included the "segregation of dusty work"; local exhaust ventilation or the wearing of respirators; and periodic medical examination. Assistance in applying the Requirements was provided by safety and medical consultants who inspected shipyards. These inspections generated hundreds of reports, most of which have been preserved in the US National Archives (*Minimum Requirements* 1943).

The reports placed little emphasis on asbestos. In a few instances potentially hazardous conditions and even a few cases of asbestosis were discovered. Although these discoveries were thought to provide "no cause for alarm," four of the consultants carried out a study towards the end of the war to ascertain whether shipyard insulation work involved an asbestosis risk. The resultant paper, published in 1946, was the first epidemiological study anywhere in the world into asbestos-related disease in a non-manufacturing context. Its main finding was that insulation work in the shipyards surveyed was safe, provided that workers did not stay in the same job for too long and provided those exposed to heavy concentrations (even comparatively briefly) were protected by exhaust ventilation and respirators (Fleischer et al. 1946). Only in the 1960s did it become clear that these conclusions were over-optimistic.

During the 1950s, with the exception of a handful of references worldwide, the published medical literature remained largely silent about asbestosis among people not employed in asbestos manufacture. It is likely that this silence reflected a continuing consensus that the disease was rare and associated only with lengthy exposure to high levels of dust. As late as 1968 a British medical inspector of factories observed not only that asbestosis was "not a common disease," but that it was usually associated with workers who had been "substantially exposed" (Doig 1968). If asbestos-related disease was caused by heavy and prolonged exposure, as many suggested, insulation workers apparently had little to fear, particularly if they wore masks or worked with dampened materials. As Irving Selikoff et al. noted in 1964, not only did much insulation work take place in the open air, but also insulation products normally contained either small quantities of asbestos or no asbestos at all. In consequence, insulator exposure was "limited" and "intermittent" (Selikoff et al. 1964). Only in the 1960s – partly as a result of large-scale epidemiological research undertaken by Selikoff and his colleagues – were the hazards of asbestos outside of asbestos factories established. Before discussing Selikoff's work, which focused more on lung cancer and mesothelioma than asbestosis, let us consider the question of cancer, asbestos dust and insulation work before and during the 1950s.

Richard Doll's work in the mid-1950s demonstrated a causal relationship between asbestos dust and lung cancer, but only in the case of heavily exposed asbestos factory workers. Suspicions of a causal link between mesothelioma and crocidolite asbestos were first raised by researchers in South Africa in the 1950s (Wagner 1960; Wagner et al. 1960; Wagner 1991). In 1963 one of these researchers, J.C. Wagner, spoke about the "incrimination of crocidolite asbestos as a cause of mesothelioma" (Wagner 1963). Although profound skepticism persisted in certain quarters (Willis 1967), Wagner's opinion had been widely accepted by the end of 1965 (Cancer and Asbestos 1968). However, the work of Wagner and his colleagues focused on one type of asbestos in the particular region of South Africa where it was mined. No crocidolite was mined in the United States, and little was ever imported. As far as insulation workers were concerned, a few case studies of lung cancer were published in the 1940s and 1950s. However, no signi-

ficant epidemiological study of this workforce took place until Selikoff studied members of the Asbestos Insulators' Union in the 1960s. This should not be considered "late" for such research to have been conducted. As Selikoff himself explained, it was difficult to study a relatively small workforce scattered amongst hundreds of employers spread throughout North America in groups averaging only some 17 workers per company (Selikoff 1970). Before Selikoff's appearance, even the insulators' union had shown little interest in the health hazards faced by its members.

In 1964 Selikoff, Churg and Hammond demonstrated "that asbestos insulation workers employed in the construction industry were subject to a significant cancer hazard" (Selikoff et al. 1964). A 1965 paper by the same authors showed that mesothelioma was "a significant complication of such exposure" (Selikoff et al. 1965). The question then arose: what could be done to deal with the problems newly uncovered?

Although there were some suggestions for the development of alternative insulation materials, the consensus in the 1960s and 1970s was for the introduction of precautions that would allow asbestos to be used safely. This emphasis reflected the widespread opinion that asbestos was an indispensable material. Selikoff himself held this position long into the 1970s. In 1972, for example, he referred to "engineering procedures [that] will allow asbestos to be used safely" (Insulation Hygiene Progress Reports 1972). What he did not do was propose a ban on asbestos. Even as late as 1976, he described asbestos as irreplaceable (*Duluth Herald* 1976).

In 1968, following meetings with representatives of organized labor and the asbestos industry, Selikoff secured substantial grants from the asbestos giant Johns-Manville and the union to establish an Insulation Industry Hygiene Research Program (IIHRP). The program sought:

1. "To develop improved methods for minimizing exposure of insulation workers to dusts and fumes" and
2. "To disseminate knowledge of […] improved methods of dust control […] and to offer […] assistance toward their universal adoption" (Insulation Hygiene Progress Reports 1969).

Selikoff was enthusiastic about the program. He welcomed the co-operation of labor, industry, medicine and government in tackling an industrial hygiene problem. He praised the insulation industry and in 1971 predicted that the "serious problems in the insulation industry […] can be solved" (Insulation Hygiene Progress Reports 1971).

With the passage of the Occupational Safety and Health Act in 1970, the federal government assumed a central role in all of this. At the end of 1971 the Department of Labor issued an Emergency Temporary Standard for asbestos. Among other things, this specified a Permitted Exposure Limit (PEL) of five fibers per milliliter of air (*Federal Register* 1971). Although some union leaders regarded this as "stringent," organized labor pushed for a standard of 2ff/ml. In June 1972,

following investigations by the National Institute of Occupational Safety and Health and by an Advisory Committee of the Department of Labor, as well as extensive public hearings, the Occupational Safety and Health Administration (OSHA) set the "permanent standard" at 5ff/ml. Simultaneously, it announced that the PEL would be reduced to 2 ff/ml in July 1976. From the outset, no employee was to be exposed, for any period of time, to asbestos dust concentrations in excess of 10ff/ml (*Federal Register* 1972).

In view of the division of medical opinion that existed, this outcome might be viewed as a reasonable compromise between the demands of business and organized labor. OSHA believed that any "conflict in the medical evidence is resolved in favor of the health of employees" (*Federal Register* 1972; Mintz 1984). Not all parties agreed with this appraisal. Paul Brodeur, a journalist who wrote a series of exposés about the asbestos industry in the *New Yorker*, considered that OSHA's final decision favored business (Brodeur 1972; Brodeur 1974). On the other hand, the academic Steven Kelman has argued that "OSHA decided for the threshold limit value that labor favored but chose to delay the effective date by three years" (Kelman 1981). Although organized labor challenged the 1972 decision, the courts substantially affirmed OSHA's standard. Therefore, both this and the 1976 standard went into effect as planned. Only in the 1980s, as in the UK, were these standards subject to further revision.

In conclusion, in the early 1940s the United States pioneered the protection of insulation workers in shipyards. Some cases of asbestos-related disease occurred in insulation workers in the 1940s and 1950s and some of these were published, but only in the mid-1960s did a major epidemiological study show that insulation workers risked incurring asbestos-related diseases. The leading researcher in this work, Irving Selikoff, believed that precautions could be devised to deal with these hazards. Neither he nor the union wanted to ban asbestos. From 1968, with funding from business and organized labor, Selikoff directed the IIHRP. During the late 1960s and 1970s this seemed to be producing good results in terms of tackling health hazards. Many observers considered that OSHA regulations introduced in 1971 would reduce asbestos dust exposures to safe levels. Whether, in these circumstances, the insulation industry merits criticism for failing to introduce substitute materials or to take other steps at an earlier stage is a moot point. It seems fair to conclude that the industry should not be viewed in monolithic terms. In other words, the actions of individual firms need to be separately assessed. Some insulation companies were also major producers of insulation products – Johns Manville is the prime example. Large-scale producers employed medical and industrial hygiene personnel, whereas firms that operated on a relatively small scale or exclusively as insulators did not. In the absence of federal intervention until the early 1970s, there is an argument that asbestos producers, if not the union, should have alerted the insulation industry at large to the occupational health hazard that it faced.

References

Aldrich M. (1997) *Technology, Labor, and Business in the Building of American Work Safety, 1870–1939*. Baltimore and London: The Johns Hopkins University Press.

Ashford N.A. (1976) *Crisis in the Workplace*. Cambridge: MIT Press.

Bartrip P. (1998) "Too Little Too Late? The Home Office and the Asbestos Industry Regulations, 1931" *Medical History,* 42:421–438.

Bartrip P. (2001) *The Way from Dusty Death. Turner & Newall and the Regulation of Occupational Health in the British Asbestos Industry 1890s–1970*. London: Athlone.

Berman D.M. (1978) *Death on the Job. Occupational Health and Safety Struggles in the United States*. New York and London: Monthly Review Press.

Bonser G.M., Faulds J.S. & Stewart M.J. (1955) "Occupational Cancer of the Urinary Bladder in Dyestuffs Operatives and of the Lung in Asbestos Textile Workers and Iron Ore Miners" *American Journal of Clinical Pathology,* 25:126–134.

Brodeur P. (1972) *Asbestos and Enzymes*. New York: Ballantine Books.

Brodeur P. (1974) *Expendable Americans*. New York: Viking Books.

Browne K. & Murray R. (1968) "Cancer and Asbestos" *British Medical Journal,* 24 Aug.:448.

Browne K. & Murray R. (1990) "Asbestos and the Romans" *Lancet,* 336:445.

Castleman B.I. (1996) *Asbestos: Medical and Legal Aspects*. 4th ed. Englewood Cliffs, New Jersey: Aspen Law & Business.

Corn J.K. (1988) "United States Occupational Safety and Health in the 1930s: The Formative Years of the American Conference of Governmental Industrial Hygienists" *Applied Industrial Hygiene,* 3:F8–11.

Corn J.K. (1992) *Response to Occupational Health Hazards*. New York: Van Nostrand Reinhold.

Doig A.T. (1968) "Asbestos Disease" *Health Bulletin,* 26:24–29.

Doll R. (1955) "Mortality from Lung Cancer in Asbestos Workers" *British Journal of Industrial Medicine,* 12:81–86.

Drinker P. (1943) "The Health and Safety Program of the U.S. Maritime Commission and the U.S. Navy in Contract Shipyards" *Journal of the American Medical Association,* 121:822–823.

Duluth Herald (31 March 1976).

Federal Register (7 Dec. 1971) 36. Pp. 23207–23208.

Federal Register (7 June 1972) 37. Pp. 11318–11322.

Fleischer W.E., Viles F.J. Jr., Gade R.L. & Drinker P. (1946) "A Health Survey of Pipe Covering Operations in Constructing Naval Vessels" *Journal of Industrial Hygiene and Toxicology,* 28:9–16.

Greenberg M. (1994) "Knowledge of the Health Hazard of Asbestos Prior to the Merewether and Price Report of 1930" *Social History of Medicine,* 7:493–516.

Hunter D. (1955) *The Diseases of Occupations*. London: English Universities Press.

Insulation Hygiene Progress Reports (1969) Asbestos Worker 17.

Insulation Hygiene Progress Reports (1971) Asbestos Worker 17.

Insulation Hygiene Progress Reports (1972) Asbestos Worker 17.

Jeremy D.J. (1995) "Corporate Responses to the Emergent Recognition of a Health Hazard in the UK Asbestos Industry: The Case of Turner & Newall, 1920–1960" *Business and Economic History,* 24:254–265.

Kelman S. (1981) *Regulating America, Regulating Sweden: A Comparative Study of Occupational Safety and Health Policy*. Cambridge, Mass. and London: MIT Press.

Kotelchuck D. (1989) "Asbestos: The Funeral Dress of Kings – and Others" In: Rosner D. & Markowitz G. (eds.) *Dying for Work. Workers' Safety and Health in Twentieth Century America*. Pp. 192–207. Bloomington, Indianapolis: Indiana University Press.

McVittie J.C. (1965–6) “Asbestosis in Great Britain” *Annals of the New York Academy of Sciences* 132:128–138.

Minimum Requirements for Safety and Industrial Health in Contract Shipyards (1943) Washington DC: US Government Printing Office.

Mintz B.W. (1984) *OSHA. History Law and Policy*. Washington: BNA Books.

Newhouse M.L. & Thompson H. (1965) “Mesothelioma of Pleura and Peritoneum Following Exposure to Asbestos in the London Area” *British Journal of Industrial Medicine,* 22:261–269.

Noble C. (1986) *Liberalism at Work. The Rise and Fall of OSHA*. Philadelphia: Temple University Press.

Official Transaction of the Great Lakes Shipyard Safety Conference, La Salle Hotel, Chicago, Illinois, 17 and 18 Feb. 1944. National Archives and Records Administration NARA, Archives 2, College Park, Maryland. Record Group 178, Entry 91, Box 459.

Page J.A. & O’Brien M.-W. (1973) *Bitter Wages. Ralph Nader’s Study Group Report on Disease and Injury on the Job*. New York: Grossman Publishers.

Rosner D. & Markowitz G. (1989) “Research or Advocacy: Federal Occupational Safety and Health Policies during the New Deal” In: Rosner D. & Markovitz G. (eds.) *Dying for Work. Workers’ Safety and Health in Twentieth Century America*. Pp. 83–102. Bloomington, Indianapolis: Indiana University Press.

Selikoff I.J. (1970) “Partnership for Prevention – the Insulation Industry Hygiene Research Program” *Industrial Medicine,* 39:162–166.

Selikoff I.J., Churg J. & Hammond E.C. (1964) “Asbestos Exposure and Neoplasia” *Journal of the American Medical Association,* 188:22–26.

Selikoff I.J., Churg J. & Hammond E.C. (1965) “Relation between Exposure to Asbestos and Mesothelioma” *New England Journal of Medicine,* 272:560–565.

Selikoff I.J., Lilis R. & Nicholson J. (1979) “Asbestos Disease in United States Shipyards” *Annals of the New York Academy of Sciences,* 330:295–311.

Stenographer’s Minutes of Meeting in Regard to Minimum Requirements for Industrial Health and Safety in Shipyards, Chicago, Illinois, 7 & 8 Dec. 1942. National Archives and Records Administration (NARA), Archives 2. College Park Maryland. Record Group 178, Entry 95C, Box 454.

Wagner J.C. (1960) “Some Pathological Aspects of Asbestosis in the Union of South Africa” In: Orenstein A.J. (ed.) *Proceedings of the Pneumoconiosis Conference Held at the University of Witswatersrand, Johannesburg, 9–24 February 1959*. Pp. 373–382. London: Churchill.

Wagner J.C. (1963) “Asbestos Dust and Malignancy” In: *Proceedings of the XIVth International Congress on Occupational Health, Madrid, Spain, 16–21 Sept. 1963 Vol. 2*. Pp. 1066–1067. Amsterdam, New York, London, Milan, Tokyo, Buenos Aires: Excerpta Medica Foundation.

Wagner J.C. (1991) “The Discovery of the Association between Blue Asbestos and Mesotheliomas and the Aftermath” *British Journal of Industrial Medicine*. 48:399–403.

Wagner J.C., Sleggs C.A. & Marchand P. (1960) “Diffuse Pleural Mesothelioma and Asbestos Exposure in the North Western Cape Province” *British Journal of Industrial Medicine,* 17:260–271.

Wikeley N. (1992) “The Asbestos Regulations 1931: A Licence to Kill?” *Journal of Law and Society,* 19:365–378.

Willis R.A. (1967) *Pathology of Tumours*. 4th ed. London: Butterworths.

9: From Balloons to Artificial Silk: The History of Carbon Disulfide Toxicity

Paul Blanc, Division of Occupational and Environmental Medicine,
University of California, San Francisco, USA

Background

In 1892, Dr. Frederick Peterson, Chief of Clinic of the "Nervous Department" of College of Physicians and Surgeons, published a report of three cases of carbon disulfide-caused delirium in the *Boston Medical and Surgical Journal* (later renamed the *New England Journal of Medicine*). He concluded his paper with the following critique (Peterson 1892):

> I have delayed in publishing these cases for some years, thinking that I might hear of other similar ones, or that I might acquire more information from the owners of the factory or from doctors in attendance upon their employees, but it is astonishing what a large amount of ignorance and secretiveness develops among the authorities connected with any factory, when questions arise as to the unhealthful conditions under which the operatives pursue their vocations.

More than one hundred years after Dr. Peterson's observations were published, the degree of ignorance related to carbon disulfide is as pronounced as ever. The history of carbon disulfide has been the story with a recurring theme: an episode of concern emerges as the dangers of carbon disulfide are recognized. Then, over time, fears are allayed by a false sense of security that the exposure either has been brought under strict control or even that it has been eliminated altogether. Later, new concerns are brought to the forefront again by another outbreak of disease. Much of the cyclical nature of carbon disulfide exposure and accompanying disease has been dictated by changing use patterns driven by technologic innovation. It is the purpose of this paper to examine the technologic applications of carbon disulfide and the changing patterns of illness that these applications have brought.

Early Chemistry

Carbon disulfide was, at first, a mere laboratory curiosity noted by the founding generation of organic chemists in the eighteenth century. Carbon disulfide is a relatively simple molecule comprised of carbon and sulfur, but its structure confused early investigators because of the absence of hydrogen, oxygen, or nitrogen, at least one of which was usually present in carbon-based substances. Although carbon disulfide does exist in nature in trace amounts, it was unknown until first synthesized by Lampadius, a German chemist, who reported his findings in a brief letter published in 1796 (Lampadius 1796). He described the newly discovered substance as an alcohol of sulfur, so denoted because of its volatile, liquid form. This novel material proved difficult to reproduce experimentally, but remained

intriguing to investigators (Chenevix 1805). It caught the attention of Humprhy Davy, who later interested one of his young protegees, Alexander Marcet, in analyzing its structure (Davy 1808; Berzelius & Marcet 1813; Marcet 1813). In an important collaboration with the Swedish chemist Berzelius during his pivotal visit to England in the summer of 1812 (Leicester 1970), Marcet and Berzelius conclusively worked out the elemental constituents of carbon disulfide, which they termed "sulphuret of carbon". In this series of experiments, the potent solvent properties of the compound became evident. Moreover, its propensity to vaporize was also manifest. This property was later to prove essential to the toxicity of sulphuret of carbon. In a footnote to their paper in the journal *Philosophical Transactions*, Berzelius and Marcet remark (Berzeleius & Marcet 1813), "The volatility of this liquid is very remarkable; it exceeds considerably that of ether".

Sulphuret of carbon, which through the evolving chemical nomenclature of the period came to be called bisulphide of carbon, might have remained little more than an experimental oddity, had it not been for a single, yet critical, industrial application of the 1840s. In the first decades of the nineteenth century any number of practical applications of new chemical discoveries were investigated. Although many of the successful commercial applications occurred in the United Kingdom, the science of applied chemistry was particularly vital in France, reflected in a series of texts such as those of Chaptal, Payen, and Regnault. Of these, Chaptal's text does not even mention bisulphide of carbon (Chaptal 1807). Payen, in the first edition of his text in 1849 (just on the eve of carbon disulfide's industrial debut), alludes to the compound only through a footnote that briefly describes some of its properties, including its ability to dissolve sulfur (Payen 1849, pp. 74–75 [footnote]). By 1851, however, Regnault devoted over 15 pages to carbon disulfide, including detailed advice on methods to synthesize the material in bulk (Regnault 1851, pp. 382–388).

Carbon Sulfide in the Rubber Industry

There was reason for carbon disulfide's new importance. On the March 25, 1846, Alexander Parkes filed a British patent for a new process for treating India-rubber in order to render it both malleable and stable for a variety of applications (Hancock 1857). The process was simple: the goods were dipped in a solution of carbon disulfide into which sulfur had been dissolved. The powerful solvent carried the sulfur into the rubber where it acted, without heat or pressure, to vulcanize the material.

Parkes was a chemist and an inventor whose métier was another technologic breakthrough of the time, electroplating. It was this work that initially drew him to the potent solvent properties of carbon disulfide. In 1843, he patented a process for electroplating, particularly delicate objects, by first dipping them in phosphorous dissolved in carbon disulfide, followed by immersion in silver nitrate, before electrolytic deposition of metal. At one point, a spider's web silver coated using Parkes' method was presented to Prince Albert (Prosser 1959–1960).

Even though electroplating was a major Victorian industry, the financial stakes in the rubber industry were immense by contrast. Only a few years before Parkes' innovation, the first chemical breakthrough in vulcanization had been patented separately in the United States by Goodyear and in the UK by Hancock for Charles Macintosh and Company (Pickles 1954–1958). This chemical reaction, the original "hot" vulcanization process, was the first that could convert natural rubber from a nearly useless product to a flexible, almost resilient, wonder-material that would not become brittle and cracked in winter nor disintegrate in summer. Within the year, Hancock further consolidated his position by acquiring the patent for the new Parkes method as well. Hancock referred to this as a rubber "converting" process to distinguish it from "vulcanization", but the semantic distinction did not hold (Hancock 1857, pp. 123–126, 256–270).

The technology of hot vulcanization, linked to mechanical innovation in the heavy equipment needed for mixing and rolling the rubber feedstock, required large-scale factory manufacturing, an arena in which Macintosh and Co. could easily dominate. In contrast, cold process vulcanization was technologically simple and often took place in small-scale workshops producing items such as balloons, rubber toys, and other small consumer items. A similar application of carbon disulfide also allowed rubber sheets to be spliced together, either for simple repairs or for more complicated fabricating, for example, making tire inner tubes. Such small-scale manufacturing did occur in the UK, but found a particular niche in and around Paris. Because of the volatility of carbon disulfide, the simple technology of the process, and the small-scale, poorly maintained workplaces where the manufacturing took place, heavy exposure of laborers to carbon disulfide through inhalation and skin contact was almost guaranteed.

The first cases of carbon disulfide toxicity began to be reported very soon after carbon disulfide was introduced in rubber working, with the index cases noted in France, which was consistent with the heavy use in this country. The symptoms of the unusual syndrome induced by carbon disulfide included headache, numbness, disturbed sleep, a feeling of drunkenness, and, in its most severe manifestations, madness in the form of mania.

Auguste Delpech first officially reported the syndrome in a note read to the French Academy of Medicine at its meeting on January 15, 1856 (Acadamie de Medecine 1856). Even in this initial report, Delpech recommended prevention by forbidding altogether such work in small rooms and, in larger factories, reducing direct contact with carbon disulfide. Delpech followed this preliminary note with an expanded case report describing a 27 year-old named Victor Delacroix, whose specific job was dissolving rubber in carbon disulfide to patch and repair objects (Delpech 1856a). Previously in perfect health, within three months of first exposure Delacroix began to experience a variety of complaints, predominantly neurological. The findings included motor weakness, described by Delpech as resembling that found in conjunction with lead colic. Delpech also made particular note that the patient's "sexual desire and erections were abolished".

In a nearly simultaneous publication, Delpech described responses in pigeons and rabbits experimentally exposed to carbon disulfide (Delpech 1856b). Another report published at about the same time and following Delpech's delineation of the toxic effects of carbon disulfide described a 16 year-old named Bois (Beaugrand 1856). It can be noted that this case description also concludes by highlighting the patient's ongoing sexual impotence.

After this initial flurry of publications on carbon disulfide, little else appeared until Delpech's voluminous 118-page paper in the *Annales d'Hygiene Publique, Industrielle et Sociale* (Delpech 1863). In this publication, Delpech documents 24 case histories, emphasizing, in particular, the psychiatric aspects of intoxication. In the psychosexual arena, the effects described include both impotence and, especially in women, heightened arousal.

Carbon Disulfide Hysteria

The clinical-scientific interest in the effects of carbon disulfide on the nervous system, epitomized by Delpech's rigorous, yet fundamentally descriptive approach, coincided with the great French advances in neurology and the emerging discipline of psychiatry in the nineteenth century. Within the neurological paradigm, toxic insults presented a specific cause and effect from which general principals could be extrapolated from the empiric evidence. For example, Esquirol's classic early text on insanity (Esquirol 1965 [1845], p. 41) specifically addresses the effects of lead, noting,

> The vapor of lead, produces in Scotland a species of insanity, in which the maniacs lacerate themselves at every opportunity and which the Scotch peasants call, mill-reeck.

As models of psychiatric disease began to develop further, however, the observed effects of neurotoxins were reinterpreted to conform to theoretical constructs, rather than serving to challenge fixed assumptions. Carbon disulfide, with its aura as a sexual toxin, even an aphrodisiac, held a particular allure for Charcot and his circle, as they promoted their novel concepts of psycho-neurological disease subsumed under the new diagnostic classification of "hysteria". Charcot featured carbon disulfide in his Tuesday Lesson of November 6, 1888 (Charcot 1889), reviewing the work of Delpech published thirty years earlier, but also presenting at length the findings of his junior colleague Pierre Marie (later of the eponymous Charcot-Marie-Tooth disease). Marie had previously published a case of a female carbon disulfide-exposed worker with paralysis, sensory loss, and visual field deficits. In his case report, Marie emphasized the sexual aspects of intoxication that were to be echoed by Charcot in his lesson. "Genital problems are, however, frequent in carbon disulfide hysteria, and can consist of genital excitation or, conversely, impotence" (Marie 1888).

The fact that carbon disulfide was clearly a toxin with multiple effects on the nervous system was interpreted as supporting the view that "hysteria" could also be triggered by this cause. Indeed, lead and alcohol were also considered potential

toxic triggers of hysteria (Gilles de La Tourette 1891, p. 109). Along with Charcot and Marie, Gilles de la Tourette and, later, Guillain were also interested in and wrote about carbon disulfide (Gilles de La Tourette 1882; Guillain & Courtellemont 1904). The term *Charcot's carbon disulfide hysteria* persisted as late as Lehman and Flury's classic text on solvents, first published in German in 1938 and later translated into English (Lehman & Flury 1943, pp. 298–302). The sexual mystique that surrounded carbon disulfide also remained well into the twentieth century. In Belgium, there were rumors that a special train car had been set aside to transport women workers exposed to carbon disulfide, so that they would not be brought into contact with other commuters on account of the workers' licentious behavior (personal communication, E. Kusters, University of Brussels, Belgium, September 19, 2001).

Carbon Disulfide in the Nineteenth Century British Medical Literature

Although the original patent was British and industrial applications of carbon disulfide certainly took place in the United Kingdom, fewer original observations on the subject of carbon disulfide toxicity were reported in the nineteenth century English medical literature. Nonetheless, British medical writers did contribute to the field, particularly in documenting carbon disulfide-related polyneuropathy and optic nerve deficits (Hadden 1886; Edge 1889; Opthalmological Society 1884). Benjamin Ward Richardson was one of the most notable British commentators on carbon disulfide. Richardson, a prolific writer on a variety of medical subjects including occupational diseases, authored a small popular book on occupational disease published by the Society for Promoting Christian Knowledge in which he wrote (Richardson 1879, p. 81):

> Toy balloon makers […] are subject to much danger from the inhalation of the vapours of bisulphide of carbon […] The workers become depressed in spirits, they lose appetite, they are emaciated, and some of them are actually rendered imbecile and insane.

Ironically, despite these dangers, Richardson (an early animal rights advocate) was a great promoter of the use of carbon disulfide for the painless euthanasia of unwanted pets (Richardson 1884).

One of the most vivid descriptions of working conditions in carbon disulfide vulcanization was published in Thomas Oliver's massive text, *Dangerous Trades* (Oliver 1902). Although a multi-authored work, he himself drafted the chapter on the specific subject of carbon disulfide. In writing of these workers Oliver relays one of the most telling anecdotes of nineteenth century industrial disease, describing how bars were placed on a second story opening of a factory to prevent the workers from killing themselves through defenestration (Oliver 1904):

> Some of them have become the victims of acute insanity, and in their frenzy have precipitated themselves from the top rooms of the factory to the ground. In consequence of bisulphide of carbon being extremely explosive, vulcani-

> zation by means of it has generally to be carried on in rooms, one side of which is perfectly open. This open front is usually protected by iron bars.

It was also the British cold vulcanization industry that gave the English language the first use of "gassed" as a passive verb to mean poisoned by inhalation, noted in an 1889 Liverpool Daily Post item stating (Simpson & Weiner 1989): "Gassed was the term used in the india-rubber business, and it meant dazed."

Viscose Rayon

In the 1890s, just as cold vulcanization was falling under somewhat better control and carbon disulfide disease outbreaks were becoming infrequent, if not rare, a new technology emerged requiring far greater quantities of carbon disulfide than ever had been used in vulcanizing. This new industry was artificial silk manufacture.

Artificial silk would prove to be the first mass market success brought to twentieth century consumers by the chemical industry – a synthetic polymer dry-run for plastics. In the first thirty years of the twentieth century, artificial silk manufacturing worldwide expanded more than 100-fold, with much of the growth in the first decade following World War I (Darby 1929). Such a brave new product required a name sleeker than artificial silk. The appellation *glos* was proposed at one point, but did not take hold. In 1924, with the United States by then leading the pack in worldwide production, the National Retail Dry Goods Association of America recommended a new name for the product, *rayon* (Simpson & Weiner 1989).

Although several different chemical processes allowed conversion of the abundant and cheap starting material cellulose pulp into a finished textile product rivaling silk, the most widely used approach, then and now, is called viscose. Viscose synthesis is entirely dependent on carbon disulfide as its key manufacturing constituent. Within only a few years of the introduction of this new technology, the first cases of carbon disulfide poisoning due to artificial silk production were reported in the scientific literature.

This time it was American physicians who alerted the medical community to these "index" cases, all of whom were presented in the late winter of 1904 and were employees of the new Artificial Silk Works in Lansdowne, Pennsylvania, a Philadelphia suburb (Jump & Cruice 1904–1905; Francine 1905). One of these case reports includes an insightful review of the literature, along with an astute critique of carbon disulfide hysteria as a diagnostic entity (Jump & Cruice 1904–1905):

> In most of the cases, in addition to the symptoms of neuritis, there have been seen the peculiar manifestations of hysteria, and in some of the milder ones the hysteria has been the prominent feature. This has led Pierre Marie to say that hysteria is the chief thing in this disorder. But in reviewing a number of cases one is stuck constantly with the appearance of those symptoms which determine peripheral neuritis of toxic origin.

The initial US publications calling attention to carbon disulfide as an emerging risk in the new artificial silk industry were followed by a long hiatus in the medical literature, despite the massive increase in rayon manufacturing that was taking place over this period. Alice Hamilton's 1929 text on industrial toxicology, for example, devotes ten pages to carbon disulfide, but only a single page to the potential risks of rayon manufacture, referring to her own case experience along with the two publications of a quarter century before as her only citations for the industry (Hamilton 1929, pp. 360–370). In the contemporaneous volume *Labor and Silk*, Grace Hutchins gives attention to both the economics and the health hazards of artificial silk, but does not mention carbon disulfide or its risks (Hutchins 1929).

In 1928, the *Lancet* carried a small item in its Parliamentary Intelligence section quoting the Home Secretary. In response to a query on health conditions in artificial silk factories, Sir William Joynson-Hicks stated (Anonymous 1928):

> I have received reports by the Medical and other Inspectors of Factories who have been visiting these works. It appears from these reports that the conditions generally are satisfactory, but cases of conjunctivitis have occurred at one or two works, and there have also been some cases of dermatitis. Suitable precautions have been taken in each case and the hon. Member may be assured that the conditions will continue to receive the special attention of the Medical Staff.

His reassurances would seem inconsistent with the data already accumulating at the time of this statement. In his final work on occupational medicine, published after his death, Sir Thomas Legge described the changing epidemiology of carbon disulfide intoxication (Legge 1934, pp. 120–122). Until 1926, Legge had been the Senior Inspector of Factories. He noted that between 1925 and 1931, 16 cases of carbon disulfide poisoning had been reported in Great Britain. Of these, eleven had been among workers in churn-room processing of artificial silk, with the earliest case reported in 1925, three years prior to the Home Secretary's reassurances that minor eye and skin problems were the only hazards of the trade. Legge also noted two additional cases in another emerging manufacturing process also dependent on carbon disulfide – *transparent paper*. This consumer product, like viscose-process artificial silk, is still made today using carbon disulfide, and, like rayon, is known by its trade name (first introduced in 1912) – *cellophane* (Simpson & Weiner 1989).

As the 1930s progressed, multiple case reports began to appear documenting hazards of the rayon industry attributable to carbon disulfide. Some of the richest occupational medical literature on carbon disulfide emerged from Italy (Negro 1930). As shown by Carnevale and Baldesseroni in their analysis of carbon disulfide-related disease in this period in Italy, the political-economic state apparatus in the Fascist period was an important contributor to large-scale over-exposure, despite firm medical evidence of the hazards of carbon disulfide (Carnevale & Baldesseroni 2001). Similar issues also came to the fore in Nazi Germany, where increased hazards due to rayon production were acknowledged at the highest

levels as a necessary expedient in intensified production of armaments and related *matériel* (Proctor 1999, p. 118). One of the most thorough investigations of carbon disulfide toxicity in the rayon industry of the period was carried out by Dr. Alice Hamilton (Hamilton 1943, pp. 287–399). One of her chief collaborators in the investigation, which was based in Pennsylvania, was Dr. F. H. Lewey, the exiled former chief of Institute for Neurological Diseases in Berlin (Lewey 1941). Dr. Hamilton took great pride in this study and particularly in the irony of being able to present some of the results (prominently acknowledging Dr. Lewey as her co-author) at the VIII International Congress for Industrial Surgery and Occupational Disease (Hamilton 1943, pp. 360–370). This was the last such international occupational health meeting before World War II, and it was held under Nazi aegis in Frankfurt-am-Main in 1938.

Perhaps the darkest chapter in the history of carbon disulfide involved a rayon plant, Widzewska Manufaktura, established by the Germans in occupied Lodz, Poland and which operated from February 1941 until January 1945. After more than a hundred cases of carbon disulfide poisoning (among 600 exposed), in 1943 the authorities directed that any of these forced laborers becoming ill would be sent directly to a psychiatric facility. Most, if not all, were later killed (Paluch 1948).

Carbon Disulfide since 1950

In the last 50 years, increasingly sophisticated epidemiologic studies have identified a number of additional hazards associated with carbon disulfide, over and above the central and peripheral neurotoxicity linked to the chemical since the nineteenth century (Agency for Toxic Substances and Disease Registry 1996). In particular, a causal association has emerged between carbon disulfide exposure and both altered lipid metabolism and cardiovascular disease. Other toxic effects are also suspected, including potential teratogenicity. Even in terms of neurological effects, case reports continue to underscore the complicated nature of carbon disulfide's toxicity (Frumkin 1998; Graham 2000).

Many thousands of workers continue to be exposed to carbon disulfide around the world. Many of those exposed work in production facilities located in less economically favored regions, although significant consumption in industrialized countries also continues. For example, just under 200 million pounds per year are used in the United States (Honeywell 2000).

Moreover, new sources of carbon disulfide exposure continue to be introduced. Although carbon disulfide is rarely, if ever, used directly in modern rubber manufacturing, it is a major chemical precursor of accelerator chemicals that are critical to the industry. Thus, 15 per cent of the carbon disulfide consumed in the US goes into the manufacturing of these rubber industry materials, with potential exposure to those employed in the chemical manufacturing sector (Honeywell 2000). Carbon disulfide, which had been employed in the past as an agricultural fumigant, has generally been phased out of this application. Yet, similar to the transformation in rubber processing, carbon disulfide is now used to as an intermediate

in the manufacture of other pesticides. The most important of these is metam sodium, a widely used fumigant for field crops such as potatoes, tomatoes, and strawberries. Metam sodium came to public attention when a large rail transportation spill in Dunsmuir, California in 1989 exposed hundreds of people to the fumigant and its principal breakdown product, an irritant chemical called methyl isothiocyanate (Pruett et al. 2001). It is less generally known that another by-product of metam sodium's use is its precursor, carbon disulfide. Indeed, environmental release of carbon disulfide from all sources combined appears to be a major source of toxic chemical pollution. In 1993, for example, the US Environmental Protection Agency's Toxic Release Inventory documented 93 million pounds of carbon disulfide pollution, ranking it the largest toxic chemical emission overall in the US (US Environmental Protection Agency 1995).

Nor is inhalation the only potential route of exposure for carbon disulfide. In the nineteenth century, despite the growing awareness of its toxicity, preparations containing carbon disulfide were a part of the standard pharmacopoeia: one accepted prescription for rheumatism called for carbon disulfide combined with alcohol, four to six drops, every two hours (Griffith & Thomas 1859, p. 451). Lest this appear quaintly ill-advised, however, a far more important source of pharmacological carbon disulfide continues to be prescribed in the form of disulfiram, which remains the cornerstone of aversive therapy for ethanol dependence (Swift 1999). The disulfiram effect is mediated by the build-up of acetaldehyde through inhibition of alcohol's metabolism. Disulfiram itself is metabolized to carbon disulfide, which may account for some of the drug's acute and chronic toxicity (Ellenhorn 1997, pp. 1356–1362).

Summary

Carbon disulfide is a highly toxic chemical with a long history of multiple industrial, agricultural, and consumer applications. From making balloon's to spinning rayon fibers, with each new technological innovation involving carbon disulfide new outbreaks of disease have occurred. The medical-scientific literature repeatedly "rediscovers" the hazards of carbon disulfide, sometimes reinterpreting the unusual constellation of its toxic effects in order to fit theoretical constructs of disease. Despite its long and dangerous history, carbon disulfide remains in widespread use and continues to pose a threat to many thousands of unsuspecting persons around the world.

References

Acadamie de Medecine (1856) "Séance du 15 Janvier 1856" *Gaz Hebdomadaire de Medecine et de Chirugie,* 3:40–41.

Agency for Toxic Substances Disease Registry (1996) *Toxicological Profile for Carbon Disulfide (Update)*. 1996–739–32. Atlanta, GA: U.S. Department of Health and Human Services (ATSDR).

Anonymous (1928) "Parliamentary intelligence: health conditions in artificial silk factories" *Lancet,* (March 24):631.

Beaugrand E. (1856) "Action du sulfure de carbone chez les ouvriers en caoutchouc" *Gaz Hop,* 331–332.

Berzelius J. & Marcet A. (1813) "Experiments on the alcohol of sulfur, or sulphuret of carbon" *Phil Trans Royal Soc London,* 103:171–199.

Carnevale F. & Baldesseroni A. (2001) "The Italian Fascist fight on occupational diseases" Paper presented to the conference *Occupational Health – Public Health: Lessons from the Past – Challenges for the Future*. Norrköping, Sweden, 6–9 September.

Chaptal J.A. (1807) *Chimie appliquee aux artes*. Paris, Chez Deter Ville.

Charcot J.M. (1889) *Lecons du Mardi a la Salpetriere. Policlinique 1888–1889*. Paris: Progres Medical.

Chenevix R. (1805) "On the action of platina and mercury upon each other" *Phil Trans Royal Soc London,* 95:104–130.

Darby W.D. (1929) *Rayon and Other Synthetic Fibers*. NewYork: Dry Goods Economists.

Davy H. (1808) "New analytical researches on the nature of certain bodies, being an appendix to the Bakerian Lecture for 1808" *Phil Trans Royal Soc London,* 99:450–470.

Delpech A. (1856a) "Accidens que develop chez les ouvriers en caoutchouc: l'inhalation du sulfure de carbone en vapeur" *L'Union Medicale,* 10 (66; May 31):265–267.

Delpech A. (1856b) "Accidents produits par l'inhalation du sulfure de carbone en vapeur; experiences sur les animaux" *Gaz Hebdomadaire de Medecine et de Chirugie,* 3:384–385.

Delpech A. (1863) "Industrie du caoutchouc souffle. Recherches sur l'intoxication special que detrminir le sulfure de carbone" *Ann D'Hygiene Pub* (*Series 2),* 19:65–183.

Edge A.M. (1889) "Peripheral neuritis, caused by the inhalation of bisulphide of carbon" *Lancet,* (December 7):1167–1168.

Ellenhorn M.J., Schonwald S., Ordog G. & Wasserbeger J. (eds.) (1997) *Ellenhorn's Medical Toxicology: Diagnosis and Treatment of Human Poisoning*. 2nd ed. Baltimore: Williams & Wilkins.

Esquirol J.E.D. (1965; Reprint 1845) *Mental Maladies a Treatise on Insanity*. New York: Hafner Publishing.

Francine A.P. (1905) "Acute carbon disulphide poisoning"*Am Med* 9:871.

Frumkin H. (1998) "Multiple system atrophy following chronic carbon disulfide exposure" *Environ Health Perspect,* 106:611–613.

Gilles de La Tourette G. (1882) "De l'intoxication raigue par le sulfure de crabone. Researches experimentales, par le Dr. Arrigo Tomassia, professeur de medicine legale a l'Universite de Pavie" *Ann D'Hygiene Pub Med Legale,* 3rd Series 7:292–297.

Gilles de La Tourette G. (1891) *Traite Clinique et Therpeutique de L'hysterie*. Paris: Librarie Plon.

Graham D.G. (2000) "Carbon disulfide" (letter) *Environ Health Perspect,* 108:A110–112.

Griffith R.E. & Thomas R.P. (1859) *A Universal Formulary*. Philadelphia: Blanchard and Lea.

Guillain G. & Courtellemont V. (1904) "Polynurite sulfo-carbonee" *Rev Neurologique,* 12:120–123.

Hadden W.B. (1886) "A case of chronic poisoning by bisulphide of carbon" *Proc Med Soc London,* 9:115–117.

Hamilton A. (1929) *Industrial Poisons in the U.S*. 2nd printing. New York: Macmillan.

Hamilton A. (1943) *Exploring the Dangerous Trades*. Boston: Little Brown.

Hancock T. (1857) *Personal Narrative of the Origin and Progress of the Caouthouc or India-rubber Manufacture in England*. London: Longman, Brown, Green, Longmans & Roberts.

Honeywell (2000) *Chemical profile: carbon disulfide*. (Revised 11/20/00). http://www.chemexpo.com/news/profiles001120.cfm

Hutchins G. (1929) *Labor and Silk*. New York: International Publishers.

Jump H.D. & Cruice J.M. (1904–1905) “Chronic poisoning from bisulphide of carbon” *University of Pennsylvania Med Bulletin* 17:193–196.

Lampadius W.A. (1796) “Etwas uber flussigen Schwefel, und Schwefel-Leberluft” *Chemische Annalen (Lorenz von Crell)* 2:136–137.

Legge T.M. (1934) *Industrial Maladies*. London: Humphrey Milford Oxford Press (Oxford Medical Publications).

Lehman K.B. & Flury F. (eds.) (1943) *Toxicology of Industrial Solvents*. Baltimore: Williams & Wilkins.

Leicester H.M. (1970) “Berzelius” In: Gillispie C.C. (ed.) *Dictionary of Scientific Biography*. Vol 2. Pp. 90–97. New York: Charles Scribner’s Sons.

Lewey F.H. (1941) “Neurological, medical and biochemical signs and symptoms indicating chronic industrial carbon disulphide absorption” *Ann Int Med,* 15:869–883.

Marcet A. (1813) “Experiments on the production of cold by the evaporation of sulphuret of carbon” *Phil Trans Royal Soc London,* 103:252–255.

Marie P. (1888) “Hysterie dans l’intoxication par le sulfure de carbone” *Bulletins et Memoires de la Societe Medicale des Hospitaux de Paris,* (November 9):1479–1480.

Negro F. (1930) “Les syndromes Parkinsoniens par intoxication sulfo-carbonee” *Revue Neurologique,* 2:518–522.

Oliver T. (1902) “Indiarubber: Dangers incidental to the use of bisulphide of carbon and naptha” In: Oliver T. (ed.) *Dangerous Trades*. Pp. 470–474. London: John Murray.

Opthalmological Society (1884) “Reports of societies: Opthalmological Society of the United Kingdom. Nettleship. Amblyopia and nervous depression from vapour of bisulphide of carbon and chloride of sulfur” *Lancet,* (October 18):760.

Paluch E.A. (1948) “Two outbreaks of carbon disulfide poisoning in rayon staple fiber plants in Poland” *J Ind Hyg Toxicol,* 30:37–42.

Payen A. (1849) *Precis de Chimie Industrielle*. Paris: Librarie de L. Hachette.

Peterson F. (1892) “Three cases of acute mania from inhaling carbon bisulphide” *Boston Med Surg J,* 128:325–326.

Pickles S.S. (1954–1958) “Production and utilization of rubber” In: Singer C., Holmyard E.J., Hall A.R. & Williams T.I. (eds.) *History of Technology: Late 19th Century*. Volume 5. Pp. 752–775. Oxford: Clarendon Press.

Proctor R.N. (1999) *The Nazi War Against Cancer*. Princeton, New Jersey: Princeton University Press.

Prosser R.B. (1959–1960) “Parkes, Alexander (1813–1890)” In: Stephen L. & Lee S. (eds.) *Dictionary of National Biography*. Vol 15. Pp. 292–293. London: Oxford University Press.

Pruett S.B., Myers L.P. & Keil D.E. (2001) “Toxicology of metam sodium” *J Toxicol Environ Health B Crit Rev,* 4:207–222.

Regnault H.V. (1851) *Cour Elementaire de Chemie Vol 1*. 3rd ed. Paris: Langlois et Leclerq.

Richardson B.W. (1879) *On Health and Occupation*. London: Society for Promoting Christian Knowledge.

Richardson B.W. (1884) “Euthenasia for the lower creation – an original research and practical result” *The Asclepiad,* 1:260–275.

Simpson J.A. & Weiner E.S.C. (eds.) (1989) *Oxford English Dictionary*. 2nd ed. Oxford: Clarendon Press.

Swift R.M. (1999) “Drug therapy for alcohol dependence” *N Engl J Med,* 340:1482–1490.

U.S. Environmental Protection Agency (1995) *1993 Toxics Release Inventory*. EPA 745-R-95-010. Washington D.C.: Office of Pollution Prevention and Toxics, U.S. E.P.A.

10: Sven P. M. Forssman: A Swedish Pioneer of Occupational Health and a Bridge Builder of ICOH

Gideon Gerhardsson, Professor Emeritus, Stockholm

> Occupational health should aim at: the promotion and maintenance of the highest degree of physical, mental, and social well-being of workers, in all occupations; the prevention among workers of departures from health caused by their working conditions; the protection of workers in their employment from risks resulting from factors adverse to health; the placing and maintenance of the worker in an occupational environment adapted to his physiological and psychological equipment and, to summarize: the adaptation of work to man and of each man to his job (ILO/WHO 1950).

In the gallery of ICOH pioneers the Swedish physician and scientist Sven Forssman is an outstanding profile, a cornerstone in the history of Swedish occupational health. He opened the doors for continental impulses into Swedish working life and initiated national and international research and development that broadened the framework of mutual understanding and started a dialogue with and among more advanced countries. Forssman was one of the architects behind the above cited definition of occupational health. His writings cover a very dynamic period of change and renewal influencing the working life at large. (Forssman 1959, 1966, 1985). This paper places Sven Forssman's work within the context of the Swedish and international developments in occupational health.

Background

Sweden is a large country with a small population. With just below nine million inhabitants, there are less than 20 people per km^2. Of these, four million are gainfully employed.

The industrial history of Sweden is relatively short. However, some remarkable contributions have been made to the common European development of occupational health and safety, particularly the activities of the labor market parties (Forssman 1985). Although changes in Swedish working life may mirror the impact of new technologies and the strong forces behind current trends, so, too, does the inherent resistance to change. In 1880 Sweden was a poor farming country, which in 1950 manifested itself as an advanced industrialized society, and in 1980 was designated as one of the so-called old industrialized countries, as compared to the newly industrialized countries, the young tigers.

Although productivity, work and the working environment are three closely inter-related concepts, there is, on occasion, a lack of congruity in their reference frameworks (Forssman 1959). The provision of goods and service of the highest possible quality at the lowest possible cost is the prime objective of production and productivity. Job content and the standard of the work environment are closely allied to the aspirations and expectations of people at work. Work is not

epitomized by the pay check, but involves the satisfaction of a job well done and opportunities for self-improvement and advancement. It is not always easy to reconcile the concept of profitability with the adaptation of the job to suit the individual.

The performance of production is the determining factor in the availability of opportunities for creating pleasant and stimulating work. The cost of industrial safety and the structuring of the job content must ultimately be borne by production. Efforts directed towards creating a viable synthesis of the concepts of productivity, work and a pleasant work environment are beset with controversial elements. In particular, these elements are conditioned by the divergence in the initial standpoint and outlook of the employer and employee.

Agreements

In all probability, Sweden is unique in the sense that the Swedish Employers Confederation – or SAF as it is known by its Swedish acronym – and the Swedish Trade Union Confederation – or LO – formulated rules governing cooperation in each individual sector of the economy at a very early stage. The two organizations set up joint organs of cooperation and employed their own experts for purposes of implementing their shared objectives. Initially after the turn of century they were generally instrumental in forcing this decision on the parties.

A series of disputes, strikes and violent conflicts of interest characterized the labor market in Sweden throughout the 1920s and 1930s. Proposals for coercive legislation to stabilize conditions were put forward in several government study papers and parliamentary bills introduced by political parties. In this situation, SAF and LO elected to ward off government interference by securing industrial peace through the negotiation of voluntary agreements in the private sector.

The most important document was the 1938 agreement to maintain industrial peace, the Saltsjöbaden Agreement, named for the place where it was signed (Forssman 1985; ALC 1989). The prime purpose of this agreement was to safeguard production and employment. Wage agreements negotiated by the two sides at the central level would be binding at the local level throughout the period of validity of the agreement.

In a series of corollary agreements, the negotiating parties formulated their community of interest in three other fields in particular: industrial health and safety, occupational training and rationalization. A number of permanent joint councils were established:

- The Joint Industrial Safety Council in 1942,
- The Joint Industrial Training Council in 1944, and
- The Joint Work Study Council in 1948.

Through a series of agreements, councils and committees, the two sides had not merely secured opportunities for promoting constructive, mutual cooperation; funds were also allocated for engaging the services of qualified, external expertise. This, in turn, necessitated the employment of in-house experts to formulate

the assignments: SAF engaged the services of Dr. Sven Forssman as medical advisor in 1939, while LO appointed its first medical advisor, Dr. Erik Bolinder, in 1964.

Sven Forssman was born in 1911 in the old university city of Lund in southern Sweden. The family, having close relatives in England and South Africa, actually lived in the mainstream of global medical sciences. His father, physician and scientist, was known world-wide, among other things, as the originator of the Forssman antigene. From childhood Sven Forssman was used to sharing the dinner table with innovative talents from all parts of the world. He spent most of his summer vacations abroad. His father loved traveling, and the young Sven often joined him.

Breaking New Ground

Sven Forssman entered the field of occupational medicine through a biochemical portal. Following medical university studies and academic research in Sweden and Germany he successfully defended his doctoral thesis in Lund, Sweden: *Studien über Umsatz und Wirkungen der Bernsteinsäure*. His scientific talents were remarkable, and in 1943, at the age of 32, the same age at which his father had reached such a position, he was appointed full professor at the National Institute of Public Health in Stockholm, Sweden. The institute was founded in 1938 but its development had been hampered by the Second World War. Initially the institute had three departments: public hygiene, occupational hygiene and food stuffs. Sven Forssman headed the occupational-related division. His first obligations included raising funds, and he successfully utilized his many contacts, particularly in the US (SIF 1938–66, 1968).

Sven Forssman's era of academic research and scholarly work was based on the philosophy that, when breaking new ground, only the most refined theories and research procedures should be practiced and that jointly by the biological, psychological and technical sciences. Production technologies were much more complex than could be judged from Safety and Health Regulations of that time.

Research, Training and Information

The duties of his department at the institute included research, training and information (SOU 1937). Research laboratory studies and animal experiments were combined with field investigations. Wartime left a backlog of health risks from substitute materials and forced production. Substitutes for technical solvents, such as benzene, carbon-disulphide and various halogenated hydrocarbons, were spotlighted. Metals and metalloids, lead, mercury, cadmium and arsenic, appeared in new combinations, inorganic and organic. The production of synthetic rubber and man-made fibers and the use of biocides raised health issues. Owing to the shortage of gasoline, producer gas from charcoal came into extensive use. The syndrome chronic carbon monoxide intoxication stimulated a debate among doctors that went on for two decades.

Two alarming issues were industrial and traffic accidents. Available personal protective equipment did not meet expectations, and much work was done on respirators, eyeglasses, ear protectors and protective clothing. The safety belt for cars, later named the Volvo belt, was one of the spectacular research results (Andréasson & Bäckström 2000).

One of Sven Forssman's slogans was: "Let not new knowledge turn to dust in the archives: explain and use it in daily life." The department's doctoral theses, reports and books were widely distributed in schools, seminars, and training and information activities of all kinds (SIF 1938–1966).

From the very beginning he received other part-time assignments as consultant and expert, both in Sweden and abroad. His talent at bringing the right people together in mutual endeavors made him influential in four international bodies that will be referred to later: the Permanent Commission (now ICOH), the International Labour Organisation (ILO), the International Social Security Association (ISSA), and the World Health Organisation (WHO).

Cultivating the Fields

The ILO/WHO concept of occupational health from 1950, which extended the scope from "absence of illness" to: "…the promotion and maintenance of the highest degree of physical, mental, and social well-being of workers in all occupations…", was a forward-looking definition but was questioned in influential quarters. It was, however, an efficient practical tool in experienced hands. The SAF appointment in 1951 gave Sven Forssman a singular opportunity to test and to apply the broadened ILO/WHO definition of occupational health.

He left his chair at the institute in experienced hands and started what was, in several respects, a new career as medical adviser to the Swedish Employers Confederation, which gave him a unique direct contact with the organized employers in the free world and also with several institutes and organizations beyond the iron curtain. In the new position his links to the national and international trade unions were strengthened.

Cooperation

Sven Forssman's appointment by the employers also gave him opportunities to continue important research projects initiated during his tenure at the Institute of Public Health. During the decade 1950–1960 Sweden enjoyed full and sometimes more than full employment (ALC 1989). The labor market parties also provided financial backing. A few examples may serve as illustrations.

A study of accident prone workers was extended to a comprehensive shop floor investigation in the iron and steel industry that resulted in a useful model for other industries (Hagbergh 1960). In a total-accident approach, the types, frequencies and conditions pertaining both to near-accidents and accidents that had occurred were mapped. Causal factors in the before-the-fact chain of events were identified. A removal of one of the main factors in the chain prevented or reduced the

number of accidents. Near-miss accident (incident) statistics were tested and came to be used effectively in preventive programs. The results could be read in a reduction of total accidents on the job, off the job and in traffic.

A big issue was absence from work (Forssman 1961, 1965). Total absence from work, both long- and short-term, was studied. Sickness, sickness absence and social absence were studied in companies of different size and were related to workers' age, sex, and type of work. The findings increased the interest of the labor market parties in occupational health services and impacted on the insurance bodies. The methods for collecting and evaluation of data provided food for further research.

Much noted were Sven Forssman's studies of occupational mobility and old age (Forssman 1946, 1957). The labor turnover differed from one type of industry to another. The pros and cons of the ageing population were visualized in a manner useful for the employer and the employee.

Ergonomics

The American concept, human factors in engineering, was launched in Sweden as ergonomics by production people but was vitalized by Sven Forssman's own experiences from the US. The foundation was provided by Taylor-Gilbreth's time and motion studies in the US in the early 1900s. From the late 1940s this approach was further developed and institutionalised as Methods, Time-Measurement (MTM). The Swedish MTM Association was founded in 1955. With strong support from Sven Forssman and his colleagues the MTM Association published in 1966 *The Swedish Handbook of Ergonomics*, which included broader British views of human performance. This book was named the production ergonomics bible (Forssman 1986).

A leading role in the systematized industrial application was played by several big Swedish companies, members of SAF, particularly the Volvo Company. In the middle of the 1970s Volvo's three car factories in Gothenburg, Skövde and Kalmar enjoyed much publicity. The whole production line received a new design. Abundant new handling devices were installed and teams replaced line assembly. Physical factors should no longer prevent women from working in most jobs. Participation of workers in decision-making was announced. In the development of new car models appropriate components were to be scrutinized and approved by ergonomics expertise from OHS.

Psychological problems, not clearly recognized at the Institute of Public Health in the late 1940s, came to the fore over the years. Swedish experiences were frequently presented internationally, such as in the two first WHO-seminars on mental health and industry-related psychiatry in 1952 and 1953, and in the ILO preparatory work for conventions and recommendations in the field. From the 1950s stress and stress factors in working life became an increasing issue of its own. In 1952 SAF created the Council on Personnel Administration (CPA 1978). The council played an important role in research on psychological and sociological problems at work. Their field studies were given wide publicity. In 1955

an industry-sponsored Institute for Physiology of Work was established, which catalyzed applied ergonomics. From the 1950s, stress and stress factors in working life became a prominent issue of its own (SOU 1973; Levi & Levi 2000; Levi 2000). In 1973, the laboratory for clinical stress research at the Karolinska Institutet was elected as WHO's first global center for studying psycho-social factors.

A Useful Umbrella

Ergonomics became an umbrella term used to describe a variety of measures designed to adapt the job and work place to the aptitudes and limitations of man on the basis of anatomical, physiological and psychological knowledge (Forssman 1986). The prime task of ergonomics lay in the deployment of suitable technical designs to render conditions at work as comfortable as possible for the individual, with job requirements pitched at a level compatible with the capability of the employee.

Major tasks of ergonomics involved ensuring that weights, lifting, work posture and movement patterns are compatible with human biology. Due consideration was given to the person's perception of his or her surroundings and behavior patterns in formulating the job description and structuring the work place, as typified by the layout of control consoles and instrument panels.

As far as was possible, every effort was made to ensure that the right man was on the right job. Work could also be made easier through education, training and various administrative actions. The use of technical devices could go a long way towards offsetting deficiencies in ability and work capacity. Because people are creatures of change, efforts had to be made to incorporate an adequate level of flexibility in technical systems. Both output capacity and reaction times decline with advancing years.

Thus, in ergonomics it became important to combine knowledge from both the human and the technical sciences to optimize the interaction between people, their work and the environment. This approach promoted both efficiency at work and the well-being of the individual.

The main issue facing industrialized and developing countries is the problem of maintaining or increasing the level of productive work coupled with a reduction in a steady stream of attempts to improve work methods, machines, material and lay-outs. Ergonomics has made a valuable contribution in the form of action to improve health and promote safety and well-being. The study of ergonomics sets out the rules for equipment, machines, tools and body movement patterns.

We must not loose sight of the fact that the statistical mean values quoted in manuals refer to a national average person, seldom, if ever, encountered in reality. The average figures quoted are too high for one half of the working population and too low for the other half. The work of planning and design should be based on the people with whom one is actually dealing. Due allowance should also be made for the difference in the physical attributes of men and women.

A sedentary position is the preferred posture for many types of work. The figures quoted in a variety of manuals for chairs and benches must frequently be adjusted for compatibility with the people who actually use them. Unfortunately, there are all too many poorly designed chairs on the market.

The use of foot pedals frequently merits reassessment. Knee-action control may, on occasion, be more suitable than foot control for sedentary work. The coordination of eye and body movement is probably the task most frequently handled by ergonomics. A thorough understanding of one's conscious perception of the surroundings is important, especially in the context of work calling for speed and precision relying on the coordinating function of the eye.

Change and variation in work are important factors influencing the individual's perception of his job. Periods of exertion must be followed by periods of rest and recovery. This requirement sets an upper limit on variations. In most cases, there are many ways of achieving variation, both in the job as such and in the environment in which it is carried out.

All work needs a structural pattern that the individual recognizes and to which he is accustomed. The absence of such fundamental stability will instill a feeling of insecurity in the individual carrying out the work. The degree of such stability, however, varies considerably from one individual to another. Some people prefer relatively monotonous work, with all eventualities known in advance. Others prefer a good measure of the unexpected and look forward to its occurrence with stimulating anticipation.

Thus, any discussion of the possibility of introducing variety to the job must be based on the premise that no two people are alike and that the individual's need for change will vary. The fundamental structure of the technical system is of decisive importance in determining the pressure to which an individual is subjected and the scope of variety which exists.

Occupational Health Services

The voluntary SAF-LO guidelines for company occupational health services (OHS) and occupational training became efficient tools for the shop-floor applications (Forssman et al. 1966). Staff members of company health programs were supposed to perform independent work on the basis of a scientific approach and proven experience under supervision of a joint committee.

The technical part of the company health services was to be managed by an authorized safety engineer. The following factors were included: industrial safety and accident prevention; occupational hygiene; ergonomics (design of workplaces); environmental hygiene; and conservation of natural resources.

The medical part of the company health services should be managed by a competent occupational physician and should contribute to achieving balance between job demands and the work capabilities of individuals and group employees. Covered factors included preventive medical measures, check-ups, first aid and minor medical treatment, and rehabilitation. Gradually even personnel from the behavioral sciences were tied to the teams. From the 1950s onward psycho-

logical tests were often used as pre-employment tools within both the private and the public sectors. Standard-setting and training played an important role in the Joint Council's many programs and projects. The trade unions accepted MTM standards (Methods-Time-Measurements) as measurement tools for rate-setting and for defining "a fair day's work".

The Swedish model deviated from those of other European countries, where legislative measures received first priority. The models for occupation health services (OHS) included in-house OHS (large enterprises), OHS-area centers (small and middle-sized undertakings) and trade-OHS archetypes, such as for building and construction, farming and forestry (Forssman 1972).

Eventually, increased efforts by the labor market parties to enroll small companies in OHS proved successful. In 1988, 80 per cent of the Swedish working population – four million gainfully employed – was covered. Some 10,000 people, safety engineers, industrial hygienists, physicians, nurses, physiotherapists and behavioral scientists, for example, were employed in the OHS with a total annual budget of three billion SEK. This point in history marked the peak accomplishment of an OHS aimed at serving all gainfully employed persons.

Demanding Goals

Health surveillance of employees was part and parcel of company health promotion programs containing not only preventive technical, medical and psychosocial aspects, but also ergonomic requirements aiming at an optimization of the employees' work and work content (ALC 1989; Gerhardsson 1999).

Classical primary prevention is the prevention of any clinical manifestations of disease. Secondary prevention is the early detection and treatment of such diseases, and tertiary prevention is the avoidance of complications, including therapy and rehabilitation. Ergonomic targets go still further, covering physical overload in work (static and dynamic) as well as psychological load (mental over- and understraining).

For the most part people have been regarded as somewhat inflexible components in technical systems that are mainly focused on raising productivity and the technical quality of the product. Higher productivity has, in turn, determined what resources are available for social development in the community. This has resulted in the content of work being watered down in far too many cases: people have been forced to realize their human potential outside their work. Higher productivity has been partly achieved through greater standardization of manufactured products and further division of work, which has at the same time led to higher pay. The contribution of the employee has been defined in the same terms as for mechanical components: time, power, speed of movement, reach. Once the skilled worker has learned the pattern of the job, the opportunities for further development of his skills have often been rather limited.

Research into job design and the organization of production has largely focused on studying the effects of attitudes, job motivation and job satisfaction. In a number of studies it has been shown that such subjective variables can be of

considerably more significance for production result than the physiological parameters previously investigated.

Technical Surveillance

In the technical field it is the engineers themselves who best understand the variables that influence technical change, so they therefore have particular responsibility for what happens. The role of the technologist today must not only be to solve technical problems, but also to contribute to the analysis of their human effects.

The relationship of working environment factors to health which should be covered may be subdivided into five main categories that may be quantified: level of activity (physical and mental), physical impact (noise, vibrations, radiation, electromagnetic fields, climate), chemical impact (fumes, gases), biological impact (micro-organisms) and social impact (man as a fellow being).

Thus, health surveillance is closely connected with the technical planning of each job. Consequently, technical health surveillance routines should cover industrial processes, equipment, instructions and work routines, and be based on the risk described and the exposure to the risk.

Occupational hygiene surveys and routine measurements are used to determine the workers' exposure and provide basic material for efforts to increase the quality of the work environment. Epidemiological studies need own appropriate strategies.

Technical supervision should involve all potential hazards and also include reliability assessment of protective systems. In the systematic management of technical surveillance of the work and working environment managers, safety engineers, doctors, trade union members and others are involved. The process-dependent parameters should be used to structure the preventive efforts.

Medical Surveillance

Medical surveillance is based on pre-employment medical examination, sickness absence surveillance, interviews after absence and periodical health reviews. The interval between the health reviews can vary and the updating depends on health status and working conditions. In many cases the nurse performs most of the examinations. Indications of, say, obstructive airways disease, are brought to the attention of the doctor. Further action is individually linked to the health status and working conditions, and preventive measures to be undertaken are individualized. Health screening schemes identifies highly susceptible individuals, such as those with obstructive airways disease.

Psycho-social Surveillance

The quality of life concept also has a "quality of working life" component. In a broad sense the quality of working life encompasses numerous factors: wages and hours, work environment, benefits and services, human relations, career and others. In a narrow sense it may be restricted to such positive individual values that can be gained by changes in work organization and increased work content.

As a part of health surveillance, work organization and work content are issues of increasing importance. Historically such aspects were defined as organizational problems to be dealt with by the personnel department and not a responsibility of the health and safety team. This philosophy is now changing. The need for consistency and a closer connection to individual life style make assistance from the health team important. However, quality of working life issues must be understood in the historical perspective, particularly with regard to the national economy and culture.

Stress reaction is the common name for physical and/or mental deviation from the body's condition of equilibrium. Stress at work is caused by both under- and overloading. The experience of stress has positive as well as negative aspects (Hagbergh 1960; Levi & Levi 2000).

All jobs need to have a structure that the individual knows and has become used to. If this underlying stability is missing, tasks are experienced as insecure. The demand for stability varies considerably from one individual to another. Some people prefer relatively monotonous work, where everything that can occur is known about in advance. Others want a greater element of unexpected situations. While they are young, people often accept less interesting work if it is well paid: pay is more important than job satisfaction. At later stages of life pay is often not so important; it is then more important to realize one's aptitudes. The work has become routine, and there is nothing more to be gained as far as the content is concerned.

Job enrichment, that is to say, assigning extra tasks, has shown itself to help some people, but it can cause stress for others. However, the values of many people change over the years. Such changes are linked to the individual and consequently of importance in health surveillance.

Various attempts have been made to adapt work organizations to technical changes, but much remains to be done. Important questions are the distribution of responsibility and authority. A functional division of production used to be the predominant pattern. Various types of group or teamwork have been tried: for example, the production flow can be split up among a number of parallel workgroups. This makes the work less tied and provides longer work cycles.

Maintained Efforts

The negotiating parties have maintained this community of interest over many years through the conclusion of revised and supplementary agreements. This cooperation on the labor market came under heavy attack in the 1960s and 1970s from opponents of confrontation politics, groups of environmental activists and others. The concept of profitability was singled out as a special target of attack.

However, by the 1980s the negotiating parties – now three in number with the addition of the Negotiation Cartel for Salaried Employees in the Private Business Sector (PTK) – formulated a joint program for the 1980s and ratified it through several agreements. Three of these agreements are noteworthy in this context:

- The Development Agreement (1982),
- The Equal Opportunity Agreement (1982), and

- The Work Environment Agreement (1983).

The Development Agreement identified the development and promotion of the efficiency of private companies, and the safeguarding of employment as issues of common interest to companies and employees alike. With the conclusion of this agreement the parties expressed their desire to promote the efficiency, profitability and competitive ability of private companies, to create conditions favorable to the maintenance of employment levels, job security and satisfying and meaningful job content. As in other quality programs, it required the active participation of all employees at a company. Work and the work environment were to be structured to reflect the statutory and negotiated requirements for a good working environment. The organization of work and the tasks allotted to the individual should be designed to ensure that the work assigned to the employee was as interesting and stimulating as possible. The employer was required to give an account of the considerations motivating the introduction of new technology, to list the technical and financial consequences, and to review its impact on employment and the environment. In many cases, this process required the participation of skilled experts.

The Equal Opportunity Agreement set out the objectives and guidelines for the promotion of equal employment opportunities. The agreement stated that the promotion of equal opportunities for men and women were an important objective. This applied to salaried staff and wage-earners alike.

The Work Environment Agreement contained the rules governing activities related to the work environment, guidelines for company health programs and an agreement on occupational training. The agreement stated that a corporate health program should consist of a technical and medical section, both with special emphasis on the psycho-social element. Staff manning the company health program should perform their work on the basis of a scientific approach and proven experience under the supervision of a joint industrial safety committee or company health program committee. Emphasis was placed on preventive action and rigorous precautions should be taken to assure the impartiality of company health programs. Issues related to the interpretation of the terms “scientific approach” and “proven experience” were referred to a national-level scientific committee for resolution.

As an example of the integrative ambitions, the LO reported that it had graded all their 2.1 million members on a point scale for purposes of wage statistics. The point system took into consideration the nature of the work and a variety of environmental factors. The points were added up to provide a total to indicate level. The task of grading all members took five years. Each occupation was graded using following scales:

1. Intellectual effort and concentration (1–3 points)
2. Occupational responsibility and hazards (1–5 points)
3. Person-to-person relationships (1–3 points)
4. Job variation (1–4 points)

5. Physical effort and mental stress (1–4 points)
6. Physical environment (1–4 points)
7. Skill, educational background (1–15 points).

A room maid in a hotel was graded at 14 points on the scale, a boilermaker in the construction industry at 23 and a professional driver at 25 points.

The Emergence of a New World of Work

Throughout the developments presented above Sven Forssman was the foresighted promoter, and he was able to spread his message through many channels (Forssman 1952, 1960, 1974; Rantanen 1992). In 1957 the ICOH endorsed his proposal the organize scientific sub-committees. In a short period of time the number rose to more than 20 such scientific committees. They managed issues from daily safety and health to long time aspects of ageing and work (ICOH 1986).

In 1966 Sven Forssman left the Swedish Employers Association for a new challenge. In that year the Swedish Parliament decided that the main organizations in the Stockholm area should be transferred or coordinated into a new Institute of Occupational Medicine, and Sven Forssman was selected as Director General of the institute. He was also elected to formulate programs for a new Swedish Fund for workers protection paid by enterprise levies (Forssman 1970).

In the reconstructed institute about 50 per cent of the capacity was devoted to research, 30 per cent to teaching and 20 per cent to service. The institute was organized into departments covering five main areas: medical, technical, physiological, psychological and sociological, and a number of interdisciplinary working teams. Early diagnoses, multifactorial causes and epidemiology were new perspectives. The institute divided the research projects into four groups: occupational hazards; special working methods or production processes; work adjustment; and vulnerable occupational groups.

The state's contribution to the financial support of a better working environment at large was manifested in 1972 in the establishment of the Workers Protection Fund, financed by employer levies (Oscarsson 1997). Of the fund's annual budget, two fifths covered the cost for the National Board of Safety and the Institute of Occupational Medicine. During its existence, 1972–1992, the fund distributed more than 10 billion SEK. The three main sectors were research and development, education and training, and state-run institutions. To the contributions from the Workers Protection Fund was added the temporary Swedish Working Life Fund 1990–1995, also financed by employer levies, which initiated 25,000 projects for workplace development. The total costs of the latter, individual employers additional costs included, were around 33 billion SEK. Here the workers particular knowledge was highlighted in concept-driven changes of different types. The models included expert-, technology-, design- and communication-driven changes.

The rising welfare increasingly changed the expectations of jobs and the working environment. To the demand for safe and healthy conditions at work were added comfort and job satisfaction. Efforts were taken by industry in order to improve the working conditions and to change the organization of work to make jobs more attractive. Practical tests were undertaken in several factories and different new methods combining increase in production with job satisfaction were evaluated. In 1975 SAF presented conclusions from 500 experimental projects in Swedish companies from 1969 to 1974. Workers' participation, new forms of supervision and job re-design were set in motion (SAF 1975). New tools from the quality movement came into use. In these workplace studies OHS criteria were frequently used but not always in the terms set down by the less flexible standardized texts.

Sven Forssman was an innovator and pioneer who was well aware of forerunning paradigm shifts (Smith 1988). He left the Swedish National Institute of Occupational Medicine in 1972 for new, summarizing and concluding duties, mainly global (Forssman 1959, 1985, 1986). His many appointments as consultant to the WHO 1950–1972 at WHO headquarters and at the Regional Offices for Europe, Middle East, Far East and Western Pacific, ended with a permanent post for Europe, 1973–79, at the WHO office in Copenhagen. He also served as a consultant for Latin America and England, 1979–1982, linked to ILO's regional offices. As an honorary member of the ICOH, he maintained close contact with ICOH activities. In reports and articles he recounted the progress at all levels, targeting research, service and teaching; new institutes, occupational health centers and company health services. Long-term and short-term needs were evaluated and coordinated. The comprehensive teaching programs, in university-based and other institutes and in companies, included manpower training, undergraduate, graduate and postgraduate courses, training in team work, continuous education and training. Different approaches to the introduction of occupational health and safety concepts to workers were tested and evaluated at both high and low levels of industrialization.

Realities of Tomorrow

The political pressure in force in Sweden from the middle of the 1970s ended the Saltsjöbaden era (Thörnquist 2003). The authorities became more policing and executed harder sanctions. During the first part of the 1990s and with the employers as driving forces, the central agreements between the labor market parties were successively dissolved. However, the labor market parties did maintain their cooperative spirit, but from 1993 mainly on the local levels.

To his more static opponents Sven Forssman replied that the visions of today were the realities of tomorrow (Frick et al. 2000). He maintained his belief in the progressive strength of the ILO/WHO definition of occupational health which was further extended in the UN Agenda 21. However, in its fulfillment two trends diverged and needed to be harmonized: the production-integrated ergonomics exponential progression and the arithmetic, step-by-step, changes of the legal

standards. The regulatory standards procedures were too rigid and lagged too far behind. Here the ICOH still had an important role to play (Gerhardsson 1999, 2003; Levi & Levi 2000; Levi 2002).

"Think globally and act locally" was a slogan introduced in 1992 from the UN Agenda 21 document on environment and development. Agenda 21 mirrored current demands and future goals. At the local community level, four needs were to be integrated: physical, psychological, ethical and existential (Nynäshamn 1995; Gerhardsson 1999). This brings many different activities to the fore. The role of OHS, to promote research, information, education and service, is not easily profiled. A current goal in Sweden is to integrate OHS with management development and business (AMF 1988; LO, SK & Vinnova 2002; Thörnquist 2003).

Some important work related aims to be strived for currently in Sweden may summarized in four major points:

A. The Remoteness and Discontinuity of the Technological Society

High-technology society does not have much in common with agrarian society. One common feature, however, is the reactions and behavior of people. To people in a technological society the remoteness of their fellow men, the discontinuity of events, the lack of an overall view and interrelationships are often frustrating experiences. Many people feel alienated in their own society. Technical progress is the result of man's talent for solving problems, his capacity for creative thought; it is strange that the resulting technology is so often considered to be man's curse.

B. The Value of Work

Work did not carry much status in earlier societies. Work was for slaves, not for free people. Work was long considered to be a necessary evil. It has sometimes been assigned an altruistic value, as a way of serving one's fellow men. But not until the materially rich society evolved did work in itself become a means whereby the individual could realise himself.

Work as a necessary evil can be performed with the same degree of acceptance in the pre-technological and the technological society. Work as a means of serving one's fellow men is not necessarily dependent on the form of organization, either. But work as a means of realizing oneself requires definite prerequisites, perhaps particularly of a material nature. A poor society has little opportunity of satisfying the numerous different individual potential requirements of its citizens.

The division and distribution of work concerns both individuals and groups of people. In an organization it is easy to see that vertical and horizontal distribution of work may be both socially and technically conditioned. A suitable social division of work may increase efficiency in a given production process. Technically conditioned division of work is often an inevitable result of the technique selected. Such prerequisites often determine rather inflexibly the conditions for work organization.

The distribution of work known as Taylorism, after its originator, was based on the assumption that scientific laws govern the organization of work. This resulted

in the first large-scale production systems, and the railway and telecommunications networks, which in a short space of time coordinated both times and duties across continents. In the old trades, the same person performed all the work operations himself. Professional skill, judgment and initiative could immediately be given weight, importance and appreciation. In modern routine repetitive work the duties are often limited in content, sometimes to the point of meaninglessness.

C. Forms of Work Organization

Various attempts have been made, perhaps particularly in Sweden, to counteract the schematic division of work through new forms of organization leading to better coordination, comprehension and independence. The assembly line can be broken up so that cycle times and scope for shifting between different work operations increase. Relatively autonomous groups permit greater variation of work operations in the format of the small group.

Human-relations research studying the relationship between job satisfaction and productivity have found that democratic forms of leadership and group decisions improve work efficiency in terms of the group. This is a less authoritarian alternative to the agrarian society.

Modern socio-technology endeavors to combine the kinds of technical and social systems which do not go as far in work division as the Taylor school did. Socio-technology has also sometimes worked successfully with ergonomic criteria.

The social system conditions the relations between the people forming part of the organization. The technical system determines the relationship between people, physical planning and work organization. Ergonomics adapts work to man by taking into account the capabilities and limitations of man. Ergonomics is an aid in humanising efficiency requirements which without it would easily become far too one-sidedly production-oriented.

D. New Technology – New Options

In theory, new technology gives us more options than earlier technologies permitted. We should accordingly be able to make both large and small organizations more human. However, the fact shall not be concealed that the mechanisms of the technological society are not easy to combine with the conventional characteristics of man.

New techniques, which have a short lifespan, are replaced by new versions that require further training and sometimes re-education. For this reason great attention has been paid to the learning process in educational connections. The learning curve illustrates the ability to absorb a new technique. Techniques are easy to learn purely theoretically. It is an interesting and all-absorbing experience. Those who apply a new technique can often pick up its use faster than the innovator. The showpiece products of the industrialized countries are now often made better in the developing countries and learning has not caused the major problems it was at first believed would arise. Entirely new branches of technology have sprouted up in a short space of time.

However, the willingness to adopt anything new is limited among ordinary people. Better the devil you know, than the devil you don't. Old, engrained traditions maintain a strong grip on people. In the industrialized society attempts are made to teach people to like variability: there is more security in a company which is changed by new ideas than in one which is rigid and static.

An industrial research scientist, Sir Jeuan Maddock, UK, once said that a tradition-preserving attitude is the same as suicide to companies practicing it. He considers it more important to study the forgetting curve than the learning curve. The reason is that the forgetting curve is too long in large bureaucratic organizational structures. The small new companies are successful because they have nothing to forget. Developing countries now undergoing industrialization have no old factories to pay off.

In the industrialized countries there is now a large surplus of old factories, abandoned machines and a great number of employees with the wrong skills and knowledge, all less suitable for the future. New companies, wherever they exist, can acquire up-to-date equipment and be sure of obtaining optimally-trained personnel and a suitable organized and practical staff that is ready to accept change from the outset. Large companies try to overcome their large inherent inertia by creating independent subsidiary companies. The number of large organizations is increasing, however, and it is therefore fairly important to devote special attention to the requirements of efficiency in the larger organizational systems.

References

Ahlmark A. & Volontis S. (1946) "Medical aspects on shift work" *Teknisk Tidskrift*, 533–537 [Swedish].

ALC (1989) *The Saltsjöbaden Agreement 1938–1988*. Hälsingborg: Schmidts Tryckeri [Swedish].

AMF (1988) *Participation in Development*. Stockholm: Arbetsmiljöfonden.

Andréasson R. & Bäckström C.G. (2000) *The Seat Belt. Swedish Research and Development for Global Automotive Safety*. Stockholm: Vattenfall.

CPA (1978) *The Council for personnel administration 1952–1977*. Stockholm: Kugel Tryckeri [Swedish].

Forssman S. (1952) "Industrial Medicine in Sweden. Recent Experiences and Future Problems" *Arch Ind Hyg Occ Med,* 6:407–415.

Forssman S. (1957) *Elderly people at work. Occupational mobility and old age. Socio-medical aspects in Sweden*. Stockholm: SAF [Swedish].

Forssman S. (1959) "Industrial health in industrial and non-industrial countries" *J Occ Med,* 1:15–20.

Forssman S. (1960) "Occupational Health. Recent Trends and Future Problems" *J Ind Med Surg,* 29:511–514.

Forssman S. (1965) *A study of absence in Swedish Industry*. Stockholm: SAF [Swedish].

Forssman S. (1966) "The present international situation and the probable future development of occupational medicine" *Proc Int Congr Occ Health,* Vienna 19–24 Sept, 1966. Pp. XV–XXVI.

Forssman S. (1970) "The Institute of Occupational Medicine. Three years experiences from a new organization" *Läkartidningen,* 67:2641–2654 [Swedish].

Forssman S. (1972) "Occupational Health in Sweden" *J Occ Med,* 14:138–145.

Forssman S. (1974) “Industrial Medicine in Sweden and in the United States” *J Occ Med,* 253–261.

Forssman S. (1985) *Occupational medicine in Europe in the 1980s*. Occupational Health Series. Stockholm: SAF.

Forssman S. (1986) *The working environment in transition*. Stockholm: Almqvist & Wiksell [Swedish].

Forssman S. et al. (1961) “Health problems in underground factories” *Proc Int Congr Occ Health ICOH, 1961*.

Forssman S., Gerhardsson G. & Masreliez N. (1966) *Occupational Health Service*. Stockholm: Andrén & Holms Boktryckeri [Swedish].

Frick K., Jensen P.L., Quinlan M. & Wilthagen T. (eds.) (2000) *Systematic Occupational Health and Safety Management: Perspectives on an International Development*. Oxford: Pergamon/ Elsevier.

Gerhardsson G. (1999) “From reactive to proactive prevention” In: Grieco A., Iavicoli S. & Berlinguer G. (eds.) *Contribution to the history of occupational and environmental prevention*. Pp. 87–98. Amsterdam: Elsevier.

Gerhardsson G. (2003) “OHS in Sweden – The Land of Associations” In: Grieco A., Fano D., Carter T. & Iavicoli S. (eds.) *Origins of Occupational Health Associations in the World*. Pp. 217–236. Amsterdam: Elsevier.

Hagbergh A. (1960) *Accidents, man, work environment*. PA rådet Rapport Nr 23. Stockholm: PA rådet [Swedish].

ICOH (1986) “Celebration of the 80th Anniversary of the ICOH” *Med Lavoro,* 77:573–612.

Levi L. (2002) *My life with stress*. Stockholm: Natur och Kultur [Swedish].

Levi L. & Levi I. (2000) *Guidance on Work Related Stress*. Luxembourg: Office for Official Publications of the European Communities.

LO, SK and VINNOVA (2002) *The Problems of Working Life in Turbulent Creativity*. Stockholm: SK [Swedish].

Nynäshamns kommun (1995) *Directive for Health Promoting Work in Nynäshamn*. Nynäshamn: Nynäshamns kommun [Swedish].

Oscarsson B. (1997) *25 years of renewal of working life, 1972–1997*. Stockholm: Rådet för arbetslivsforskning [Swedish].

Rantanen J. (1992) “Occupational Health Services in Europe” *NIVA Nordic News Letter* 4:2–6.

SAF (1975) *Job reform in Sweden. Conclusions from 500 shop floor projects*. Stockholm: Grafisk Reproduction.

SIF (1938–1966) *Annual reports 1938–1966*. Stockholm: Civiltryck [Swedish].

SIF (1968) *The National Institute of Public Health 1938–1966*. Stockholm: Civiltryck [Swedish].

Smith F.R. (1988) “A paradigm for perspective. Occupational medicine in a deregulatory era: The beginnings, 1835–1970” *J Occ Med,* 30:425–428.

SOU 1937:31, *Report proposing a national institute of public health*. Stockholm: Nordiska Bokhandeln [Swedish].

SOU 1973:55, *Scientific, behavioural research on working life*. Stockholm: Liber [Swedish].

Thörnquist A. (2003) “The development of the ‘Swedish Model’ for co-operation in occupational health and safety, and the joint industrial safety council as its main association” In: Grieco A., Fano D., Carter T. & Iavicoli S. (eds.) *Origins of Occupational Health Associations in the World*. Pp. 237–253. Amsterdam: Elsevier.

Part IV
Global Perspectives on Health, Old and New

11: Health in the Era of Molecular Medicine – An Historical Perspective

Alfons Labisch, Institute for the History of Medicine, Heinrich-Heine-University, Düsseldorf

The Enigma of "Health" – Introduction

Health is an enigma. Georges Canguilhem labeled it "a life in the silence of the organs (*Leben im Schweigen der Organe*)" (originally a dictum by the French surgeon René Leriche, quoted in Georges Canguilhem 1974, p. 58) – a nice but intriguing formula that has been adopted by many others (Gadamer 1993). "Health" cannot be grasped. Nevertheless, everybody wants to be healthy at almost every stage of her or his life. Health always takes one of the top positions among all social values and private wishes. There is a myriad of literature about health. One characteristic of this genre is that the topic is dealt with in nearly hermetic circles that take hardly any notice of each other – be they in social science, in the humanities, or in everyday life. This is a first hint at the fact that "health" always subsumes other questions to be dealt with, more than seems to be the case in "pure" scientific discourse.

It is just as interesting as it is difficult to cut a path through the jungle of knowledge, desires and needs called "health". However, the interrelationship between medicine and health helps to determine an orientation in the possible contents of this term. To examine this interrelationship in history presents us with the specific task of paying attention to the dimension of time – which is of course the main dimension of history, but which is also an important dimension of any possible meaning of health (Koselleck 1979, 2000, for the history of medicine, Labisch 2001b). Looking for the complex interrelation of medicine, health and society in history is always fascinating – as our societies[98] and our network[99] both imply. But facing the dramatic changes in science and society it seems to be – as a sort of applied history of medicine – especially fruitful to change perspectives and – while drawing some "lessons from the past" – to look for the "challenges of the future" (as the motto of this conference implies). So what deserves to be explicated here is an historical comparison that goes beyond the current processes. We are now facing a new era in which the old foil of a cellular-bacteriological concept based on physiology and biochemistry is being replaced by a new foil of the subcellular molecular concept. The main focus will be the question of the dynamics and dimensions of these leading ideas. With a glance at the interdependence of health and society, some conclusions will be drawn from our small medico-historical mind-game: What can the current, still more or less hidden, concept of

[98] European Association for the History of Medicine and Health; Society for the Social History of Medicine.

[99] The International Network for the History of Public Health.

"molecular health" mean in a globalized world? Our discussion will be summarized under the aspect of the general rationalization of modern life.

From Bacteriology to Constitutional Hygiene, from Genomics to Proteomics – an Historical Comparison

In the following section, two secular changes in medical concepts[100] will be compared: the development from bacteriology to constitutional hygiene (*Konstitutionshygiene*) is an historically completed process. This process may serve to shed light onto the current change in molecular medicine from genomics to proteomics. This is equally true for the scientific concept and for its effects on the everyday world, because our life today is in every respect hygienically and bacteriologically improved (as Anne Marie Moulin would probably say, our world is "pasteurized"). So what happened in the years following 1880, when the seemingly simple and clear concept of bacteriology was first developed scientifically in a revolutionary step and then became an integral part of our daily lives? What – and this is exactly our little medico-historical mind-game (or should we say: thought experiment) – can be expected when something similar happens to our current, equally simple and clear concept of genetics?

Bacteriology (ca 1880 to 1910) and the "Homo Hygienicus"

The Bacteriological Concept of ca 1880. In the 1880s, Robert Koch (1843–1910) proceeded on the assumption that there is a one-dimensional relationship between germs and disease: "Where there's a germ, there's a disease", and vice versa: "Where there's a disease, there must be a germ".[101] This linear concept of early bacteriology produced significant innovations (on the significance of Koch's discovery for the theory of science, see Carter 1985; 1991; Schlich 1996). Beyond science and clinical research, there is a specific notion of health inherent in every medical concept. Bacteriology therefore affected the perception and interpretation of individual and public health. Individual bacteriological health meant the absence of germs; public bacteriological health meant securing health by eliminating germs which may cause disease, or at least by breaking the chain of infection. The complex domain of public health was designed according to laboratory conditions; this led to the ideal type of the homo hygienicus exemplified elsewhere (Labisch 1992). With its scarce rules, bacteriology had an enormous impact on public and individual life as well and thus enormous public campaigns were also launched.

This one-dimensional interpretation of health – and by analogy also of disease – called forth massive criticism in medical science, in clinical practice, and even-

[100] A "medical concept" – in accordance with Karl Eduard Rothschuh's magnificent masterpiece *Konzepte der Medizin* – is here defined as a coherent scientific theory and medical practice of a physiology, a pathology, and therapy (see Rothschuh 1978).

[101] This linear theory is the fundament of the famous Koch postulates. These postulates may be summarized as follows: 1.) The germ can be found in every case of disease. 2.) The germ must be isolated and cultured. 3.) The germ causes in case of over-vaccination the same disease and has to be newly extracted from the vaccinated animals.

tually also in scientific hygiene and in public health. With this a discussion started in which the initial concept of bacteriology was continually complemented and expanded. Such a development represents a model (*Lehrstück*) of both medical history and theory of science which cannot be described in detail here. Yet it should be noted that even those attempts in therapy which were conceptually conclusive led to a scandal – the failure of Koch's tuberculin in 1890 (Gradmann 1999a, b, 2000, 2001).

The Bacteriological Concept of ca 1910. The bacteriological concept of ca 1910 is characterized by the fact that all possible factors in the interplay of germs and hosts were regarded as dynamic, both by themselves and in their interplay. The virulence of germs varies from harmless to life-threatening. The influence of (microbiological) vectors or of the environment, respectively, varies from negligible to constantly pathogenic. Finally, the disposition of a potential host varies from immune to highly infectious. Moreover, there is a mutual influence of germ, vector and host. The model disease from which these results – including the phenomenon of the "healthy germ carriers" – were obtained was tuberculosis, which in those days was scandalized as "the proletarians' disease". The result of rather fortuitous tests was that, although one hundred per cent of the population, i.e. everybody, was infected with tuberculosis germs,[102] only a very small percentage fell ill with tuberculosis in the course of their lives, and an even smaller percentage died of it.[103] The phenomenon of the "healthy germ carriers" was confirmed in the campaign against endemic typhoid during the first decade of the twentieth century (e.g. Anon. 1912; Drigalski 1948).

As a consequence, the medical basic concepts, the understanding of exposition and disposition, and finally the understanding of individual and public health developed from static to dynamic forces. In the 1890s a dynamic concept of the interrelationship of disposition for a certain disease and its cause developed (Hueppe 1893; for a summary, see Hueppe 1923). A generation later, Ferdinand Hueppe (1852–1938) was able to recapitulate (Hueppe 1925, p. 10):

> In this sense, no normal and pathological life process, no disease is a fixed state of affairs, "status", but an energetic process, "processus", and as such a function of variable factors, i.e. of variable pre-disposition or disposition as cause, of variable triggering impulses or germs or of variable external conditions.

These dynamics in the interplay of germs, vectors and human beings can be studied again today (to the misfortune of the people concerned, especially in

[102] Cf. Naegeli 1900. All corpses examined were infected with tuberculosis, but only in a few cases was tuberculosis known as manifest disease.

[103] On the significance of tuberculosis in the transition from infection to epidemic theory, cf. especially the work of Adolf Gottstein: Cf. Koppitz & Labisch 1999. On the socio-historical significance of tuberculosis, cf. Condrau 2000.

Africa) in a particularly dramatic way in the return – or, as malariologists say, in the "rollback" – of malaria.[104]

Molecular Medicine (ca 1980 to ?) and Molecular Health

The Genetic Concept of ca 1980. After a leap in time of roughly 100 years the concept of molecular medicine regains attention. Since the 1940s the genetic credo has been as follows: A gene encodes a protein, a given protein presupposes a gene – or to put it in clinical terms: a gene encodes a disease, or a given disease presupposes a gene, respectively. The human organism therefore is the realization of its genetic program, and there is a strict hierarchy from gene to organism.

As has been shown above, every medical concept carries a specific interpretation of health. From the genetic dogma of that time follows a one-dimensional understanding of individual and public health. Disease cannot exist when genes are in perfect order. If this is not the case, individual and public means have to ensure that the genetic handicap of diseases be eliminated or at least be kept from spreading.[105] This clear and neat concept of early genetics, too, had a major impact on science, on medicine and on the public. The consequence, again, was a one-dimensional understanding of individual health (health equals genetic norm) and public health (implicitly and partly explicitly, eugenics). These poor ideas of "a gene for [...] (this or that disease)" led as well to exaggerated hopes of clinicians (e.g. gene therapy) as well as to groundless fears of the public ("cloning" as the demanded or horrible replication of individuals).

The Genetic Concept of ca 2010 – Emerging since 1995. With another time warp we leap into the year 2010. If what happened to the early concept of bacteriology were repeated, what would the concept – not of genetic but of molecular – medicine look like in the year 2010? In protein analysis a new understanding of the interplay of genes and environment has become apparent since the middle of the 1990s, but at first only for the expert.[106] There are two examples: through splicing or RNA editing different information may emerge on the way from the actual gene (DNA) to the messenger-RNA, which may lead to different proteins. These events are probably controlled by metabolic processes which means control from

[104] According to the WHO reports there were 1.1 million casualties (fatal cases) in 1998; the annual incidence was 273 million. Africa, with an incidence of 238 million has almost reached the initial rate of the early 20th century. According to recent research by MIM (Multilaterale Initiative on Malaria), even these dreadful figures are underestimates by far (Keusch 2001).

[105] The more or less explicitly voiced and apparently unavoidable health-related utopias of genetics and the eugenic conclusions drawn from them are frequently addressed in the literature. Among many others, see Dunn 1962; Kevles 1985; Wess 1998; Silver 1998; Kitcher 1998. See also, Paul 2001; 2003; Paul and Ganten 2003.

[106] A definition: A genome comprises the entire genetic information of an individual. Each cell contains a complete copy of the genome. The term genomics circumscribes the characterization and the sequencing of the genome as well as the analysis of the relationships between genetic activity and cell function. A proteom includes the whole protein profile of a given cell or tissue at a given time. The term proteomics circumscribes the systematic analysis of the protein profile of healthy and diseased tissue with reference to the respectively active genes. On the development and the state of the art in proteomics, see Burley et al. 1999; Maelicke 1999; Williams 1999; Lander and Weinberg 2000.

the outside. In addition, a protein sequence may split after its production into different proteins (posttranslational modification). These may in turn influence genetic control. This means that there is a spatial and temporal coordination of the production of proteins that cannot be explained from the genetic set of a cell, the so-called "genome". Let us take an example: pupa and butterfly have the same genome. Our focus thus turns from "genome" to "proteome" and hereby to the analysis of the interplay among genes and proteins with a special awareness to the epigenetic dynamics of molecular phenotypes (Pandey & Mann 2000).

The question of genetic factors and actual real-life manifestations of fatal diseases illustrates how problematic the genetic perspective on predominant diseases in clinical medicine will become. For instance, what should women who carry a breast cancer gene do? Although the chance of actually falling sick during one's lifetime is very high, nobody can tell the exact point in time when this is going to happen. (By the way, this is just another aspect of time in conceptualizing health.) What is going to happen to women who have to face life with such knowledge? What is going to happen within their families? What is going to happen to their daughters (and mothers)? And what advice should the doctors give? In other words, are those women healthy? Are they sick? Are they ill? Are they handicapped? Are they at least "healthily ill" (Hubbard & Wald 1993; Lerner 1999)?

Even the phenomenon of the healthy carrier of "bad genes" is repeated. Often the phenotype does not correspond to the (pathological) genotype. So apparently, the genetic makeup of organisms is able to adapt dynamically to defects, risky behavior, and environmental pressure (e.g. the myoglobin-knockout-mouse which is as lively as any other mouse) (Goedecke et al. 1999a, b). This has important consequences for securing individual and public health, only very few diseases can be explained monogenetically; major diseases and causes of death, such as heart or circulatory diseases and malignant formations, can only be explained epigenetically. And, although it is quite obvious, we may state here that epigenetic processes are the classical area of public health.

To take this analogy to the bitter end: We have to record at least one scandalous therapeutic attempt that failed. Jesse Gelsinger died unnecessarily in September 1999 at the Institute of Human Gene Therapy at Pennsylvania State University, Philadelphia because of an exaggerated attempt at genetic therapy. A conceptually conclusive gene therapy does not yet exist (although we know from several case-histories, that the model works on natural bases). Just as in bacteriology, the development of a conceptually conclusive therapy will probably take much longer and will, maybe, as in the case of penicillin, only be discovered "accidentally".

What follows from these rapidly changing methods in molecular medicine is that the individual distinctiveness of a gene on the one hand and the behavior of individuals and the influences of the environment on the other hand must be perceived and evaluated in a completely new form. There is no causal programmatic and hierarchical relationship between genome and organism; there is no genetic determinism. Rather, gene control takes place in an interaction between genetic and epigenetic factors. Gene, individual and environment thus must be

understood as equal factors. As genes have just been mapped by the HGP, gene control through behavior and environment will be one of the main areas of research – and at least the concept of "gene" (in German *Gen für*) will be called into question (Beurton 2000).

As an analogy to Hueppe's résumé of the situation at the turn to the twentieth century cited above, we may therefore formulate the situation today at the turn to the twenty-first century:

> Every normal and pathological course of events in life is not a permanent state that is predisposed in the human genome, but rather a lifelong process; and as such it is a function into which the genetic predispositions, the variable behavior and the variable environmental conditions enter as factors.

Health, Medicine and Society in a Globally Industrialized World

Change in Society, Change in Medicine

Health is defined in a categorical way. It has to be filled with new meanings from different points of view, depending on the given time and social context. The only distinguishing feature of similar categories – such as time or money – is that health can in some form be related to a given biological basis, the "biological material" of human behavior and action, which in itself is conceived and shaped in contingent and historically conceptualized forms.

So the question is now: How does the new concept of molecular medicine interrelate to the new cosmology of life and work in a globalized society? How does the new computerized and molecularized *Aussen-Welt* – usually labeled as "nature" – interfere with the globalized *Mit-Welt* – usually labeled as "community" or "society" – and the genetically individualized *Innen-Welt* – usually labeled as the "I and me"? (For a revised version of this philosophical-anthropological concept, see also Labisch 1992, 1999.) For people, the new forms of work and life mean growing spatial and social mobility. In the work process, an externally pre-determined positional discipline has been replaced by a task-oriented functional discipline. A good example of these processes is the production of cars with the development from the production line of the 1930s that lasted until the 1960s to today's group production of automatically pre-built modules. Production line work is now mainly carried out by robots (unless it is cheaper to have it done by the new laboring class of the "developing countries". E.g., Nike, Esprit and comparable labels exist only as registered names and not as industrial facilities). Classical industrial "blue-collar work" will decrease to less than ten per cent, while media- and data-processing "T-shirt-work", as I refer to it here, will increase to more than one third of the labor force. (The other third are employed in services.) The leading kind of human work means today regulating, controlling and processing information. The "blue-collar-worker" of a stratified "fordian" society and the "T-shirt worker" of the so-called "post-modern" society are quite different people.

Social discipline is individualized to an extent and scope hitherto unknown. In work and everyday life the demand on individually displayable communicative skills and performance is constantly growing. Consequently, the demand on predictable psychic, mental and social capacity and, therefore, on a newly evaluated form of physical capability is also growing. It is this kind of health that becomes a value to all people who want to participate in this new world. So for the twenty-first century a new panorama of diseases is to be reckoned with. The new "morbidity", the wide field of psycho-mental disorders including addiction and violence, will grow in importance. This development occurs alongside the growth of the illnesses of the elderly and newer maladies (e.g., AIDS, HIV), as well as the recurrence of older infectious diseases (e.g., tuberculosis, malaria). In any case, classical public social insurance schemes have been implemented to meet stratified risks ("class", "strata", "regular employment schemes"). This is especially true for public health measures, which are by definition related to groups, strata, and, as far as legal or political measures are concerned, to communities and/or society. As we have seen, the new risks are mainly individualized on a new concept of the biology of the body. How social policy and public health should react to this development has neither been discussed nor even noted up until now in Germany – and perhaps in other classical industrialized countries as well.

The Molecular Transition of Medicine

Modern data-processing is one of the main driving forces of globalization. Electronic data-processing also affects medicine. The results may be particularly noticed in all areas of imaging procedures – such as CT-Scanning, MRI, 3-D-Sonography, etc. This development leads to a virtualization of the patient. It also makes itself felt within the context of computer-guided apparatus in the form of so-called robotics in surgical techniques (e.g., stereotactic brain surgery). Moreover, medicine has shifted its scientific frame of reference to the so-called life-sciences, in particular to molecular biology. The molecular transition, which has been taking place since the 1980s, is yet another secular concept change in medicine following anatomy in the sixteenth century, pathology of organs in the seventeenth century, pathology of tissue in the eighteenth century, and cellular pathology and bacteriology in the nineteenth century.

In concord with the potential of data-processing, molecular medicine will change our understanding of human life. In the last couple of decades medicine has more or less followed the model of "exposition": diseases approach the human being from outside (e.g., bacteria, viruses, stress factors). Molecular medicine shifts this etiology from exposition, i.e. from the outer world, to disposition and thus to the (genetic) inner world of the individual human being. First, this means that dispositions to disease are internalized as biological fate. From this follows, secondly, that dispositions to diseases, hitherto understood as general risk factors, are individualized. And, thirdly, this implies that, on the basis of this individual genetic disposition, individual statistical risks become evident. In the cultural context of medicine this means that the obvious processes of individualization in

society (*Mit-Welt*) and self (*Innen-Welt*) are met by biological individualization (*Aussen-Welt*).

For the most frequent diseases and causes of death, these genetic risk factors, in turn, range from a negligible general risk to 100 per cent certainty. Moreover, the factor time, even with 100 per cent probability, is not predictable. The example of hereditary breast cancer has already been addressed. Still, diseases will soon be due to individually determinable handicaps. This individualization must be welcomed from the doctors'/practitioners' as well as from the patients' point of view. Instead of a general statistical risk, there is a personal risk; diagnosis and prognosis may be carried out on the basis of individual genetic probabilities. Finally, this has significant consequences for therapy: drugs will soon be produced according to specific genetic profiles, and coordinated in special groups, which are defined by so-called SNPs (Single nucleotide polymorphisms).[107] Pharmacogenomics will shape pharmacy as well as medical practice in an hitherto unseen individualized therapy. Finally, prevention will also change dramatically.

Molecular Medicine and Public Health

Thus, public health will also be scrutinized under the headings of molecular medicine. There is a myriad of international examples of how public health and the knowledge of inherited diseases interfere in history. Currently, the question is dealt with as a new kind of problem. What really is new, is the kind of knowledge available. Life sciences and molecular medicine seem to be paving the way toward a sort of biological engineering of man. These assumptions are based on the model of genetic determinism, which has been shown above to be obsolete.

Two main paths of public health intervention using molecular medicine are widely discussed: genotype-prevention and phenotype-prevention.[108] The prevention of risk- or disease-related genotypes involves, more or less, the old and well-known question of (collective) eugenics. For ethical reasons (eugenics in history, esp. NS-medicine) as well as for scientific reasons (genetic determinism), this is no real alternative. Phenotype-prevention is based on the knowledge of specific genotypes, tackled on the basis of group prevention both in behavior and in the environment. Some well-known examples are treatment of Phenyl-Keton-Uria (= PKU) and Haemochromatosis. Both diseases belong to the category hereditary

[107] For further detail, see the SNP-Consortium Ltd, built by the most important pharmaceutical companies of the world: http://snp.cshl.org/.

[108] Cf. Norbert Paul (2002b). In accordance with Paul phenotype- and genotype-prevention are defined as follows: Phänotypische Prävention bedeutet die Vermeidung von Gesundheitsschäden und Todesfällen in Personengruppen mit einem spezifischen Genotyp. Die Beziehung potentiell schädlicher, mutagener oder genotoxischer Umweltfaktoren mit menschlicher genetischer Varianz wird als Ausgangspunkt für Strategien genommen, in denen es a) um die Veränderung der schädlichen Umweltfaktoren und b) um eine Unterbrechung der schädlichen Interaktion von Umwelt und Genotyp etwa durch eine Veränderung des Genotyps geht. Genotypische Prävention hat zum Ziel, die Weitergabe risiko- oder krankheitsbezogener genetischer Eigenschaften von einer Generation auf die nächste zu unterbrechen. Beratung in der Familienplanung, genetisches Screening von Merkmalsträgern, pränatale Diagnostik, Abtreibung und – in ferner Zukunft – genetische Eingriffe in die menschliche Keimbahn stehen hierfür als Instrumente zur Verfügung.

metabolic diseases, which are among the best known hereditary diseases. Recent summaries of the results in managing these diseases in the long run with special diets are quite restrained.[109] Nevertheless, these diseases serve as a sort of a paradigm for future public health genetics and an applied healthy behavior. The main features of these public health procedures are a more or less compulsory genetic screening and life-long diets. These diets are the basis for the recently much acclaimed concept of functional food, nutriceuticals, which opens a new round in commercialized health food (Kellogg's then, Nutri-Food now).

All these developments are challenging the classical public health scene – a movement, that accidentally invented in the 1980s the term "*new* public health", now seems quite old. One of the very first scholars who discussed public health and genetics was Neil A. Holtzman from the School of Public Health in Baltimore (Holtzman 1989). After more than ten years of research (mainly on genetical screening), relying on the complex model of genotypes and phenotypes, quite recently he attacked the rising euphoria concerning gene-screening, predictive medicine and genetic prevention (Holtzman & Marteau 2000a, b):

> In our rush to fit medicine with the genetic mantle, we are losing sight of other possibilities for improving the public health. Differences in social structure, lifestyle, and environment account for much larger proportions of disease than genetic differences.

Julio Frenk is an international protagonist of the "new (?) public health" movement who has worked in WHO on reducing health inequalities and enhancing responsiveness to the legitimate expectations of the population and assuring fairness in financial contribution. He has thus dealt with all the classical new public health goals and procedures of today. In the early 1990s, he wrote:

> ... the biological sciences also contribute to understanding human populations. [...] biological sciences are just as essential to public health as are the social sciences, [and, summarizing his ideas in the nice phrase] Health is a crossroad. It is where biological and social factors, the individual and the community, and social economic policy all converge (Frenk 1993, p. 469).

So knowledge of life sciences and molecular medicine will disperse into the public. Within this general process people concerned will ask for the new diagnostic and preventive procedures discussed in the media. Molecular knowledge is already influencing behavior, mainly in the field of procreation. So, the most promising ways to go ahead are those which try to combine the growing knowledge on epi-genetic processes (e.g., NO, free radicals) with standard procedures in individual and public prevention. The problem is that many people in public health still do not accept the idea that health – including all notions of public health – always have a biological component. "In the Universe of Public Health

[109] See the quite pessimistic, Treacy et al. (1995): "Progress in the treatment of hereditary metabolic disease is thus better than it was, but it is still only a partial success. [...] Restoration of normal homeostasis, the key to successful treatment, remains an elusive challenge and is a logical, major focus for research in human genetics."

knowledge is based on applying biological, social and behavioral sciences", as Julio Frenk has written. Whichever departure point one chooses, nature/biology, society/sociology and the self/behavioral sciences, this field opens a special field of pragmatic history in public health, or, as may be seen from several examples, even of an applied history of public health. (This is especially observable in the history of public interventions, e.g., malaria.[110])

"Molecularization" as an Aspect of "Medicalization", Part of a General "Rationalization" of the Body – Conclusion and Summary

The consequences of the molecular transition in medicine, which has been mainly one of pure science up until now, will be the "molecularization" of individual lives and societal action (Paul 2002a). Our exploding knowledge in this case first appears as a threat. Dispositions to diseases have been transformed from the statistical probabilities of risk factors into an individual probability of actually falling ill with a particular disease and maybe even of dying of it. For some monogenetic diseases this even turns into individual certainty. Here, too, a basic characteristic of modernity is realized once again: Our expanding knowledge leads ever more events in life from the realm of "re" or "fate" to the realm of certainty, of knowledge, and thus to the inescapable "must" of deliberate and sensible action. In the future, the images of normality that are incorporated in our physiology and implicit in a new notion of health will be substantially bound to our knowledge of our own definitely individual genetically determined dispositions.

Basic knowledge of medicine and medical techniques affect society; they change both actions and behavior. Medical thinking and doctors' action have an immediate effect on both the social and cultural levels. Hygiene and bacteriology are prime examples of these processes: They have "hygienized" or "pasteurized" our environment and our behavior. In recent years the pharmacological possibilities of contraception changed sexual behavior in general, including the role of women. The transition to molecular medicine will change the individual life-spheres and the social world in a similarly fundamental way. Already today molecular genetics and clinical reproductive medicine influence the generative behavior of man. The technological potential to manage basic physiological processes influences our understanding of the end of life (e.g. "brain-death"). So the beginning and the end of life are in question again. Thus, in the end a genetic everyday life will become as real for mankind as the bacteriological life-sphere has become. The transitional phase will be characterized by great uncertainty. As soon as young people grow up into this genetic *Lebenswelt*, it will become fact and will be furnished in a way that as yet remains invisible to us.

Still, humans probably have ca 32,000 genes, and ca 400,000 proteins have been estimated to date. The gap between those two figures shows that there is a

[110] For the revival of ecological measures against malaria, see Takken et al. (1991); for the historical comparison of the concepts of bacteriology and of molecular medicine, see Labisch (2001a).

special link between the possibilities encoded in the genome and the infinite diversity of human phenomena. The linkage of genotype and phenotype does not become simpler, but ever more complex. Or, to say it as succinctly as possible: "the fewer genes, the more environment and behavior". It is exactly this complexity that lies behind replacing the term "genetization" (for this special concept, see, e.g., Gordijn 1998, p. 11; van Zwieten & ten Have 1998; Lipman 1998), which implies a one-dimensional relationship in the sense of a genetic determinism, by the multi-dimensional term "molecularization". "Molecularization" is only one further step in an all-encompassing "medicalization" of all aspects of life, including the birth of "volatile bodies", as Norbert Paul has termed the dynamic relation of gene, information and the body. "Medicalization" itself is in turn only one aspect of a "rationalization" of life in modernity. As the seemingly simple and shameful small genetic program of man has been revealed with the completion of the HGP, it will be the epigenetic processes – from protein patterns to the influences of behavior and environment – that will be the real problems in the future.

References

Anon. (i.e., Kirchner M et al.) (1912) Denkschrift über die seit dem Jahre 1903 unter Mitwirkung des Reichs erfolgte systematische Typhusbekämpfung im Südwesten Deutschlands. *Arbeiten aus dem Kaiserlichen Gesundheitsamte*, 41. Berlin: Springer.

Beurton P.J. (Hrsg.) (2000) *The concept of the gene in development and evolution. Historical and epistemological perspectives. Cambridge studies in philosophy and biology*. Cambridge: Cambridge University Press.

Burley S.K. et al. (1999) "Structural genomics: Beyond the Human Genome Project. Nature" *Genetics,* 23:151–156.

Carter K.C. (1985) "Koch's Postulates in Relation to the Work of Jacob Henle and Edwin Klebs" *Medical History,* 29:353–374.

Carter K.C. (1991) "The Development of Pasteur's Concept of Disease Causation and the Emergence of Specific Causes in Nineteenth-Century Medicine" *Bulletin of the History of Medicine,* 65, 4:528–548.

Condrau F. (2000) *Lungenheilanstalt und Patientenschicksal. Sozialgeschichte der Tuberkulose in Deutschland und England im späten 19. und frühen 20. Jahrhundert.* Kritische Studien zur Geschichtswissenschaft, Vol. 137. Göttingen: Vandenhoeck & Ruprecht.

Dunn L.C. (1962) "Cross Currents in the History of Human Genetics" *American Journal of Human Genetics,* 14:1–13.

Frenk J. (1993) "The New Public Health" *Annual Revue Public Health,* 14:469–490, 493.

Gadamer H.-G. (1993) *Über die Verborgenheit der Gesundheit. Aufsätze und Vorträge*. Frankfurt a M: Suhrkamp.

Goedecke A., Floegel U., Zanger K. et al. (1999a) "Disruption of myoglobin in mice induces multiple compensatory mechanisms" *Proc. Nat. Acad. Sc USA,* 96, No.18, Aug 31:10495–10500.

Goedecke A., Floegel U., Zanger K. et al. (1999b) "Disruption of myoglobin in mice results in activation of multiple compensatory mechanisms" *Circulation,* 100 Suppl. S, No. 18, Nov 2.

Gordijn B. (1998) "Genetisierung: Die wachsende Rolle der Genetik in der Gesellschaft" *Forum Public Health Forschung, Lehre*, Praxis 6, Nr. 22, Okt.:11.

Gradmann C. (1999a) “Robert Koch und das Tuberkulin. Anatomie eines Fehlschlags” *Deutsche medizinische Wochenschrift,* 124:1253–1256.

Gradmann C. (1999b) “Ein Fehlschlag und seine Folgen. Robert Kochs Tuberkulin und die Gründung des Institutes für Infektionskrankheiten in Berlin 1891” In: Gradmann C. & Schlich T. (eds.) *Strategien der Kausalität. Konzepte der Krankheitsverursachung im 19. und 20. Jahrhundert.* Pp. 29–52. Pfaffenweiler: Centaurus.

Gradmann C. (2000) “Money and Microbes. Robert Koch, Tuberculin and the Foundation of the Institute for Infectious Diseases in Berlin in 1891” *History and Philosophy of the Life Sciences,* 22:59–59.

Gradmann C. (2001) “Robert Koch and the Pressures of Scientific Research. Tuberculosis and Tuberculin” *Medical History,* 45:1–32.

Holtzman N.A. (1989) *Proceed with caution. Predicting genetic risks in the recombinant DNA era.* The Johns Hopkins Series in Contemporary Medicine and Public Health. Baltimore: Johns Hopkins University Press.

Holtzman N.A. & Marteau T.M. (2000a) “Will genetics revolutionize medicine?” *The New England Journal of Medicine,* 343, Nr. 2, July 13:141–144.

Holtzman N.A. & Marteau T.M. (2000b) “Will genetics revolutionize medicine? Reply” *The New England Journal of Medicine,* 343, Nr. 20:1498.

Hubbard R. & Wald E. (1993) *Exploding the gene myth. How genetic information is produced and manipulated by scientists, physicians, employers, insurance companies, educators, and law enforcers.* Boston: Beacon Press.

Hueppe F. (1893) “Ueber die Ursachen der Gährungen und Infectionskrankheiten und deren Beziehungen zum Causalproblem und zur Energetik” (Vortrag, gehalten in der 3. allgemeinen Sitzung der 65. Versammlung deutscher Naturforscher und Aerzte zu Nürnberg am 15. September 1893). *Berliner Klinische Wochenschrift Organ für practische Aerzte* (also: *Verhandlungen der Naturforschergesellschaft* I (also: Separatum, Berlin 1893)) 30:909–911, 944–950, 971–980.

Hueppe F. (1923) “Ferdinand Hueppe (Auto-Ergographie)” In: Grote L.R. (ed.) *Die Medizin der Gegenwart in Selbstdarstellungen.* Bd. 2. Pp. 77–138. Leipzig: Meiner.

Hueppe F. (1925) “Zur Geschichte der Sozialhygiene” In: Gottstein A., Schlossmann A. & Teleky L. (eds.) *Handbuch der sozialen Hygiene und Gesundheitsfürsorge.* Bd. 1. Pp. 1–70. Berlin: Springer.

Keusch G.T. et al. (2001) “The Intolerable Burden of Malaria: A New Look at the Numbers” *American Journal of Tropical Medicine and Hygiene*, Suppl.

Kevles D.J. (1985) *In the Name of Eugenics: Genetics and the Uses of Human Heredity.* New York: Alfred A. Knopf.

Kitcher P. (1998) *Genetik und Ethik. Die Revolution der Humangenetik und ihre Folgen.* München: Luchterhand (Orig: (1996) *The Lives to Come. The Genetic Revolution and Human Possibilities.* London: Penguin).

Koppitz K. & Labisch A. (eds.) (1999) *Adolf Gottstein. Erlebnisse und Erkenntnisse. Nachlass 1939/1940. Autobiographische und biographische Materialien. Mit einem Vorwort von Klaus und Ulrich Gottstein.* Berlin: Springer.

Koselleck R. (1979) *Vergangene Zukunft. Zur Semantik geschichtlicher Zeiten.* Frankfurt: Suhrkamp.

Koselleck R. (2000*) Zeitschichten. Studien zur Historik. Mit einem Beitrag von Hans-Georg Gadamer.* Frankfurt a M: Suhrkamp.

Labisch A. (1992) *Homo hygienicus. Gesundheit und Medizin in der Neuzeit.* Frankfurt a M: Campus.

Labisch A. (2001a) “Bakteriologie und Konstitutionshygiene – Genomics und Proteomics: Konzepte der Medizin und Konzepte der Gesundheitssicherung in Vergangenheit und Zukunft für die Zukunft” *Das Gesundheitswesen,* 63:191–199.

Labisch A. (2001b) “Von Sprengels ‘pragmatischer Medizingeschichte’ zu Kochs ‘psychischem Apriori’: Geschichte der Medizin und Geschichte in der Medizin” In: Frewer A. & Roelcke V. (Hrsg.) *Die Institutionalisierung der Medizinhistoriographie – Entwicklungslinien vom 19. ins 20. Jahrhundert*. Pp. 235–254, Stuttgart: Steiner.

Lander E.S. & Weinberg R.A. (2000) “Pathways of Discoveries. Genomics: Journey to the Center of Biology” *Science,* 287:1777–1782.

Lerner B.H. (1999) “Great expectations. Historical perspectives on genetic breast cancer testing” *American Journal of Public Health,* 89:938–944.

Lipman A. (1998) “The Politics of Health: Genetization Versus Health Promotion” In: Sherwin S. (Hrsg.) *The Politics of Women’s Health. Exploring Agency and Autonomy*. Philadelphia: Temple University Press.

Maelicke A. (1999) “Proteomic. Nachrichten aus Chemie, Technik und Laboratorium” *Zeitschrift der GDCh,* 47, No. 12:1433–1435.

Naegeli O. (1900) “Ueber Häufigkeit, Localisation und Ausheilung der Tuberkulose nach 500 Sectionen des Zürcherischen Pathologischen Instituts” *Archiv für Pathologische Anatomie,* 160:426–472.

Pandey A. & Mann M. (2000) “Proteomics to study genes and genomes” *Nature,* 405, June 15: 837–846.

Paul N.W. (2001) “Anticipating Molecular Medicine: Smooth Transition from Biomedical Science to Clinical Practice?” *American Family Physician,* 63(9):1704–1706.

Paul N.W. (2002a) “Genes, Information, Volatile Bodies” In: Gimmler A., Lenk C. & Aumüller (eds.) *Health and Quality of Life. Philosophical, Medical and Cultural Aspects*. Pp. 187–198. Münster: Lit.

Paul N.W. (2002b) “Molekulare Prädiktion: Ein Weg zur molekularen Prävention?” In: Gostomzyk J.G. (ed.) *Innovative Aspekte in der Prävention*. Gesundheitswesen 63. Pp. 39–61. München.

Paul N.W. (2003) *Making Molecular Medicine: Historical, Theoretical, and Ethical Dimensions*. Habilitationsschrift. Düsseldorf: Medizinische Fakultät der Heinrich-Heine-Universität.

Paul N.W. & Ganten D. (2003) “Zur Zukunft der Moleularen Medizin” In: Honnefelder L., Mieth D., Propping P., Siep L. & Wiessemann C. (eds.) *Das genetische Wissen und die Zukunft des Menschen*. Pp. 103–114. Berlin: De Gruyter.

Rothschuh K.E. (1978) *Konzepte der Medizin in Vergangenheit und Gegenwart*. Stuttgart: Hippokrates.

Schlich T. (1996) “Die Konstruktion der notwendigen Krankheitsursache: Wie die Medizin Krankheit beherrschen will” In: Borck C. (ed.) *Anatomien medizinischen Wissens. Medizin, Macht, Moleküle. Philosophie der Gegenwart*. Pp. 201–229. Frankfurt a M: Fischer.

Silver L.M. (1998) *Das geklonte Paradies. Künstliche Zeugung und Lebensdesign im neuen Jahrtausend*. München: Droemer (orig: (1997) *Remaking Eden. Cloning and Beyond in a Brave New World*. New York: Avon).

Takken W. et al. (1991) “Environmental measures for malaria control in Indonesia. An historical review on species sanitation” *Wageningen Agricultural University Papers,* 90–7 (1900), (WAU) Wageningen.

Treacy E. et al. (1995) “Response to Treatment in Hereditary Metabolic Disease: 1993 Survey and 10-Year Comparison” *Am. J. Hum. Genet*., 56:359–367.

van Zwieten M. & ten Have H. (1998) “Geneticalisering: een nieuw concept. Maatschappelijke verschijnselen in verband gebracht met genetische kennis” *Medisch Contact,* 53:398–400.

von Drigalski W. (1948) *Im Wirkungsfelde Robert Kochs*. Hamburg: Dulk.

Wess L (ed.) (1998) *Die Träume der Genetik. Gentechnische Utopien von sozialem Fortschritt. Schriften der Hamburger Stiftung für Sozialgeschichte des 20. Jahrhunderts*. Bd. 6. 2nd ed. Frankfurt a M: Mabuse.

Williams K.L. (1999) “Genomes and proteomes: Towards a multidimensional view of biology” *Electrophoresis,* 20, No. 4/5:678–688.

12: Vaccines as Global Public Goods

Anne Marie Moulin, Director of Resarch, CNRS-Centre for Economic, Judicial and Social Studies and Research (CEDEJ), Cairo. President of the Administrative Council of the French National Agency for AIDS Research (ANRS)

> No man is an island [...] and therefore never send for whom the bell tolls; It tolls for thee (John Donne 1622, *Devotions upon Emergent Occasions*).

"Globalization" is as loaded with promises as it is frightening (for the concept of global public goods, see Kaul et al. 1999; Sen 1987). Globalization is an encompassing concept, which refers to many events of the last century, the submission of the planet to market laws and the dependence of populations on shareholders' decisions in distant capitals. This globalization is concomitant with persisting gross inequalities in economic and health status across the world (Wilkinson 1996). Globalization is also currently equated with increased risk of deforestation, pollution, destruction of ecosystems, and the many misuses of nature. These developments are of an extent that it may be argued in favor of a new contract with nature (Serres 1990) as a prerequisite for any safe social contract within human communities. Globalization is also related to the apparent return of epidemics, both old plagues and new scourges. An unprecedented exchange of germs has been made easier by modern transportation and streams of migration caused by war or poverty. The adoption of new lifestyles and novel modes of consumption and production have facilitated the trespassing of the species barrier. Globalization has been accompanied by intent reflection on the way of securing more happiness and well-being for the majority. In the present eclipse of interest in utopian thinking, economists and politicians have put the stress on the failure of the free market to fulfil some important human needs, appealing to the theory of public goods.

The concept of public goods (Samuelson 1954) encompasses items that display the characteristics of publicness (common goods) as compared to private goods. They cannot be individually appropriated and can be shared without competition. In economic terms, they display the features of non-rivalry and non-exclusion of use. Although they are essential to the harmony and well-being of everybody, they are not allocated optimally on the market because no one is prepared to pay the price. Everyone relies on his neighbors (called free riding or *passager clandestin* in French). The examples of public goods most often cited are security, public health, air purity and education. Public goods do not discriminate against population groups or generations (present and future), and they may suggest and even require collective action.

Economists have paid great attention to this matter. Since the market is not supposed to produce these essential goods, external agencies such as states, for example, should be responsible for providing them and securing their access for all. But in many countries the state is weak or corrupt (Visvanathan & Sethi 1998) and does not fulfil its functions, causing a dramatic shortage of these precious

goods. The intervention of NGOs offers alternative solutions but may induce negative effects that further debasement, deterioration, loss of credibility and prestige, thus undermining local states.

With the decline of socialism and the triumph of liberal thinking, the notion of "global public goods" has been introduced as a necessary provision. It represents an extension of the notion of public goods at the international level. Thinking in terms of global public goods (global versus national) means looking for mechanisms to ensure a more equitable international status quo and share experiences and resources. Some people tend to add to the already long list, liberty with its five components as defined by Amartya Sen: liberty of speech, economic opportunities, social capital, transparency and political security.

Public health and scientific knowledge, among other things, have thus emerged as global public goods. They should be shared by all, since this sharing is not detrimental to anyone and is furthermore an absolute necessity. AIDS has conquered the planet without resistance. The African viruses, such as Marburg or Ebola, may strike European cities as well. If countries do not collect and exchange reliable and timely statistics on diseases, how can national surveillance be possible? In the post-antibiotic era, if multiresistant pathogens expand, there will be no sanctuary for anybody. "…and therefore never send for whom the bell tolls; it tolls for thee."[111]

Vaccines developed to alleviate the burden of infectious diseases and eradicate, or at least contain, the various plagues that besiege mankind may legitimately rank among those global public goods. However, no efficient mechanism exists for their distribution.

Vaccines may not exactly correspond to the definition of global public goods, because they do not strictly correspond to the criteria of non-rivalry and non-exclusivity of use. They are sometimes labeled as "impure" by economists. Although strictly speaking, there should be no competition for good health, vaccines can be detained and monopolized, to the detriment of those people most in need. Paying due attention to them means a quest for strategies circumventing the market, such as alliance between governments and non-profit private agencies and foundations. The debate shifts from the economic to the political level.

The Vaccinal Status of Populations over the World

If we choose to assess public health in the world by considering the vaccinal status of populations and the production and distribution of vaccines, what is the present picture? The burden of infectious diseases, once conceived as a legacy of an archaic past, still predominantly weighs on the least developed countries, the one third of the 160 non-industrialized countries, which do not belong to OECD (Organization for Economic Development). These 160 countries represent 85 per

[111] Ernest Hemingway has built up his novel on the civil Spanish War on this famous quote from the Elizabethan metaphysical poet, John Donne.

cent of the whole population. In 1977, 17 million deaths were still caused by infectious diseases.

Only six basic pediatric vaccines are generally implemented throughout the world: BCG, polio, diphtheria, tetanus, whooping cough and measles. These are historical vaccines developed more than 25 years ago and implemented jointly in the UNICEF Extended Immunization Program, familiarly known as EPI.

In spite of many discussions, the EPI has not been extended. A vaccine against hepatitis B has been developed, the first vaccine known against a cancer whose viral origin is documented (among infected newborns the virus induces a major risk of liver cirrhosis and cancer). However, the vaccine is not yet included in the EPI program. Another example of a disease not covered by the EPI program is meningitis, which periodically strikes children in the Sahelian belt of Africa.

Even for EPI, the actual coverage does not reach the level required by international programs. Reports from countries on their own data have sometimes turned out to be inaccurate, the resources allotted by international programs being proportional to the good results obtained by Ministries of Health. An investigation recently conducted in Burkina-Faso revealed that less than 30 per cent of the children were protected by the basic vaccines.[112] The vaccines currently available are far from dealing with the totality of infectious diseases: diarrheas, AIDS and hepatitis, hemorrhagic fevers, to name only a few.

In spite of historical tradition that in the past singled out vaccines among other remedies, especially in France (*Pasteur oblige*), vaccines aimed primarily at the protection of collectives and delivered to them free tend today to lose this privilege and become anonymous goods subject to the same laws as other pharmaceuticals. In developed countries, there is a growing advocacy in favor of vaccination tailored to the individual, after looking at his lifestyle, genetic make-up, and personal or family allergic antecedents. This individualist current should gain momentum as the knowledge derived from the program on the Human Genome imparts more information on decisive factors in individual susceptibility to pathogens. What are the roots of this historical tradition that makes vaccines singular?

Globalization in the Past: The Triumph of Jennerian Vaccine

Globalization began long before the theorization on global public goods. Turning to history, we can ascertain the consequences of incipient globalization in the past. The Colombian adventure, for example, in the sixteenth century, triggered an unprecedented exchange of goods and evils (Crosby 1972; Moulin 1991a), germs and technologies that developed rapidly and traveled along the same route as merchandise and slaves. Immunization against smallpox, even before the emergence of immunology as a science (Silverstein 1989; Moulin 1991b), represents

[112] Philippe Stoeckel, Association for Medical Research, AMP is a non-profit medical association, personal communication, June 2001.

the first known universal attempt at ridding mankind from a plague, and, in fact, comprises the first medical globalization.

Whereas Jennerian vaccine is usually considered a landmark of Western innovation, Edward Jenner capitalized in fact on former practices of variolation. Jenner himself was a variolator. Before submitting young Phipps to cowpox, the material he used for his inoculations was derived from spontaneously occurring benign smallpox cases in order to protect his clients in the countryside.

Variolation may have come from the East and probably originated in many places in Africa as well as in Asia. Voluntary exposure of children, the population most at risk, to a benign form of the disease had probably long been practiced in many countries all over the world. After Jenner's discovery, almost all countries retrospectively claimed a local or national recipe leading to successful protection based on the casual manipulation of germs, probably due to the spontaneous attenuation of microbes in the natural environment.

The best known epic comes from China. Variolization, effected by inhalation of smallpox crusts, expanded from China into most of Southeast Asia. China has been celebrated as the cradle of many valuable inventions such as gunpowder, writing and even immunization. But it is not the Chinese custom of sniffing smallpox, transmitted by generations of Chinese scholars, that spread all over the world. Another technique, smallpox inoculation, was the one that ultimately prevailed and is today still the underlying model for most vaccines, which are commonly injected. In recent years, some historians of Chinese medicine such as Charlotte Furth, Angela Ki-Che Leung, Bridie Andrews, and Michele Thompson have documented another story (Thompson 1998; Moulin 1999a). At some point between the thirteenth and the eighteenth century, the sniffing of smallpox came to coexist with another method, inoculation. This method may have originated among the underprivileged half of humanity: women.

Smallpox inoculation perhaps represents the first known invention to be attributed to women. In their medical treatises, Chinese scholars repeatedly complained about ignorant female quacks who took care of patients and pretended to heal them with acupuncture without any apprenticeship and knowledge of the body "meridians". Operating in the secrecy of homes, they opened up smallpox pustules in order to quicken the evacuation of pus and to stimulate the natural course of the disease.

This leads me to an exciting hypothesis. If women, intending to facilitate the discharge of pus, pricked the smallpox vesicles with a needle, they loaded their needlepoints with infected matter. If they inoculated other children later with the same needle, they certainly observed, variolous matter being extremely contagious, the efflorescence of a few spots. Although the risks were great, the infection had a chance of conveying protection against the dreadful scourge.

Whereas the sniffing method remained restricted to parts of Asia (Indochina, Japan, Korea) (Rotermund 1991), smallpox inoculation expanded in the world to the point of later challenging Jennerian vaccine after it was introduced in 1800. In the very last decades of the WHO eradication program, an epidemic of smallpox

flared up in China and was attributed (Henderson et al. 1987) by medical authorities to the survival of traditional inoculation.

Yet, in spite of the competition with smallpox inoculation and the absence of rapid means of communication, Jenner's vaccine spread rapidly, adopted by medical elites and governments eager to stimulate the natural growth of their populations and to protect their troops. More than 100,000 vaccinations were thus carried out in Europe in the early nineteenth century.

Just a few dates may serve to illustrate the globalizing march of the vaccine. Jenner published his *Inquiry* in 1798. The vaccine reached Eastern Europe and the Mediterranean in 1800; it arrived at Constantinople by the turn of the century and made its way to Baghdad in 1802. One year after, Balmis' Vaccine Cruise carried the prophylactic fluid from Spain to Latin America, after a journey of several months with arm-to-arm transfer among orphans who embarked on the boat (Bowers 1981).

In many countries vaccination was officially made compulsory: in 1812 in Russia, in 1816 in Sweden, in 1837 in Egypt (Gallagher 1990; Chiffoleau forthcoming). (By comparison, in France the law making vaccination compulsory was passed only in 1902! Murard & Zylberman 1996.)

No doubt populations were less enthusiastic than their leaders about the new technique. They did not understand the link between smallpox and its prevention (Moulin 1999b). They felt anxious about the innovation and often perceived it as an odd invention of a tyrannical state. Naturally enough, they linked the vaccine to other vexations, such as taxes and conscription.

I had long assumed that this requirement could not be enforced in countries before the advent of the omnipotent modern state. This view was based on previous work on Egyptian hygiene. In Egypt, reports assessing the results of vaccination campaigns indicated that the operation was not carried on reliably among newborns. Administrators who were responsible for the execution of orders by the Viceroy were more careful about registration than about the actual immunization (Moulin 2002). Jean-Pierre Goubert has analyzed the situation in three capitals, Algiers, Montreal and Paris during the same period and showed that the move for vaccines was irregular according to the social group involved (Goubert 2001).

In fact, immunization was probably implemented more regularly (and more roughly) in the early nineteenth century than I supposed. In czarist Russia, for example, vaccination was made compulsory at the very beginning of the nineteenth century. While it is unlikely that peasants rallied heartily to the tenets of hygienist doctrines, it should be remembered that landlords retained absolute rights over their "souls" (serfs). We have an echo of that power, applied to medical affairs, in the literary work of Countess de Ségur, a writer of popular novels for children in the romantic era. She was born Rostopchin and was the daughter of the governor who burned Moscow when Napoleon invaded Russia. He was himself a zealous advocate of Jenner's innovation and ordered *moujiks* on his estates to be vaccinated. Peasants resented this animal poison being inoculated into their blood and tried to escape the measure by cauterizing the vaccinal wound with

what was available to them, hot limestone found in basins close to their homes. Countess Rostopchin had the opponents publicly flogged (Dufour 1990, pp. 73–74). The novels *Les petites filles modèles* and *Les malheurs de Sophie* integrated parts of these harsh episodes into these edifying stories intended for the children of the European bourgeoisie.

This tradition of brutality left a scar. People have had mixed reactions to public health campaigns and sometimes reacted violently to what they considered as a provocation. The urban revolts of Rio have been documented by Brazilian historians (Fernandes 1990; Theophilo 1997). Similar episodes in Canada, Uruguay and elsewhere are currently being explored.

Not only do vaccination campaigns infringe on privacy and liberties; they may also expose people to adversities and the hazards of immunization (Wilson 1967). The Mulkowal disaster in India, tetanus contamination of an anti-plague vaccine at the beginning of the twentieth century, had a long-lasting impact on the acceptance of vaccines on the sub-continent. The Lübeck trial in 1930, following one hundred infant deaths, possibly due to contamination of BCG vaccine by living Koch bacilli vaccine, nearly nullified half a century of vaccinal research and caused stigmatization of the vaccine in many countries (Menut 2001; Moulin 1999c). Some countries, such as the Netherlands, have never encouraged the use of BCG.

In recent years, in countries of West Africa, the news that vaccinated children had perished of measles, induced an immediate drop in the vaccine coverage. Public opinion is easily turned upside-down, and communication has to be carefully engineered and updated to avoid panic and to foster confidence (Balinska 2001). Recently, in northwestern Cameroon, rumors that a tetanus vaccine administered to girls over fourteen during a mass campaign was intended to sterilize future mothers triggered roars of protest against the doctors and state officials coming from the capital who carried out vaccination. Suspicion that the western countries want to curb African fecundity, ethnic rivalries and lack of confidence in the central administration contributed to development of the rumor (Ndonko & Schmidt-Ehry 2000). Although there was not a shred of evidence, schools were deserted for a while due to fear of compulsory vaccination! Vaccine acceptance is a matter of belief as well as science (Moulin 1996, pp. 11–37).

In spite of these adversities, smallpox vaccination became a global "première" and spread across the world, laying a groundwork that WHO would complete in the 1970s.

The Myth of Eradication

The eradication of smallpox was a celebrated victory of international cooperation. Although it was largely due to decades of empirical work and even hazardous practices, this success was hailed as a monument of modern science and universal solidarity. To date it has remained unrivalled, in spite of WHO's vigorous efforts.

The focus of international organizations on specific diseases in a context of limited resources has even induced some adverse effects. During recent years,

WHO has successively conceived programs aimed at eradication of the main scourges. These programs have met unexpected obstacles and have been ridden with intrinsic controversies over strategic choices.

Poliomyelitis is an instructive example. Polio has disappeared from Europe and the United States, but a few thousand cases are still currently reported in Africa. Harlem Gro Brundtland, the director of WHO, has made the eradication of polio one of her targets. It will not only accomplish forcibly one of WHO's goals of eradication in the face of posterity. It has also been promoted by American countries because the hazards of a single case linked to emigration, force maintenance of immunization programs at a high cost in terms of staff and money, and they are impatient to have this burden removed from their shoulders.

On the other hand, the specific investment in polio in developing countries is enormous, and mobilizes many people each year. When the polio season arrives, sometimes the bulk of the health teams is unavailable for other tasks, especially in countries with scattered populations. During this period there is nobody left to take care of more immediate and vital concerns, even in emergency cases such as fulminating meningitis that induces irreversible cardio-vascular collapse.

For many other diseases such as malaria, WHO has cautiously retreated to the adoption of keywords, such as disease control, that do not have the emotional appeal linked to the dream of eradicating diseases. This century-old dream was born with microbiology and is a progeny of the Baconian enterprise for tailoring nature to man's needs and desires. Is this relative failure the reason why the present picture of vaccinal status in populations is still so heterogeneous and unsatisfactory?

Modern Times. The State of the Vaccinal Art

Large companies now produce vaccines on an unprecedented scale. These changes have necessitated the establishment of strict regulations, even before the precautionary principle was proclaimed in full.

In 1955, the Cutter episode in the polio saga (Paul 1971) illustrated how mass production of viral vaccines differed from laboratory research: insufficient inactivation of the virus in one of the batches resulted in the occurrence of acute polio in two hundred children, eleven of whom died. Today the safety of vaccine production has been greatly improved and elaborate regulations are implemented. We have come far from the bold amateurism of Pasteurian times!

Because of the level of expertise required and the monopolizing tendency of the market, the number of vaccine-producing firms has been reduced to a handful. Few newcomers venture into the field, and the old firms themselves tend to merge. The cost of new technologies is skyrocketing, and the companies want primarily to ensure their research and development departments substantial benefits.

For many years, the old Fermi rabies vaccine (cultivated in sheep brains) has been maintained in Africa, where it sporadically occasions allergic disorders and neurological syndromes. In comparison with the grim reality of rabies cases, there is no question that it should continue to be employed. Yet a harmless vaccine,

genetically engineered, has long been available, but its price is too high for the continents where rabies exacts its toll of victims.

A similar story could be told for meningococcal vaccine. Since the available meningococcus polysaccharide vaccine did not work for newborns (polysaccharide antigens do not induce immunity at this early age), a conjugate vaccine against A/C meningococcus was planned that could offer better protection in infants (Campagne et al. 2000). Probably for commercial reasons, the company decided ultimately not to proceed, disappointing expectations for improvement of infant mortality in the "meningitis belt" linking the countries of the Sahel (Kaninda 2000).

An effective vaccine against the strains A, C and W does exist, in fact, in developed countries. Administered every two or three years in sub-Saharan populations, it would interrupt the transmission among children. International organizations suggested that trials take place in countries struck by epidemics such as Burkina Faso. But pharmaceutical firms did not take the challenge.

Cost considerations bias public health decisions. The old polysaccharide vaccine against meningitis is still in use but, these last years, it has not been systematically administered. Health services wait for the onset of epidemics. It is only after notification of numerous cases that a campaign is launched *a posteriori*. This new strategy, meant to avoid the problems of storage and the waste of vaccine lots left unused, is responsible for casualties that could have been avoided (Chippaux 1999, 2001). Such a public health policy, adopted on economic grounds, means a departure from the systematic immunization strategy that prevailed in colonial and early post-colonial times.

Vaccines are biological products. Once produced, they still need to be stored and delivered, each stage being exposed to specific risks. The refrigeration chain is vital for the storage of vaccine stocks. The replacement of gases dangerous for the environment (ozone) in refrigerators (following the Montreal agreement) was very expensive. It cost more than one million dollars in the Ivory Coast (Da Silva 1999). Injected vaccines demand material safety, and disposable needles and syringes. The ban put on merthiolate, a mercury derivative used as an antiseptic in multidose presentations, has led to a drop in this type of presentation, useful for mass campaigns, due to fear of contamination.

Recently news spread of the use of counterfeited meningitis vaccines against meningitis, offered by Nigeria to its neighbor, the Republic of Niger, during an epidemic. The vaccines, bearing the brand name of a pharmaceutical company administered by NGO in the field, allegedly contained nothing but water (Broussard 1996).

Any modification in vaccine production is now considered as a departure from authorized practice, and relevant boards must check the chain of operations, as if it were a completely new approach. This regimentation, which introduces additional delays and costs, makes improvement of vaccines little attractive for business unless the market is very promising, as it is for some diseases that raise great concern in the industrialized countries.

For economic reasons, developing countries will not benefit soon from the expensive "high tech" vaccines to come, directed against *Helicobacter pylori*, related to stomach ulcer, or *Chlamydia*, involved in arteriosclerosis. (The sphere of vaccination extends far beyond infectious diseases!)

In 1976, when Merck marketed hepatitis vaccine at the high price of $30, it was out of reach for most countries suffering from a high rate of the disease. It was the first vaccine genetically engineered, and it was also the first vaccine against a virus-induced cancer. The WHO Hepatitis Taskforce then advocated the local production of vaccine using cheaper methods: producing vaccine out of the infective virus particles found in patients' sera (Muraskin 1995). This method did not involve sophisticated technology transfer and in addition created local opportunities. National firms in Korea, China and Thailand accepted the challenge, but the results were uneven. The question was raised: since the inactivation of infectious particles may be faulty, is it ethical to allow lower security standards for economic reasons in less developed countries?

This double standard question is raised for vaccines that are badly needed in the developing world. To be developed, they need to be considered as useful on the western market so that they are attractive to companies that could produce them.

For example, in 1999, an urgently needed vaccine against rotavirus was sponsored by the National Institutes of Allergy and Infectious Diseases (NIAID) in Bethesda, Maryland, USA. When tried in the US and Venezuela, although highly lauded for its efficacy against the greatest killer of children, it was found to induce a small percentage of intussusception (inducing bowel obstruction) and was consequently abandoned. The vaccine, that had been welcomed as "a fabulous treasure for the children in developing countries" (Melton 2000; Glass et al. 1997; Bresce et al. 1999) was taken off the market, after the CDC (Centers for Disease Control and Prevention) in Atlanta recommended that clinicians stop administering it. It is now being argued that rotavirus infection might itself be responsible for intussusception, provoked by a mesenteric rotation around enlarged ganglia stimulated by the infection.

Three vaccines were about to be launched, and planned trials were stopped in Bangladesh and in India. The question was passionately debated: was it ethical to drop a vaccine offering good protection because of a few casualties in poor countries with high infant mortality? The risk/benefit calculation may vary from one country to another. The counterargument was: is it ethical to license a vaccine or a drug with known adverse effects? A general debate has arisen whether vaccines in less developed countries may include those judged unacceptable in more affluent countries. In the time of globalization, there is an ongoing debate on the universal application of safety standards across national borders.

The ethical debate notwithstanding, the heart of the matter lies elsewhere. If developed countries do not market a vaccine, there is not the slightest chance that this vaccine will be produced and distributed to the poorest countries with a prevalence of waterborne intestinal infections. Supporters of the vaccine still argue to date that this decision has deprived children of the Third World of a much-needed

preventive measure and that thousands of deaths could have been avoided (Cohen 2001).

The ethical question of the "double standard of care" is raised for vaccines as it has been for other kinds of drugs, such as antiretroviral therapy. The debate, which has flared up around the fate of AIDS patients and access to antiretrovirals, has pointed to the unequal status of patients across the world.

The Site of Clinical Trials

What happens when trials take place in the less advanced countries? This is now increasingly the case. Although developing countries are far from benefiting from research spin-off, they are on the frontline of clinical trials (European Science Foundation Policy Briefing 2001, p. 13), including many types of vaccines. Most trials for vaccines, still in their infancy (e.g., for schistosomiasis, malaria, AIDS), are taking place in the Third World. Why?

The reasons are many. Multicenter vaccine trials are most efficient where the rates of infection are high: hence the importance of the so-called vaccine trial "sites" for tuberculosis or AIDS in Africa, Asia and America. In order to accommodate the requirements of statistical computations, it is also easier to recruit numerous cohorts for epidemiological studies in the Third World. These populations are less often solicited for other types of studies and less likely to be taking drugs liable to interfere with the new drug administered. Some other motivations exist as well. In developing countries, populations are often more flexible and less demanding. They expect personal benefits from their participation in clinical studies, such as access to medical care or financial compensation.

In some places, the research projects may not be in tune with the epidemiological context and the population's interests in the country that hosts the trial. A lack of concordance has been shown in South Africa between the vaccine strains elected for the trial and the prevalent local clades (Salim & Karim 2000).

Once implicit and informal, understandings of the conduct of human experimentation have become codified into national and international regulations that require careful examination of the intended research, both from a scientific and ethical viewpoint. The IRBs (Institutional Review Boards) are supposed to supervise the trials and check the informed consent procedures of the proposed research. Although there is a kind of universal agreement on the ethical framework of clinical trials in the medical and scientific community, one of the foundations of modern biomedicine, national legislation may be limited or lacking. Local IRBs are often not well developed and may be subject to influence. Competent experts are already burdened with many administrative tasks and may neglect careful supervision of the submitted projects.

The matter of informed consent has been little dealt with from an anthropological viewpoint. There are on-going debates on the validity of consent, if given by a person different from the subject of experimentation: for example, village chiefs, local deputies, or heads of the families. Words such as randomization or placebos are abstractions that are not easy to present in crystal clear language. In

Western countries experience shows that detailed consent forms are elaborated more to protect the investigator and the sponsor against legal ramifications than to convey clear information adapted to the subjects. An investigation recently conducted in France on clinical practices showed that, because of the increased sophistication of forms, most of them prepared by the sponsors of the trial and their lawyers, the responsibility of imparting clear explanations to the subjects falls upon the clinicians' shoulders. The quality of the patient/doctor relationship emerges as the decisive element in the context (Fagot-Largeault & Amiel 2000). In underdeveloped countries, doctors and health officers are already overworked and do not have adequate quarters and time to inform the patients at length (Mselatti et al. 2001). Ultimately, more than illiteracy, extreme poverty deprives the subjects of their autonomy.

If the trials lead to positive results, there should be provision to ensure access to the new drugs. It has been far from the rule in the past. In the past, populations of the countries who served as guinea pigs for clinical studies on hepatitis B vaccines (in Senegal, for example) did not benefit from the vaccines at a fair price after licensing. As yet, there has been no universal agreement on the terms of a contract that would link the participation in a trial with the availability of the tested vaccine. Such agreements would put an end to this kind of scandal (Rothman 2001). Negotiations about adequate post-trial access to a successful vaccine, such as against malaria or AIDS at an affordable price, remain pending.

The choice of technological platforms in some parts of Africa and Asia, where populations are already registered and monitored, professionalizes patients, who find secondary benefits in their participation. The choice of these sites and their captive cohorts is not only influenced by considerations of safety for investigators (absence of civil or foreign war, permission from local ministries), but reflects various interests, in particular the agendas of the firms and the foreign countries involved. How can the benefits of studies be extended to areas remote from the big cities and the national hospitals? What is the impact of these trials on the development of local know-how and research team training? All these considerations go further than the simple question of the consent form and appropriate information delivery and bear on the future of the local scientific communities.

The Universality of Vaccinal Strategy in Question

While vaccinal trials are sources of political and ethical queries and doubts, the basic dogmas of vaccinal science are themselves questionable. Are vaccines among the most effective instruments of global health, as products of the universal validation of "science"? What is the place of immunization in tomorrow's society?

Numerous questions remain unanswered: the interaction between natural and artificial immunization on which the vaccination and revaccination agenda depends; the impact of maternal antibodies on infant behavior toward environmental pathogens; the reactions of bodies exposed to various strains of pathogens, that have a varying microbial burden in their guts and natural cavities that poten-

tially interfere with the mucosal delivery of vaccines. Nutrition deficiencies, parasitic infections, elective genetic variations may substantially affect the immune response. Auto-immunity has to be discussed, as well as the onset of tumors of the immune system such as lymphomas.

The predominant model of injectable vaccines may also be challenged. More than 1,000 cases of hepatitis caused by injections are reported in Africa. Edible vaccines would be interesting, but raise questions linked to the use and spread of GMO (genetically modified organisms) in human organs.

The development of genetics, illustrated by the worldwide successes of the Human Genome projects, points to another issue. The detection of individual genes governing susceptibility to diseases might encourage industrialized countries to develop individual vaccines tailor-made to the personal genetic make-up. Some biologists suggest that the time of collective immunization, irrespective of individual differences, is behind us and that we may have reached the historical limits of artificial immunization. The new germs are hidden in our cells and successfully escape our immunization mechanisms. If we trespass this limit, we might be at risk of provoking an unprecedented wave of autoimmunity. Politicians are thus confronted with the scientists' queries. But these same politicians also have to remember that vaccinations strengthen the communitarian ethos but are subjected to the criticisms of sacrificing the individual (Pywell 2000) or may reinforce the application of "double standards" to "northern" and "southern" populations.

South African Thabo Mbeki's stance on AIDS treatment may apply to vaccines. While his statement that HIV viruses are not the cause of AIDS raised, legitimately, a roar of protest in the international scientific community, his remark that drugs (are vaccines among them?) marketed by the wealthy countries are not the solution to the African tragedy, has some truth in it. Hygienists have long pleaded that wonder drugs too easily replace the much needed measures of social justice that modify the life circumstances and remove the conditions that promulgate disease.

Conclusion

In conclusion, although a century-old culture of public health has promoted what some authors call a "vaccine reflex" among the health professionals ("reflex" sounds a strange term, the opposite of sound and critical evaluation), although the practice of vaccination raises obvious questions. The universalization of vaccines still has a long way to go. Various initiatives have recently come from private foundations to balance the tendency to leave the fate of the vaccines to the market.

The rules of appropriation of the global public goods such as health and knowledge, allegedly available to all, still need to be redefined at the international level and strictly applied. The case of vaccines illustrates the intricacies of the issues involved by political and social choices in this domain. The official declaration of vaccines as global public goods would be a step in the right direction, if it initiates

concrete action and sound reflection on why and how, and which vaccines should be used.

References

Balinska M. (2001) "L'affaire 'hépatite B' en France" *Esprit,* Juillet: 34–69.

Bowers J.Z. (1981) "The Odyssey smallpox vaccination" *Bulletin of the History of Medicine,* 55: 17–33.

Bresce J.C., Glass R.I. & Ivanoff B. (1999) "Current status and future priorities for rotavirus vaccines, development, evaluation and implementation in developing countries" *Vaccine*, 17:2207–2222.

Broussard P. (1996) "Du Nigeria au Niger, d'étranges vaccins contre la méningite" *Le Monde,* 26 Octobre: 2.

Campagne G. et al. (2000) "Safety and immunogenicity of the three doses of a Neisseria meningitidis A+C diphtheria conjugate vaccine in infants in Niger" *Pediatric Infectious Diseases Journal,* 19:144–150.

Chiffoleau S. (forthcoming) "Un siècle de vaccination antivariolique en Égypte (1827–1927): Politiques de santé publique et pédagogie de la modernisation" In: Moulin A.M. (ed.) *L'slam et la modernité du corps*. Paris: Editions des archives contemporaines.

Chippaux J.-P. (1999) "Preventive immunisation could reduce the risk of meningoccal epidemics in the African meningitis belt" *Ann. Trop. Med. Parasitol,* 93:505–510.

Chippaux J.-P. (2001) "Epidémies au Sud, vaccin au Nord" *Sciences au Sud,* 11:1.

Cohen J. (2001) "Rethinking a vaccine's risk" *Science,* 293:1576–1577.

Crosby A. (1972) *The Columbian Exchange*: *Biological and cultural consequences of 1492*. Westport, CT: Greenwood Press.

Da Silva A. (1999) "Vaccination en Afrique. Réalités et defies" *Comptes Rendus de l'Académie des Sciences,* 322(11):1011–1012.

Dufour H. (1990) *Comtesse de Ségur née Rostopchine*. Paris: Flammarion.

European Science Foundation Policy Briefing (2001) *Controlled Clinical Trials,* May:13.

Fagot-Largeault A. & Amiel A. (2000) "Enquête sur les pratiques et conceptions de l'information et du recueil du consentement dans l'expérimentation sur l'être humain. vol I" Paris: unpublished.

Fernandes T.M. (1990) *Vacina antivariolica: Ciencia, tecnica, e poder dos homens, 1808–1920*. Rio de Janeiro: Fiocruz ed**.**

Gallagher N. (1990) *Egypt's Other Wars. Epidemics and the Politic of Public Health*. New York: Syracuse University Press.

Glass R. et al. (1997) "Rotaviruses at the threshold" *Nature Medicine,* 3:1324–1350.

Goubert J.-P. (2001) "La ville, miroir et enjeu de la santé: Paris, Montréal et Alger au XIXe siècle" *Histoire, Economie et Sociét,é* 3:357–363.

Henderson D.A., Arita I. et al. (1987) *Smallpox and its eradication*. Geneva: WHO.

Kaul I., Grunberg I. & Stern M. (1999) *Global Public Goods. International Coopération in the 21th century*. Oxford: Oxford University Press.

Melton L. (2000) "Lifesaving vaccine caught in an ethical minefield" *Lancet,* 356:318–320.

Menut P. (2001) "The Lübeck Catastrophe and its consequences for anti-tuberculosis vaccination" In: Moulin A.M. & Cambrosio A. (eds.) *Singular Selves, Historical issues and contemporary debates in immunology*. Pp. 202–210. Paris: Elsevier.

Moulin A.M. (1991a) "Le choc microbien" *L'Histoire,* 146:128–132.

Moulin A.M. (1991b) *Le dernier langage de la médecine*. Paris: Presses universitaires de France.

Moulin A.M. (1996) *L'aventure de la vaccination*. Paris: Fayard.

Moulin A.M. (1999a) “La société et ses vaccins” *Comptes rendus de l’Académie des Sciences,* 322:983–987.

Moulin A.M. (1999b) “Premiers vaccins, premières réticences” *Pour la Science,* 264:12–15.

Moulin A.M. (1999c) “The impact of BCG on the history of tuberculosis” In: Palfy G., Dutour O., Deak J. & Huttas I. (eds.) *Tuberculosis Past and Present.* Pp. 77–86. Budapest: GB Tuberculosis Foundation Publisher.

Moulin A.M. (2002) “L’esprit et la lettre de la modernité égyptienne. L’enseignement médical de Clot bey” In Panzac D. & Raymond M. (eds.) *La France et l’Egypte à l’époque des vice-rois 1805–1882*. Pp. 119–134. Le Caire: IFAO.

Mselatti P., Vidal L. & Moatti J.-P. (2001) *L’accès aux traitements du VIH/Sida en Côte d’Ivoire*. Paris: ANRS.

Murard L. & Zylberman P. (1996) *L’hygiène dans la République*. Paris: Fayard.

Muraskin W. (1995) *The War against Hepatitis B: A History of the International Task Force on Hepatitis B Immunization*. Philadelphia: University of Pennsylvania Press.

Ndonko F.T. & Schmidt-Ehry B. (2000) *Sterilizing Vaccines in Cameroon*. Yaoundé: Editions CLE.

Paul J.R. (1971) *A History of Poliomyelitis*. New Haven: Yale Universty Press.

Pywell S. (2000) “Vaccination and other altruistic medicaments: should autonomy or communautarianism prevail?” *Medical Law International,* 4:223–243.

Rotermund H.O. (1991) *Hosogami ou la petite vérole aisément*. Paris: Maisonneuve.

Rothman D.J. (2001) “Les nouveaux cobayes de la recherche médicale” *La Recherche,* 342:29–37.

Salim S. & Karim A. (2000) “Globalization, Ethics and AIDS vaccines” *Science,* 288:2199.

Samuelson P. (1954) “The pure theory of public expenditure” *Review of Economics and Statistics,* 36:357–389.

Sen A. (1987) *On Ethics and Economics*. Oxford: Blackwell.

Serres M. (1990) *Le contrat naturel*. François Bourin: Paris.

Silverstein A.M. (1989) *A History of Immunology*. New York: Academic Press.

Theophilo R. (1997) *Variola e Vacinaçao no Ceara*, Fortaleza: Fundaçao Waldemar Alcantara.

Thompson C.M. (1998) *A negotiated dichotomy: Vietnamese medicine and the intersection of Vietnamese acceptance of and resistance to Chinese cultural influence*. Ph. D. Dissertation: Washington.

Wilkinson R.G. (1996) *Unhealthy Societie: The Affliction of Inequality*. London: Routledge.

Wilson G.S. (1967) *The Hazards of Immunization*. London: Oxford University Press.

Visvanathan S. & Sethi H. (1998) *Foul Play, Chronicles of Corruption 1947–1997*. New Delhi: Banyan Books.

13: Mills, Migration, and Medicine: Ethnicity and the Textile Industry, 1950–2000

Ian Convery and *John Welshman*, The Institute for Health Research, Lancaster University

Introduction[113]

The history of the textile industry has mirrored the industrial fortunes of Britain over the past hundred and fifty years. This paper is concerned with the health of South Asian migrants in the textile industries of Lancashire and Yorkshire since 1950. It is based on the preliminary findings of a series of oral interviews conducted with former mill workers, at four sites – Blackburn, Bolton, Bradford, and Preston. These study sites were chosen to permit comparisons between different types of industry, predominantly cotton and wool, and among different ethnic groups. Whereas much of the available literature tends to look at individual diseases, such as byssinosis, our concern was to look more holistically at the health of migrant workers, both in the workplace and at home. This material has been supplemented with other archival and documentary sources, such as census data; trade union records; public health records including Medical Officer of Health (MOH) reports; and company records. The paper contrasts the "traditional" concerns of the histories of occupational health and public health with the issues that emerge as significant in the oral interviews.

Although the economic history of the textile industry has been relatively well served, less has been written on the history of occupational health, and even less on the history of the health of migrant workers. But a number of academic studies in different disciplines have touched on these themes. One has been a well-established literature that has been concerned with the economic history of the textile industry, including the role of migrant Irish workers (Rose 1996; Timmins 1996; Winstanley 1996, pp. 147–148). This includes histories that make use of oral interviews, though this work has in general been confined to the United States (Bradford Heritage Recording Unit 1987; Dowd Hall et al. 1987). A second has been academic writing on migration which in part has argued that the "myth of return" has been influential (Anwar 1979). Third, there have been studies that have been concerned with the radicalization of labor, including workers in the textile industry, and based in part on ethnographic fieldwork (Khan 1979; Jackson

[113] We would like to thank the British Cotton Growing Association People's Workplace Collection Fund which provided the funding for this study, and also the Pasold Fund for a small travel grant towards the costs of attending the conference. The interviews were greatly facilitated by the help provided by Preston Muslim Forum, SAHARA (particularly Nagina Ali), and the Keighley Sangat Centre. At the Bradford Industrial Museum, Eugene Nicholson was generous with his time, and Jim Taylor enabled us to see one of the surviving mills in action, at Heritage Mills, also in Bradford. We are also grateful for the comments on the paper made by the participants at the Norrköping conference, and at subsequent seminars at the universities of Central Lancashire and Lancaster.

1992). One strand of this work has served to demonstrate the potential role played by ethnic brokers (Brooks & Singh 1979). Fourth, there are increasing numbers of local studies, including one of the experiences of South Asian migrants in the textile industry in Oldham (Kalra 2000). Finally, and more recently, there is an emerging literature on the history of occupational health (McIvor 2000, pp. 111–147).

However, our concern is particularly with health. In general the history of the health of migrant workers has been neglected, as has the history of ethnicity and health in general (Welshman 2000). This study has attempted to illuminate the twin themes of public health and occupational health by making use of oral interviews. It has responded to Dorothy Porter's call to look at the histories of public health and occupational health "from below". In that respect, its approach is similar to that of McIvor and Johnson and their work on asbestosis in Glasgow (Johnson & McIvor 2001). It attempts to make sense of the oral material in light of the secondary literature outlined above and is organized in three sections. First, it examines the health issues usually seen as significant in relation to the textile industry, such as dust, scrotal cancer, byssinosis, lighting and ventilation, and noise. In this case the main actors were central government departments, the trade unions, and individual academic researchers. Second, it explores "health" from the perspective of the workers themselves and analyzes these issues "from below". Here the main areas that emerge from the interviews transcribed so far include experiences of migration, perceptions on arrival, experiences on the night shift, health and safety, and racism. Third and finally, the paper assesses what implications this approach has for how we view the histories of occupational health and public health.

The History of Occupational Health and the Textile Industry

The framework presented by Avtar Brah, in a seminal study of South Asian Muslim women and the labor market, offers an analytical framework for this study. It provides an opportunity to reconcile the often polemical arguments of structure and culture, and contextualize the narratives of the mill workers interviewed within the various temporal and spatial dynamics of social differentiation, gender, labor position, health, and migration. It is therefore instructive to see how the health and labor of South Asian mill workers is socially constructed, is represented in discourse, is constituted by and is constitutive of labor markets, and is framed within personal narratives and collective histories. To these, we might add migration histories, British industrial archaeology, South Asian cultural identities, and political and social change, and how labor markets are determined by entitlements. Such a framework weaves together structural and cultural formations and addresses the salient issue of how structures (economic, political, and ideological) may change on an inter-generational and temporal basis, and both interact with and shape cultural identities and meanings (Brah 1993, p. 443).

Recent writing on the history of work provides a helpful framework for viewing the history of occupational health in the textile industry. Arthur McIvor, for exam-

ple, has argued that in general the history of occupational health has been neglected. He suggests that what has been written tends to fall into one of three main strands of interpretation. First, there is a "Whig" interpretation that tends to stress the emancipating effects of science, technology and political reform. Together these resulted in an amelioration of the work environment. Second is found a Marxist interpretation that typically is concerned with the allegedly alienating and physically harmful effects of work under industrial capitalism. Profit was placed above health and safety. Third, a revisionist perspective is common in much recent writing on this subject, that challenges stereotypes and shows that improvements were uneven and subject to reversal, and that inequalities persisted (McIvor 2001, pp. 111–113). Some of the health issues in the textile industry, such as heating, lighting and ventilation, were generic issues that were common to industrial work in general. Others, such as scrotal cancer and byssinosis, had a more specific connection with the actual materials and processes involved. But it is also important to understand that the implications for health of the cotton and wool industries could be quite different.

Health issues of course have played a key role in the earlier history of the textile industry. It was recognized in the nineteenth century that workers in the Lancashire cotton industry were characterized by high incidences of tuberculosis, bronchitis and asthma (Winstanley 1996, p. 124). The respiratory disease of byssinosis, caused by inhaling cotton fibers and associated with dust in cardrooms, was described as early as the 1860s (Schilling et al. 1955, p. 217). But it was only in the twentieth century that health issues came in for more systematic attention. In his Milroy lectures to the Royal College of Physicians, given in March 1927, William Francis Dearden, MOH for Manchester and a Certifying Surgeon, considered some of the health "hazards" of the textile industry. Among these dangers were temperature and humidity, dust, fatigue, twisters' cramp, lighting, infections that included weavers' cough, and sanitation (Dearden 1927). McIvor suggests that occupational health and safety standards in the textile industry worsened during the inter-war period, when workers had to cope with older machines and cheaper fibers and when production was accelerated (McIvor 2001, p. 140).

Ventilation was a particular concern in the early 1900s, when the etiology of some diseases remained poorly understood. Again, trade unions were prominent in pushing for improved conditions. But equally, wartime was a time of movement, when the improved ventilation and air conditioning experienced in the munitions factories made textile workers unwilling to return to dusty cardrooms and hot spinning rooms. The issue of ventilation was often bound up with the related theme of heating. Here government-sponsored departments and individuals carried out some important research. In 1927, for example, a sophisticated study was devised to test the hypothesis that artificial humidity in weaving sheds was responsible for the excessive rates of sickness among the workers. Sponsored by the Industrial Fatigue Research Board, it was conducted by Austin Bradford Hill, later to be famous, with Sir Richard Doll, for his work on smoking and lung cancer (Bradford Hill 1927). But again debates about the heating of factories

persisted into the postwar period. Evidence from attempts to get agreements between unions and manufacturers in the 1940s suggested that mills were more often too cold than too hot.

Arguably, the most rigorous investigation into the health of textile workers was the Joint Advisory Committee on Conditions of Work in the Cotton Trade. It was established in November 1944 with the terms of reference to:

> enquire into and report on the most effectual methods of implementing certain requirements of the Factories Act, 1937 in cotton spinning, doubling and weaving factories and other cognate problems.

These included ventilation, lighting, sanitation and washing facilities, medical and welfare services, dust, the arrangement and spacing of machinery, and noise in weaving sheds. Its membership included representatives of management, trade unions and HM Factory Inspectors. Reconstituted with new terms of reference in 1958, it issued a series of reports, with a final report in 1961. Even then, attention was sporadic, and remedial measures were often slow to be implemented.

In the early part of the twentieth century, much of the concern about health in the textile industry centered on the particular disease of scrotal cancer, long known to be common among mule spinners. Spinners typically worked barefoot in undershirt and trousers, and leaned over the mule to join the broken ends of yarn. The scrotum thus was constantly in contact with oil on the trousers. In 1922, experiments on mice demonstrated that cancer was caused by crude mineral oils, and the connection between lubricating oils and scrotal cancer was proven. Remedies suggested by the 1926 Home Office report included the provision of safer oils, the prevention of contamination by oil, the provision of protective clothing, education on the importance of cleanliness, and medical examinations (Home Office 1926). However, these recommendations were not compulsory, and although "epitheliomatous ulceration" became a registered disease from 1919, medical examinations for workers were rejected. Moreover, while splashguards were fitted on existing mules from 1938, so that oil would not soil the clothing of workers, protection against scrotal cancer was not incorporated in the 1937 Factory Act. While trade unions and the Joint Advisory Committee of the Cotton Industry campaigned for safer lubricating oils, commercial companies proved obstructive, and such oils were slow to be introduced (Ministry of Labour and National Service 1952). Only in 1954 were compulsory medical examinations for workers belatedly started. In the late 1960s and early 1970s, the Amalgamated Association of Cotton Spinners and Twiners continued to do valiant work with former workers suffering from scrotal cancer, but compensation remained a battle. The work of Terry Wyke on the history of scrotal cancer provides a good example of McIvor's revisionist strand of writing. Wyke argues that, while more research might have been conducted and opportunities were missed, in the end the employers showed little interest in the health of their workers (Wyke 1987, pp. 195–196).

A more general area of concern in the early 1900s was around issues concerning dust in early processing, particularly in the carding process. Here trade

unions were active in trying to prove that dust inhaled in cardrooms had an effect on the health of the workers. A Dust in Cardrooms Committee was appointed in order to see if dust in cardrooms was the cause of ill health and disease, and it held its first meeting in September 1927. Its Secretary was Dr S. A. Henry, HM Medical Inspector of Factories, and it took evidence from a large number of individuals and organizations. The Home Office and the trade unions together sponsored conferences, and commercial companies were active in promoting equipment that allegedly reduced the amount of dust produced. Examples included the Weco Vacuum Card Stripper, produced by British-Weco Ltd.; the New Patent Dustless Card Stripping and Flat Strip Conveying Plant; and Platts' Patent Metallic Clothing for Carding Engines. Nevertheless, these problems persisted through the early postwar period. The final report of the renamed Joint Advisory Committee of the Cotton Industry, published in 1961, concerned dust in cardrooms (Ministry of Labour 1961). As late as 1977, studies were still suggesting that levels of dust in the textile industry remained unacceptably high (HM Factory Inspectorate 1979a).

Dust was an area of concern because of its association with the industrial disease of byssinosis. As we saw earlier, this had been the subject of debate as early as the 1860s. The case of byssinosis was different from that of scrotal cancer. In the 1950s, the Nuffield Department of Occupational Health at the University of Manchester and the Medical Research Council's Pneumoconiosis Research Unit at Cardiff were active in epidemiological research. One study compared 190 card- and blowroom workers aged 40–59 from 28 mills, with 88 men of the same age from two engineering factories. Of the cotton workers, 115 (60 %) had symptoms of byssinosis, while only four of the controls had any serious degree of respiratory disability (Schilling et al. 1955, p. 225). R. S. F. Schilling, Reader in the Nuffield Department of Occupational Health at Manchester, offered a comprehensive history of the disease in his Milroy lectures to the Royal College of Physicians, given in February 1956. Schilling argued that

> with a new awareness of the disease and more effective methods of dust control, the cotton workers should soon be rid of it after suffering for more than a century (Schilling 1956, p. 29).

The compensation scheme remained limited to workers employed in the opening, blowing and carding rooms. But later studies established that byssinosis was also found among winding room workers (Mekky et al. 1967).

Compensation for male workers who had died or become incapacitated from byssinosis was payable under the 1940 Act and later under the 1946 National Insurance (Industrial Injuries) Act. The Amalgamated Association of Cotton Spinners and Twiners supplied data to the Nuffield Department of Occupational Health at Manchester and awarded sickness benefits. The trade unions tried, for example, to reduce the qualifying period for disablement benefit from twenty to ten years. Other organizations, such as the Socialist Medical Association, were also active in campaigning. Some encouragement was given by the experience in the United States, where legislation was introduced in August 1970 to provide

federal disability payments to textile workers who suffered from "brown lung" or byssinosis. Back in Britain, new regulations introduced in 1974 meant that workers employed in any processes up to and including the winding and beaming processes in any department where the spinning or manipulation of raw cotton was carried out could claim disability benefit (DHSS 1973a, pp. 59, 69). The qualifying period was reduced from ten years to five. In May 1976 the first compensation award to a cotton worker suffering from byssinosis opened the way for hundreds of other claims on cotton firms.

Nevertheless, in terms of action taken, there were arguably more similarities than differences between the cases of byssinosis and scrotal cancer. The payment of disability and death benefits, in particular, remained carefully circumscribed. For much of the early postwar period, it remained limited to workers employed in the opening, blowing, and cardrooms in factories where the spinning of raw cotton was carried on; workers had to be employed for at least 20 years; and they had to be totally or permanently incapacitated for work as a result of byssinosis (Ministry of Pensions and National Insurance 1963, p. 5). Much of the contact between specialists and the trade unions consisted of diagnoses on individual union members. However, byssinosis remained difficult to diagnose and distinguish from bronchitis and emphysema, particularly among cotton spinners. Perhaps most interesting is the potential role of the trade unions. Wyke argued that, in the case of scrotal cancer, the trade unions had played a relatively unimpressive role (Wyke 1987). But in relation to byssinosis, Sue Bowden and Geoffrey Tweedale have recently argued that the trade union response has been much misunderstood, and that the unions deserve more credit than they have traditionally been afforded (Bowden & Tweedale forthcoming).

Arthur McIvor has made the point that occupational health has traditionally made progress in wartime, and this is perhaps clearest in the case of lighting, though this was not peculiar to the textile industry. Lighting was the subject of attention for a number of reasons. Perhaps most prominent was its effects on industrial production and on the way that the association between poor lighting and eyestrain, headaches, and psychological effects might contribute to the inefficiency of the worker. It was claimed, for instance, that studies of silk weaving carried out in the winter months showed how lighting affected the quality and quantity of the work that was produced. Second, it was recognized that poor lighting was often a contributory factor in accidents. Third, it was argued that good lighting also helped to maintain a high standard of sanitation and prevent accumulation of waste and dirt. Thus the Home Office argued in 1921 that "good lighting is essential for the maintenance of order and decorum" (Home Office 1921, pp. 1–2). Studies of lighting tended to assess it in terms of its adequacy and suitability, including within the second category such issues as constancy and uniformity, the prevention of glare, and the avoidance of shadow. An important distinction was that between natural and artificial lighting.

The links between lighting, productivity and the efficiency of the workforce were further illustrated by some of the studies carried out in the 1930s by the

Industrial Health Research Board and the Illumination Research Committee under the auspices of the Medical Research Council. One of these concluded from a series of experiments that, although it was always more difficult to see small objects than large ones, improved illumination did improve the ability of the subjects to see small objects (Weston 1935, p. 11). Lighting was covered in successive reports issued by the Departmental Committee on Lighting in Factories and by the 1937 Factories Act. Nevertheless, it was during the Second World War that most attention was given to lighting. On the one hand, it was necessary to instigate a blackout, but, on the other, wartime conditions led to increased employment of workers at night. Contemporary observers thought that work was done under greater pressure, leading to greater strain on the worker. Equally, the increased prevalence of night work meant that the time spent under artificial light was greater. The result was new minimum standards for artificial lighting. As was argued by the Ministry of Labour and National Service, the new wartime conditions justified a higher standard of lighting than that previously recommended "in the interests both of the workers and of increased production" (Ministry of Labour and National Service 1940, p. 6). Whether these higher standards survived into peacetime is difficult to judge.

A final issue that was more specific to the textile industry was noise. Again, it had long been recognized that particular types of workers, notably those involved in weaving, were particularly prone to deafness. An investigation by the Industrial Health Research Board in 1935 showed that noise in weaving sheds (with noise levels above the 90–100 decibel range) seriously impaired hearing and affected production. Therefore, weavers learned to lip read (McIvor 2001, p. 141). However, proof of causation was not enough to satisfy the courts, it being necessary to demonstrate negligence on the part of the employer. In 1970 the Wool Industries Research Association (WIRA) concluded that much machinery in the wool textile industry generated noise that was in excess of that considered safe, and more could be done to relieve the effects of high noise levels by paying more attention to machine maintenance and siting and by using ear defenders and absorption barriers (WIRA 1970, p. 16). In the 1970s, the Amalgamated Textile Workers Union tried to persuade central government departments to extend compensation coverage for occupational deafness to include its members. It was argued that conventional looms should be replaced by more modern weaving machines, weavers provided with hearing protectors, and weaving sheds constructed with sound absorbing ceilings. Occupational deafness was subsequently prescribed under the 1965 National Insurance (Industrial Injuries) Act (DHSS 1973b, p. 90). Nevertheless, there was also evidence that little attempt was made to reduce noise levels by management, and that individual workers remained reluctant to wear ear protection.

The textile industry was thus associated with a range of health issues, some of which were generic to industrial work in general, while others were particularly linked to specific materials and processes in the textile trade. Scrotal cancer and byssinosis were associated more with the Lancashire cotton trade, and noise (and

in the early 1900s, anthrax) more with the Bradford wool industry. There were also differences over time, so that in the early part of the twentieth century the main concerns were over dust levels in cardrooms. But by the 1970s, it was byssinosis and noise that had become the subject of attention. Together, the changing nature of the labor force, medical research, wartime conditions, growing union power, changing attitudes on the part of employers, and state intervention meant that by the postwar period conditions had improved (McIvor 2001, p. 145). The main actors in this area were central government departments, trade unions, legal firms and individual researchers, of whom Schilling in Manchester was a good example. How far these issues impinged on individual workers is more difficult to judge. Trade union records sometimes contain correspondence between individual workers and their trade union representatives, usually in connection with compensation claims. These are often eloquent and moving testimonies from workers in the final stages of scrotal cancer. In a more general sense, the voice of the worker is absent. How far were issues of health perceived as important, and what significance did health have in the general context of working life? In the next section we examine these issues through the particular example of the experiences of South Asian migrants in the Lancashire and Yorkshire textile industries.

Migration

It is arguable that by the immediate postwar period some of the major occupational health issues in the textile industry had been cleared up. What is more certain is that the industry itself was in decline. The decline of Britain's manufacturing base in the late 1970s and early 1980s had a particularly serious impact on the textile industry. To take one local example, in 1971 there were 18,234 people in Oldham employed in textiles, but by 1995 this number had fallen to only 1,827 (Kalra 2000, p. 133). The decline had actually begun much earlier. Reports published in the 1940s convey vividly the economic and manpower problems faced by the wool trade. In 1947, for example, the Board of Trade lamented the retirement of older workers along with manpower shortages in terms of women, younger workers, different sections of the industry and particular districts. It outlined a range of measures designed to improve the attractiveness of the industry (Board of Trade 1947, pp. 43–65).

These problems were reflected in measures taken by individual mills: offering accommodation for migrant Italian workers and providing transportation for workers from outlying areas. Nevertheless, a report by the National Economic Development Office (NEDO) on the wool trade, published at the end of the 1960s, also presented a pessimistic picture. This argued that increased output was necessary, along with increased investment and modernization, more shift work and higher productivity, the standardization of product ranges, more specialization in products and services, further reductions in manpower, and the liquidation of unprofitable businesses (NEDO 1969, p. xi). What was also apparent from the NEDO report was the increase in the number of migrant workers. It was estimated in 1969 that, of the overall workforce of around 144,000, European migrants

comprised 3,645 or 2.6 per cent; Indian and Pakistani migrants 9,813 or 6.8 per cent; and other Commonwealth or foreign workers 1,542 or 1.0 per cent (NEDO 1969, p. 22). In particular cities and on particular shifts, the proportion of migrant workers was much higher.

While the rise and fall of the economic fortunes of the textile industry is relatively well-known, the history of the health of migrant workers has been generally neglected, as has the history of ethnicity and health in general. But first it is necessary to provide some background information on the reasons for migration, and the growth of ethnic minority communities at our four study sites. There are problems in using census data, particularly for the latter part of our period. The 1991 Census included an ethnic question for the first time, as opposed to simply recording place of birth. The census data indicates that the number of South Asian migrants in the four study sites increased substantially over the period 1951 to 1991 (Tables 13.1 and 13.2).

Table 13.1. South Asian population of the four study sites, 1961–1991.

Year	Bradford	Bolton	Blackburn	Preston
1961	4,969	424	639	693
1971	17,060	4,910	4,555	3,125
1981	25,352	7,157	7,346	7,731
1991	60,646	17,812	18,830	10,103

Source: Office of Population Censuses and Surveys (1961–1991).

Table 13.2. South Asian population as percentage of population of the four study sites 1961–1991.

Year	Bradford	Bolton	Blackburn	Preston
1961	1.7	0.3	0.6	0.6
1971	5.8	3.2	3.2	3.2
1981	5.6	2.8	5.2	6.2
1991	13.3	6.9	13.8	8.0

Source: Office of Population Censuses and Surveys (1961–1991).

In terms of the profile of early migrants, the original pioneers were former seamen and soldiers, who provided an important source of support for the later arrivals. Others were small landowners who invariably joined a relative or close friend in Britain. An important group was that of displaced people, including those from the Manga Dam project. Many used the compensation they received to send family members abroad as an investment, with the expectation of a return through remittances (Anwar 1979; Kalra 2000). Above all, the early migrants were male: for example, over 90 per cent of South Asians in Bradford at the time of the 1961 census were male. Obtaining a visa, collecting the money for a ticket, and finally landing in Britain involved an immense amount of labor and effort. In the 1950s, travel agents in Pakistan charged £250–£300 for a passport and airfare to Britain, rising to around £600 in the 1960s. With average per capita incomes in Pakistan of around £30, migration was restricted to relatively affluent families. Those who participated in migration did so with the expectation of a substantial return

through remittances, with the aim of returning to Pakistan within four to five years. This was the so-called "myth of return" (Anwar 1979).

An important theoretical framework around migration is provided by the debate between those who favor alternative structural and cultural explanations. Among the former are writers such as Rex, Miles, and Duffield, while the latter include Wallman, Anwar, and Khan. Together they have engaged in a polemical debate about the history of the labor market position of South Asians in Britain. The structuralist position derives in part from a Marxist interpretation of society. An "informal apartheid" was central in determining occupation and labor market position, and jobs were those that the white population did not want. In this analysis, power relations limit choices, so that Asian people do not choose to live in inadequate housing any more than they choose low-status jobs. An "underclass" or class fraction analysis is often apparent in this interpretation (Rex 1979; Miles 1982; Rex & Tomlinson 1997). On the other side is the culturalist interpretation, coming in part from ethnographic studies. Here the role of culture is central in determining occupation and labor market position. It is thus argued that the early migrants wanted work that required little long-term commitment and paid fairly well, and that South Asians have different goals from the rest of society, with solidarities based on ties of religion and kin (Anwar 1979; Khan 1979).

A case study of migration from Mirpur in Azad Kashmir, Pakistan (Figure 13.1) to Bradford in West Yorkshire indicates some of the key "push and pull" factors associated with the migration process. Two "push" factors were particularly important in relation to the migration of Pakistanis to Britain: the partition of British India in 1947 when Pakistan (East and West) was created, and the construction of the Mangla Dam in Pakistan in the early 1960s which flooded 250 villages in the Mirpur district of Azad Kashmir (Anwar 1996). In both these cases, large numbers of people were displaced, and Mirpuris were given priority for immigration at that time. Whole communities from that area migrated to Britain, particularly to the West Midlands and Yorkshire (Kalra 2000). The Mangla Dam project was thus important, combined with the post-partition political climate in Azad Kashmir and increased pressure on rural land in Pakistan. The corresponding "pull" factors in Britain were gaps in the labor market caused by the economic boom of the immediate postwar period that created a need for workers, particularly in manual jobs and shift work. Specific "pull" factors in Bradford included the development of community and kin networks around mosques, shops and community organizations. As Anwar has written, "colonial links, political freedom of movement and economic push and pull factors developed into a chain migration" (Anwar 1979, p. 21). Thus these were significant factors in relation to migration and settlement patterns (Taylor 1990).

Figure 13.1. The Indian subcontinent. Source: Taylor (1990).

The migration of South Asian workers to West Yorkshire was evident in the changing demography of Bradford. The numbers of Indians, Pakistanis and Bangladeshis increased from 542 to 60,646 between 1951 and 1991. In 2000 it was estimated that by 2006 Indian, Pakistani, and Bangladeshi ethnic groups would represent three, eighteen and one per cent, respectively, of the total estimated population of Bradford (Bradford Metropolitan District Council 2000, p. 3). Both structuralist and culturalist arguments have relevance to the migration of "South Asians" to Britain. Most of the jobs available were unskilled and involved unsociable hours of work, poor working conditions and low wages (Ahmat et al. 1993). But recruitment was often through family ties and kin networks. The motivations for migration were conveyed in some of the interviews. One South Asian worker in Bradford said that

> when I was in Pakistan, everyone asking when you going to England you know, that time very easy come here. Very easy, you have ticket money, then you can just pay and make a passport and come to here (interview TP034).

Another from Bradford simply replied that "I came in search of better future" (interview TP002). The arrival of Irish migrants in Britain in the late 1800s offers some points of comparison, except that the Irish arrived during a period of industrial expansion and the "South Asians" in an era of decline.

Perceptions on Arrival

The debate between the structuralists and the culturalists provides a helpful framework for the background to migration. In addition, the oral interviews provided

vivid testimony on the experience of arrival. One worker who arrived in Bradford in the 1950s commented that "it was a cold, dark misty evening. A lot of mills around, a lot of darkness, very short days, long nights, very, very cold. That was the picture" (interview TP036). Another recalled that "it was like another world, because of the fog and the smoke" (interview TP032).

In the early phases of postwar migration, Pakistani men had arrived without their female kin. The class position of these men was typically that of low wage workers residing in poor quality housing in declining inner-city areas of British cities. Groups of young Asian males lived together in often overcrowded conditions. They faced difficulties in adapting to life in Britain, including cooking, obtaining halal foods, and coming to terms with the climate. A South Asian worker from Preston, for example, recalled that

> we have a main problem on those days is the food. One Asian grocer used to come from Birmingham, Mr. Desai, and we giving our requirements, a list, so every fortnight he bring them (interview TP027).

Another worker from Bradford remembered that:

> Our house was 53, and end of the street there were toilets for each households. It was cold and damp. There used to be coal available to burn, but in those days it was not easy. You were only to burn coal on Saturday and Sunday. You had to put on a lot of coats (interview TP032).

Another worker from Preston recalled how it was difficult to find suitable food. He said that

> we used to slaughter the chickens in the kitchen ourselves to make them halal, but there were difficulties in finding grinding equipment. We used to use a milk bottle to grind ginger (interview TP028).

Many of the respondents told stories of up to 17 young Asian men living together in three or four bedroom houses. Those working on the night shift would share a bed with the day shift workers, and they recalled that "the bed was never cold".

It is relatively clear how and why South Asian workers came to be employed in the textile industry in Britain in the immediate postwar period. They were a cheap source of labor for an industry that was in decline, and they came to occupy an ethnic niche (Ahmat et al. 1993). What is much less well-known is the history of the health of migrant workers. Some recent writers have argued that migrants and ethnic minorities have reduced entitlements in host societies. They tend to be exposed to poor working and living conditions, which are *per se* determinants of poor health, but they also have reduced access to healthcare for a number of political and cultural reasons. These include language, lack of education, different concepts of health and disease, discrimination and racism (Bollini & Siem 1995, p. 821). Others share this view, stating that members of immigrant ethnic minority groups tend to have poorly paid, insecure jobs, and their success in the job market depends upon the availability of work, their skills and qualifications, and their

ethnic stereotype as "good" or "bad," "skilled" or "unskilled" employees (Lloyd Evans & Bowlby 2000).

The psychological and physical health of migrants in Bradford was linked to the new climate and living conditions. A lifestyle that was overwhelmingly indoors was in great contrast to the outdoor sociability of village life in Pakistan. The loss of social networks led to isolation, particularly for mothers, while the lack of English lent a complexity to formal interactions. In addition there were cultural differences, with the individualism and independence that characterized urban Britain providing a contrast to the dependency and loyalty evident in rural Mirpur.

Working on the Night Shift

One of the issues that we were concerned to explore in the oral interviews was the experience of working on the night shift. The night shift would run until six AM, with a thirty minute break for food at about one AM. It has been suggested that the concentration of South Asian men on the night shift showed how their opportunities for other jobs were blocked and reflected a deliberate attempt to minimize contact between South Asian men and white female workers. But from the point of view of the workers themselves, there were clear incentives to work on the night shift. It offered a sense of security in working with people who spoke the same language and with migrants who were kin relations. Equally important, the night shift paid more than the day shift. So the night shift was advantageous both to the management and to the migrants (Kalra 2000, pp. 113–116).

By the mid-1960s, around 65 per cent of Bradford's South Asian population was employed in the textile industry. Different people justified the concentration of Pakistani men on the night shift, from which women were prohibited from working by law, in different ways. Some justifications were linguistic, since it was claimed that segregated shifts allowed Urdu or Punjabi speaking worker teams to communicate more easily among themselves. Others were evidence of sexual panic: a view that South Asian men were somehow threatening to white women. Paradoxically, notions of the feminine oriental were used to justify their employment. Perceptions of manual dexterity reflected general and radicalized stereotypes, with claims of "nimble" fingers illustrating a feminization of the male Asian worker (Jackson 1992, p. 202). And blatant racism was evident in claims that, for example, Asian workers could cope with the boredom of a 12 hour shift.

A former worker from Bolton commented that

> white people did not want to work night shift because of the inconvenience, and the Asian people, wanted to work night shift, its only because it was paid better (interview TP036).

A former worker from Bradford said that "at night all Asian, there were only Pakistani at that time, up to 1971 […] overlookers were white, and in charge of all Pakistanis" (interview TP032). A former worker from Bolton commented that "the night shift always operated with Asian people, 99 per cent of the staff were Asian" (interview TP036). A Bradford worker recalled that "there were shifts

when all night and weekend, 12 hour shifts, day and night. No time for your family, no time for leisure" (interview TP028). A former fellow-worker from Bradford said that "they [English workers] considered day shift was for them, night shift for Pakistani and weekends were Pakistanis" (interview TP032).

One question in the query concerned the health implications of working on the night shift. One of the workers interviewed by Kalra responded in the following way:

> I did not want to leave the job. But after working on the night-shift for so many years I could not sleep at night. The doctor gave me sleeping pills, which worked at first and I thought I could go back to work, but they stopped working after a while. Then I went to Mirpur and even though I could sleep there, the rest of my health suffered. While I was there, I went to a *desi hakim* [doctor] who gave me some *apna* [local] medicine with which I was getting better. But it is not the same level of health care. Now, I can only sleep by taking pills and they make me feel sleepy all the time (Kalra 2000, p. 125).

Kalra goes on to argue that prolonged working on the night shifts in the Oldham mills led to industrial accidents, bone complaints, and breathing problems. Further, ill health led to the high level of unemployment found among these migrants. He argues that "years of working on the night-shift took their toll and resulted in weakened bodies not able to even undertake light laboring work" (Kalra 2000, pp. 125–126). However, those arguments have not been borne out in the interviews conducted for this study.

Health and Safety

As we noted earlier, some of the occupational health problems that had previously dogged the textile industry may have been mitigated by the postwar period. In reviews conducted in the 1970s, the Health and Safety Executive commented that accidents were still occurring because of a management failure to implement health and safety recommendations, and because workers were too reticent to adopt safe working methods (HM Factory Inspectorate (1979a, b). It was found, for example, that on routine visits, many safety guards in plant blowing rooms were defective. Anecdotal evidence supports the argument that health and safety measures were ignored or not implemented. One study published in 1976 suggested that workers often took their face masks off; that dust was like a "snowstorm" and caused "Monday fever"; and that noise levels remained deafening, especially in weaving sheds (Cox & Golden 1976, pp. 5, 8, 11, 25).

Again, the oral interviews provided insights in how health and safety issues were perceived by the workers themselves and integrated into lay conceptions of health and illness. One former worker from Bradford recalled that

> dust levels were always very high. On your clothing, your body and your hair, there was always a lot of dust, extractor fans […] were not regularly used because the mill becomes too cold (interview TP036).

A worker from Bolton said that

> the noise was the first thing you take home with you the very first day, cause you can actually hear it when you go to sleep after. But it was very, very noisy, and very dusty, because of the cotton fibers (interview TP032).

Another worker from Bolton remembered that

> although as a supervisor it was my responsibility to make sure everyone wears it, I felt uncomfortable wearing it myself, so I never put a restriction that they must wear it (interview TP036).

One of the interesting aspects of health and safety is the relationship with language and literacy. A former worker from Bradford remembered that

> there were some [health and safety] notices around, I never read it. One, you couldn't read, and if you do read you don't understand (interview TP028).

Another worker from Bolton said that:

> they would always give some sort of warning to say when they [factory inspectorate] are coming in, so all the guards are put on, and you know you are going to get inspection, and it's probably once or twice a year […] when the guards start coming off again you know they've been and gone, and they are not going to come during the night shift anyway (interview TP036).

Johnson and McIvor have argued persuasively that in relation to asbestosis on Clydeside, attempts to enforce health and safety regulations in the workplace were compromised by the *machismo* culture evident among shipyard workers. Whereas in younger workers this took the form of a reckless bravado, in older workers it was expressed more through a sense of stoic fatalism (Johnson & McIvor 2001, p. 57). With regard to our interviewees, the latter theme provides a better fit with the oral evidence, with the migrants displaying evidence of a relative disregard for personal health. Of course, comparison between the two studies is difficult. The workers interviewed by Johnson and McIvor were asbestosis victims, who provided vivid testimony to the effect that occupational disability had had on their lives. In contrast, our project made a deliberate decision not to use lists that were available of workers who were seeking to make compensation claims against employers for allegedly work-related health problems. It was thought that these would bias the findings of the study.

Racism in the Textile Industry

Early sociological studies of the north of England found evidence of racism in the mill culture. Polish, Latvian, and West Indian migrants were viewed with hostility, and were seen in terms of stereotyped characteristics, although these findings also revealed important differences in how the different ethnic groups were viewed (Jackson 1965, pp. 85–88). The main legislative attempt to tackle racism came with the 1968 Race Relations Act, covering discrimination in employment,

trade unions and trade organizations, advertising and notices, housing accommodation and other business premises. In the textile industry, the 1968 Act affected agreements relating to the employment of foreign workers and requirements to join a trade union. But it was only in 1970 that the Department of Employment and Productivity issued memos on migrant workers in relation to the separate issues of religious observances, language and communication.

It is clear that in addition to racial abuse from colleagues, there was institutional racism in the industry. This could take the form of a lack of promotion or training, radicalized labor, pay differentials, arguments over the control and management of time (trips home and Eid), and a perceived lack of union support, with the migrants being seen as "alien, foreign, and temporary". This was again evident in some of the oral interviews. One interviewee simply stated that "the union doesn't support ethnic minorities" (interview TP005). One worker from Bolton recalled that:

> All management structure was all white, and the view of the people at that time was it will stay white as along as we are here. It was very fresh from the British Raj in India, that "we are the masters" and "we shall remain the masters", and I think that people accepted that (interview TP036).

Another worker from Blackburn recalled that:

> when I was promoted as a mechanic first time, the manager promoted me and I got the letter, and er… all the white mechanics they walked out and they said to the management if he comes in we're going out. So the personnel rang me up and said we have a problem, we want you, but this is our problem, they will all walk out (interview TP005).

Evidence of racism came through strongly in the other interviews that were conducted. Another worker from Bolton said that "the rate of pay was different. If you work on the same job on the nights it is different, less, than during the day" (interview TP036). One worker from Bradford said that "I think there was a racist attitude in every structure, whether it's coming from the workforce, union, management" (interview TP033). A worker from Bradford summed his feelings up simply by saying that "well, it was depressing for us, no promotion, after thirty years no promotion" (interview TP032). Another worker from Bradford said that "it was a feeling of just a second class citizen […] it degrades yourself you see" (interview TP028). One worker from Preston replied similarly that "there was never an opportunity for promotion, you were always on the dead-end job. It is your luck that you will stay on the shop floor" (interview TP027). Recent sociological work has argued that racism has important implications for health, including psychological well-being. The history of racism, including its implications for the health of migrant workers over time, is an area deserving further study.

Conclusion

This paper has attempted to compare the conventional history of occupational health in the textile industry with the material that emerges from interviews conducted with former South Asian workers. The interviews provide striking evidence of the economic problems that the industry faced, and how migration fitted into this. Those interviews that have been transcribed so far show how, as mill owners were faced with a shortage of workers in the 1950s, they turned to South Asian migrants. A workforce that had been predominantly young and female, was thus replaced in a short space of time with one that was male and ethnic. New technology allied to increasing competition from abroad required longer working hours, and South Asians took jobs that were not wanted by the local population, such as on the night shift. Migration was organized by family and kinship ties, with "ethnic brokers" playing an important role. Employers claimed that manual dexterity made these migrants particularly suitable for textile work, but stereotypes that were often feminine were also contradictory. What is clear is that migrants were not often members of trade unions. Equally important, there were varieties in their experience, depending on the mill in which they worked, their education, and the level at which they were employed. This analysis highlights the potential of comparative studies. It would be extremely interesting, for example, to compare the ways that perceptions of difference impinged on the way that both Irish and South Asian migrants were viewed within the textile industry.

Evidence on health is more fragmentary, but it is clear that migrants lived in overcrowded conditions, at least initially, and safety notices were often not read, because they were in English. Working on the night shift also had important implications for health, though these are difficult to measure systematically. What is perhaps most striking is the dissonance between the conventional history of occupational health in the textile industry and the material collected in the oral interviews. In the former the main themes include scrotal cancer, byssinosis, dust in cardrooms, lighting and ventilation, and noise, where the main actors were central government departments, trade unions, and individual researchers. But the issues that have emerged as significant in the oral interviews are usually concerned with the experiences of migration and arrival, living in overcrowded conditions, working on the night shift, health and safety, and racism.

It is important to remember that, at the time of the conference for which this paper was prepared, only a small number of the interviews conducted had been transcribed. In this respect, the findings are very much preliminary and the fuller analysis will follow. The respondents were predominantly male, and the sample was relatively small. It is also arguable that in a sense they represent a "survivor's story", in that workers who may have died from byssinosis were unavailable for interview. However, what is arguably most interesting about the interviews is how they have revealed less explicit information about health than was anticipated at the outset. The interviewees tended to give relatively low priority to health when compared to more general issues concerning the experiences of migration and

arrival, housing, and racism. When the interviewees considered issues of occupational health, they were usually integrated into lay conceptions of health and illness. In this respect, a different type of analysis, incorporating traditional concepts of health and illness around metaphors of heat, cold, wet, and dry, is arguably necessary. Health is there in the interviews, but in coded forms.

In turn, the use of oral interviewing has implications for how we view the histories of occupational health and public health. Looking at occupational health in this way brings us closer to the point of work, but also challenges the emphasis traditionally given to the main actors and organizational forces. To give one obvious example, South Asian migrants in the textile industry were not usually members of trade unions. Another task is to link oral and documentary sources more effectively. This presents both challenges and opportunities, but it should be possible to use the oral interviews to interrogate other documentary materials. In relation to the theme of housing in the 1950s, it should be possible to juxtapose the radicalized accounts of "multi-occupation" that occur in MOH reports of the 1950s with the lived experience of the migrants as recounted in oral interviews. Finally, it is also arguable that this study has more wide ranging implications for the twin histories of public health and occupational health. The experience of the worker has traditionally been refracted through other organizations, such as trade unions, and public health and occupational health look rather different when seen "from below". Interviews with workers make it possible to look at health both in and out of the workplace, and to focus on individual outcomes rather than organizational forces. Indeed, from the point of view of the worker, the division between public health and occupational health, with which the conference has been concerned, is perhaps in the end irrelevant.

References

Ahmat Y., Hussain A., Gata Aura T. & Clarke A. (1993) "The textile industry and Asian workers in Bradford" *Race Today,* 14:215–218.

Anwar M. (1979) *The Myth of Return: Pakistanis in Britain*. London: Heinemann.

Anwar M. (1996) *British Pakistanis – Demographic, Social and Economic Position*. Warwick: University of Warwick.

Board of Trade (1947) *Working Party Reports: Wool*. London: HMSO.

Bollini P. & Siem H. (1995) "No real progress towards equity: Health of migrants and ethnic minorities on the eve of the year 2000" *Social Science Medicine,* 41(6):819– 828.

Bowden S. & Tweedale G. (2003) "'Mondays without dread': The Trade Union Response to Byssinosis in Lancashire Cotton Industry in the Twentieth Century" *Social History of Medicine,* 16(1):79–95.

Bradford Heritage Recording Unit (1987) *Destination Bradford: A Century of Immigration*. Bradford: Bradford Heritage Recording Unit.

Bradford Hill A. (1927) *Artificial Humidification in the Cotton Weaving Industry: Its Effect Upon the Sickness Rates of Weaving Operatives*. MRC Industrial Fatigue Research Board Report no. 48. London: HMSO.

Bradford Metropolitan District Council (2000) *Bradford Population Forecasts Information Bulletin*. Bradford: Bradford Metropolitan District Council.

Brah A. (1993) "'Race' and 'culture' in the gendering of labour markets: South Asian young muslim women and the labour market" *New Community,* 19(3):441–458.

Brooks D. & Singh K. (1979) "Pivots and presents: Asian brokers in British foundries" In: Wallman S. (ed.) *Ethnicity at Work.* Pp. 93–112. London: Macmillan.

Cox S. & Golden R. (1976) *Textile Worker*. Harmondsworth: Kestrel Books.

Dearden W.F. (1927) "Health hazards in the cotton industry" *Journal of Industrial Hygiene,* IX (9): 371–401, 453–472, 488–502.

DHSS (1973a) *Pneumoconiosis and byssinosis: Report by the Industrial Injuries Advisory Council.* Cmnd. 5443. London: HMSO.

DHSS (1973b) *Occupational Deafness*. Cmnd. 5461. London: HMSO.

Dowd Hall J. et al. (1987) *Like a Family: The Making of a Southern Cotton Mill World.* Chapel Hill and London: University of North Carolina Press.

HM Factory Inspectorate (1979a) *Cotton and allied fibers: Health and safety 1971–1977*. Health and Safety Executive, London: HMSO.

HM Factory Inspectorate (1979b) *Wool-textile: Health and safety 1971–1977*. Health and Safety Executive, London: HMSO.

Home Office (1921) *Lighting in Factories & Workshops*. London: HMSO.

Home Office (1926) *Report of the Departmental Committee Appointed to Consider Evidence as to the Occurrence of Epitheliomatous Ulceration among Mule Spinners*. London: HMSO.

Jackson B. (1965) *Working Class Community: Some General Notions Raised by a Series of Studies in Northern England*. London: Routledge and Kegan Paul.

Jackson P. (1992) "The radicalisation of labour in postwar Bradford" *Journal of Historical Geography,* 18(2):190–209.

Johnson R. & McIvor A. (2001) "'Dust to dust': Oral testimonies of asbestos-related disease on Clydeside, c1930 to the present" *Oral History,* 29(2):48–61.

Kalra V.S. (2000) *From Textile Mills to Taxi Ranks: Experiences of Migration, Labour and Social Change.* Aldershot: Ashgate.

Khan V.S. (1979) "South Asian women in South London" In: Wallman S. (ed.) *Ethnicity at Work.* Pp. 114–133. London: Macmillan.

Lloyd Evans S.L. & Bowlby S. (2000) "Crossing boundaries: Racialised gendering and the labour market experiences of Pakistani migrant women in Britain" *Women's Studies International Forum,* 23(4):461–474.

McIvor A. (2001) *A History of Work in Britain, 1880–1950*. London: Palgrave.

Mekky S,. Roach S.A. & Schilling R.S.F. (1967) "Byssinosis among winders in the cotton industry" *British Journal of Industrial Medicine,* 24(2):123–131.

Miles R. (1982) *Racism and Migrant Labour*. London: Routledge and Kegan Paul.

Ministry of Labour (1961) *Dust in Cardrooms: Final Report of the Joint Advisory Committee of the Cotton Industry*. London: HMSO.

Ministry of Labour and National Service (1940) *Fifth Report of the Departmental Committee on Lighting in Factories*. London.

Ministry of Labour and National Service (1952) *Mule Spinners' Cancer: Second Interim Report of the Joint Advisory Committee of the Cotton Industry*. London: HMSO.

Ministry of Pensions and National Insurance (1963) *Pneumoconiosis and Byssinosis*. London: HMSO.

NEDO (1969) *The Strategic Future of the Wool Textile Industry*. London: HMSO.

Office of Population Censuses and Surveys (1963) *Census 1961 (Great Britain),* London: HMSO.

Office of Population Censuses and Surveys (1973) *Census 1971 (Great Britain),* London: HMSO.

Office of Population Censuses and Surveys (1983) *Census 1981 (Great Britain),* London: HMSO.

Office of Population Censuses and Surveys (1993) *Census 1991 (Great Britain),* London: HMSO.

Rex J. (1997) “The nature of ethnicity” In: Guibernau M. & Rex J. (eds.) *The Ethnicity Reader*. Cambridge: Polity Press.

Rex J. & Tomlinson S. (1979) *Colonial Immigrants in a British City: A Class Analysis*. London: Routledge and Kegan Paul.

Rose M. (ed.) (1996) *The Lancashire Cotton Industry: A History Since 1700*. Preston: Lancashire County Books.

Schilling R.S.F. (1956) “Byssinosis in cotton and other textile workers” *Lancet,* ii:261–265, 319–325.

Schilling R.S.F., Hughes J.P.W., Dingwall-Fordyce I. & Gilson J.C. (1955) “An epidemiological study of byssinosis among Lancashire cotton workers” *British Journal of Industrial Medicine,* 12:217–227.

Taylor C. (1990) “Asians in Britain – origins and lifestyles” In: McAvoy B.R. & Donaldson L.J. (eds.) *Health Care for Asians*. Oxford: Oxford University Press.

Timmins G. (1996) *Four Centuries of Lancashire Cotton*. Preston: Lancashire County Books.

Welshman J. (2000) “Tuberculosis and ethnicity in Britain 1950–70” *Sociology of Health & Illness,* 22(6):858–882.

Weston H.C. (1935) *The Relation Between Illumination and Industrial Efficiency. 1 – The Effect of Size of Work*. London: HMSO.

Winstanley M. (1996) “The factory workforce” In: Rose M. (ed.) *The Lancashire Cotton Industry: A History Since 1700*. Pp. 121–153. Preston: Lancashire County Books.

WIRA (1970) *WIRA report 101: Noise in the textile industry*. Leeds: WIRA.

Wyke T. (1987) “Mule spinners’ cancer” In: Fowler A. & Wyke T. (eds.) *Barefoot Aristocrats: A History of the Amalgamated Association of Operative Cotton Spinners*. Pp. 184–196. Littleborough: George Kelsall.

14: Politics, Industry and International Health in Latin America during the 1940s

Marcos Cueto, School of Public Health, Universidad Peruana Cauetano Heredia, Lima, Peru

International health during the mid-twentieth century is a theme that has received little attention from historians of medicine. The remarkable studies on medicine as a tool of empire that appeared a few years ago studied developments of the turn of the century and concentrated on the activities designed in the metropolitan centers. I believe that an enlarged temporal perspective could be an instrument in understanding change and continuity in international health and will provide better insight into the interface between global and local interests. This perspective is pertinent even today when international health is again redefined (Kikbusch 2001). A similar thought appeared in the Rockefeller Foundation 1946 Annual Report:

> International health has in recent years expanded so rapidly and crystallized into such definite form that it appears to be of more recent origin than it actually is (Rockefeller Foundation 1948, p. 2).

The purpose of this paper is to describe and analyze the major changes in the motivations, organization and practice of international health in the Americas during the 1940s. As this study will try to demonstrate, these changes were marked by an increase in the range, diversity and intensity of international health activities and left a strong legacy for the post-war period. In addition, its ties with political imperatives – marked by the conflict of World War Two and the beginning of the Cold War period – were stronger than before.

In order to understand the period analyzed in this paper, I will describe briefly international health in Latin America at the beginning of the twentieth century. I will not address here the Latin American responses to this new panorama of international health, because of the lack of research. In any case, I recognize that the view of this article from the top-down may be incomplete, but it should be helpful for future studies on the reception and resilience of Latin American health systems and ideas.

Background

Between 1913 and 1939 the International Health Division (IHD) of the Rockefeller Foundation (RF) was the most important international health agency operating in Latin America. Support of research in the basic biomedical sciences, the reform of medical education and campaigns against hookworm, yellow fever and malaria, were the main activities of the Rockefeller Foundation in the region (Cueto 1994). Besides the foundation, there was a loose web of institutions interested in health in the Americas. The main institutions related to this web were US

businesses, universities and the military. Some of the web's members concentrated their interest in Latin America, while others were interested in Latin America as part of a broader concern with health affairs in general.

The web included the medical departments of US industries operating in Latin America, such as the United Fruit Company. The United Fruit Company cultivated and exported bananas from Central America, the Caribbean and Colombia and established a network of hospitals, laboratories and sanitation activities beginning in 1912 (Wilson 1942). Another important component of this web was one of the first truly multilateral institutions: the Pan American Sanitary Office. It was created in 1902 as a unit of the Pan American Union, and, until the 1940s, it concentrated on the establishment of quarantine regulations, health codes, smallpox vaccination and campaigns against bubonic plague in Latin American ports and cities (Howard-Jones 1980; Pan American Health Organization 1992).[114]

Other components of this international web were the academic institutions devoted to tropical medicine. These were created in the first decades of the century and experienced a revival with the entry of the US into World War Two. The most prominent institutions were the School of Tropical Medicine of Tulane, the one in Puerto Rico (created in association with Columbia University (Ramirez de Arellano 1989) and Harvard School of Medicine's Department of Comparative Pathology and Tropical Medicine (Cueto 1996). It also included professional societies, such as the American Society of Tropical Medicine (that grew from 520 active members in 1940 to 952 in 1943), and academic journals, for example, *The American Journal of Tropical Medicine* that has existed since 1921; *Mosquito News*, that began to appear in 1941; and *The Journal of the National Malaria Society*, published between 1942 and 1951. Some of their activities were funded by the Rockefeller Foundation and new philanthropies such as the American Foundation for Tropical Medicine, that operated in New York in 1940 (Faust 1944). Finally, other components of this web (that have been less well studied) were the various medical departments of the US military and humanitarian and religious organizations, such as the National Red Cross Societies coordinated by the League of Red Cross Societies created in Geneva in 1919 and the Adventist Church (Reid & Gilbo 1997).

Despite the diversity of institutions and the organization of important sanitation campaigns, the scope and relevance of international health before World War Two were not clearly defined in the Americas. The links between international agencies and US politics and industries were unstable, and activities were scarce, fragmented, suffered discontinuity and – with some exceptions – used few resources and little personnel. In contrast, during and just after World War Two, the number of agencies, programs, fellowships and grants directed toward Latin America increased dramatically. In addition, from the early 1950s international health became part of more global development schemes and an important ingredient of the Cold War.

[114] The Pan American Sanitary Bureau is today better known as the Pan American Health Organization, PAHO.

New and Old Motivations

International health in the Americas experienced a revival at the beginning of the 1940s for a combination of reasons. Some were similar to the motivations that launched international health in the precedent period. One strong motivation was the fear of reinfection. US governments and institutions were concerned that increased contact with less-developed regions of the world produced by commerce, war and air transportation augmented the risk of imported infections in the US. International health became a valid means of protection for American soldiers, businessmen and travelers, and a form of prevention for the US population at large.

The concern for protection and prevention was especially strong among the military. During the years of World War Two, eight million American soldiers were exposed to disease hazards that were under control in the US, such as malaria. This disease had the highest incidence among tropical illnesses in the army during the war with a total of 460,872 cases, of which only 4,000 transmissions occurred on the American continent. However, thanks to new drugs and medical treatment, mortality rates for malaria among the US military were very low.[115] In the wake of the conflict, Fred L. Soper, a former officer of the Rockefeller Foundation, added an important argument to support a close relationship between international health and the US military: "Should the war come again, the United States will need healthy nations as allies."[116]

The military concern for hemispheric safety also resulted from the need to secure a safe supply of rubber and quinine from South America. The Japanese invasion of the Dutch East Indies in 1942 cut off the primary world source of quinine, which was crucial for the treatment of malaria (Steere 16 February 1946). Almost immediately the US government signed agreements with all Andean countries to revive the almost extinct Chinchona-bark industry, organize scientific expeditions to the areas where quinine was first discovered, establish laboratories in the main Latin American cities and buy all bark that exceeded certain minimum alkaloid content. Likewise, the US lost the rubber supply after the Japanese takeover of Malaysia as well as in other rubber production areas in Asia. Another military reason for following developments in Latin America closely during the war was the strategic location of the Panama Canal and the fear that, if Nazis controlled Dakar, a possibility that existed until 1943, they would be able to invade the new world.

A loyal hemisphere was necessary in the war effort and not only for military reasons. Another important motivation was the economic importance of Latin America for the US International health was constructed as a tool for increasing

[115] Dengue was second to malaria, the former causing 84,090 hospital admissions among soldiers. The two diseases had the highest incidence among tropical diseases in the army during the war. See Simmons 1947.

[116] Fred L. Soper. "International Health Work in the Americas, May 3, 1948." Nelson A. Rockefeller Papers (hereafter NAR) Series 114. Box 111. Folder 932. Rockefeller Archive Center, New York (hereafter RAC).

the economic productivity of regions of the world under American influence. The protection of plantations, mines and camps from epidemics became essential. The growth of American business in the region was corollary to the development of industrial medical departments operating abroad. For example, by the late 1940s the United Fruit Company employed 89,986 people in the tropics and maintained 1,830 beds in its hospitals and dispensaries. The medical director of the company explained to the participants of the Fourth International Congress on Tropical Medicine and Malaria the importance of medicine for successful business in the tropics: "Philanthropy is not only a virtue; it is a basic law of survival" (Salisburry 1948). In the same meeting the idea was even expressed in technical terms: health was an important investment for "the stabilization" of the labor force and the continuity of economic production.[117]

Moreover, during and after the war, American political and academic leaders realized that Latin America represented a very important market for American goods. In order to render Latin Americans capable of buying these products, it was necessary to instigate some degree of economic and social development to raise the local standards of living. In 1945 a medical military officer in charge of US-Latin American relations explained the idea to other Americans attending the annual dinner of the American Foundation for Tropical Medicine:

> All the taxpayers' money spent […] in the other Americas will come back to the taxpayers of the United States in improved trade relations (Dunham 1945).

Paradoxically, the growth of interest in Latin America came out of the tragedy of Europe. This was true in the case of the Rockefeller Foundation. After the Nazi invasion the Rockefeller Foundation's work in continental Europe practically ended. In addition, China, a long-term interest for the foundation, was in the middle of a civil war. As a result, the foundation closed its offices in continental Europe and transferred some resources and personnel to Latin America.[118] In 1945 Rockefeller appropriations to Latin America were greater than those earmarked for all other regions of the world combined. The relocation of resources continued even after the end of the war. In 1948 Latin America received 44.3 per cent of the International Health Division money, the US and Canada only 32.8 per cent and the rest of world 22.9 per cent. In contrast, during the period between 1913 and 1933, Rockefeller Foundation expenditures by geographical areas were: 35 per cent for Europe; 49 per cent for the Far East (where the RF supported a medical school at Beijing) and only 10 per cent for South America, Central America and

[117] Comments of Jerome Rodhain to the presentation of E. I. Salisburry, "Health and Medical Services in the Tropics." p. 1450. In: *Proceedings of the Fourth International Congress.*

[118] In a 1943 meeting of the RF it was noticed: "Geographically the field of operations has shifted under the influence of the War. While the work in Continental Europe and much of the Far East is temporarily at the standstill, the activities under regular program in South America have increased markedly." "Analysis of program in relation to changing condition. Preliminary Divisional Statement, 5 October 1942." Rockefeller Foundation Archives (hereafter RFA). R.G. 3. Series 908. Box 13. Folder 135. RAC. "Memorandum about the extension of our IHD Program in South America." Attached to the letter A.J: Warren to R.B.F. 8 August 1940. RFA E.G. 3 Series 908 Box 12 Folder 126 RAC.

the Caribbean.[119] It is also important to underline the reversal of this trend in the 1950s when the foundation resumed contact with European institutions and individuals. In 1948 an important Rockefeller officer expressed the consensus of the IHD: "we cannot expect in the future to maintain our program in Latin America at the level reached during the War."[120] An illustration of these trends appears in the evolution of IHD fellowships by region during the period 1917 to 1951 (Table 14.1).

Table 14.1. International Health Division fellowships by country, 1917–1951.

	1917–26	1927–36	1937–46	1947–51	Total
Canada and US	89	354	229	157	829
Latin America and the Caribbean	73	126	219	55	473
Europe (including UK)	182	232	90	78	582
Near and Far East	45	151	57	95	348
South Pacific and Others	18	9	46	32	105

Source: Rockefeller Foundation Archives. Record Group 3. Series 908. Box 15. Folder 173. Rockefeller Archive Center.

Note: Europe includes West and Central Europe, Scandinavia and the Balkan areas. The Far East includes India, China and Japan. South Pacific includes Australia. The category "others" includes a few grants to countries of the Middle East and Africa.

The fellowships from the IHD and other agencies intensified the Americanization of Latin American medical and health personnel and institutions. At the beginning of the twentieth century the medical Mecca for many Latin American students was Paris, and it was common to find a large amount of French textbooks in local medical libraries. By the mid-twentieth century US universities became the favorite choice for Latin American medical students pursuing a postgraduate education, and a reading command of English nearly became a requirement for medical training. For example, in 1943, of the 123 Latin American RF fellows, 119 studied at educational institutions in the US and Canada. There were also greater facilities to overcome language barriers. Beginning in 1942 Latin American RF fellows attended a preliminary eight-week course at Johns Hopkins University, basically to improve their English, before the start of the regular course of study (Rockefeller Foundation 1943, p. 139). In addition, the foundation granted an important number of travel grants to enable experienced health officials and medical researchers to visit the US and exchange views with their American colleagues. Americanization was not a trend resisted by local individuals and institutions. Moreover, it appears that there was competition among locals to take advantage of the access to technology, financial resources and fellowships.

[119] "Report of IHD Staff Conference, 19 May1948, New York City," RFA. R.G.3 Series 908 Box 13 Folder 134; "Rockefeller Foundation Expenditures during the period 22 May 1913 to 31 December 1933 by Geographical areas." RFA. R.G. 3 Series 900 Box 3 Folder 23. RAC.

[120] Lewis Hackett "Interrelationship of IHD and other agencies operating in Latin America: the problems that arise and their solution. To what extent is coordination possible?" In: "Report of IHD Conference, 19 May 1948." RFA. R.G. 3 Series 908 Box 13 Folder 134. RAC.

New Institutions

The greater interest in international health in the Americas was also expressed in the emergence of new agencies and a series of reorganizations at the RF. At the beginning of the 1940s the Latin American work of the IHD was reorganized in four main field offices located in Rio de Janeiro, Mexico City, Havana (in charge of the Caribbean, Central America, Colombia, Venezuela and British Guyana) and Buenos Aires. It is important to emphasize that in 1940 only one other IHD field office existed abroad (in India) (Rockefeller Foundation 1941, p. 117). The Buenos Aires' office, created in 1939 as the *Rio de la Plata and Andean Region Office*, operated in Argentina, Bolivia, Chile, Peru, Ecuador, Uruguay and Paraguay. It was extremely active until 1949 when it closed its doors, partly because of political tensions between the US and the populist Argentinean dictator Juan Perón.[121]

Lewis W. Hackett, an experienced officer of the RF with experience in Central America (1914–1924) and Italy (1924–1940), moved from Rome to Buenos Aires to head the new IHD office in Buenos Aires. It is interesting to note that the decision of the foundation was considered the beginning of the end of its work on yellow fever and a diversification of the foundation's interests in the region. During the 1930s, the significant work of the RF on yellow fever in Brazil was handed over to the Brazilian government. This work completed, the moment was considered ripe for an expansion of "the general public health program throughout South America". The latter was understood as the decentralization of health services, the promotion of full-time positions in the public health ministries, the training of nurses and support for medical education reform.

The activities of the foundation in Latin America were not isolated events but part of a broad process of renewal of international health's institutions (see Table 14.2).

In addition to these organizations, other institutions existed in the US for which data are not readily available, such as the W.K. Kellogg Foundation that concentrated on the education of dentists, physicians and other health professionals in Latin America; the Division of International Health of the US Public Health Service created in 1945 as the Office of International Health; the powerful Medical and Research Program of the National Research Council and a Committee on Medical Research of the Office of Scientific Research and Development (Williams 1951).

[121] "South American region-authorization, November 6, 1939." RFA. R:G: 3 Series 908. Box 12. Folder 126. RAC.

Table 14.2. Organizations working in international health in the Americas, 1949.
Note: N.A. = Not Available.

Name	Year of Creation	Scope	No. of Officers	Headquarters	Annual Budget USD
IHD of the RF	1913	The globe	49	New York	2.1 million
Pan American Sanitary Bureau	1902 (1946) major reorganization	21 American republics	309	Washington D.C.	1.9 million
Office of Inter-American Affairs	1940	Western hemisphere	100 (US)	Washington D.C.	9.5 million
World Health Organization	1946 (Constitution)	74 states	549	Geneva	5 million
United Nations International Children's Emergency Fund UNICEF (UN agency)	1946	50 countries	N.A.	New York	N.A.

Source*:* "Meeting of the Rockefeller Foundation Commission on review of the international health Division, May 19, 1950." Rockefeller Foundation Archives. R.G. 3. Series 908. Box 13. Folder 140; "Structure, Policy, Staff, Methods of Operation, Program and Expenditures of the International Health Division of the Rockefeller Foundation." Rockefeller Foundation Archives. R.G. 3. Series 908. Box 13. Folder 136; "The Rockefeller Foundation Commission on Review of the International Health Division. "Other Organizations which have International Health Programs or Related activities." Rockefeller Foundation Archives. R.G. 3 Series 908. Box 14. Folder 147. RAC

During World War Two, medical departments of the US Army acquired an enormous global role. When the war was imminent in 1939, the medical departments, that between the two world wars had been granted insufficient appropriations and had only a small nucleus of officers, received substantial support from the government.[122] These funds prompted the Army Epidemiological Board of the Secretary of War (originally established as the "Board for the Investigation and Control of Influenza and Other Epidemic Diseases in the Army") to play a very active role between 1941 and 1946. An example of the US Army medical activity was its use of 17 million dollars during World War Two in a mosquito control program that included the use of DDT and distribution of antimalarial drugs.

More importantly, the intervention of military medicine in the war was perceived as a remarkable success. A military doctor stressed the fact that, in the Spanish American War at the turn of the twentieth century, 13 US soldiers died of disease to every one killed on the battle fields. In World War One the ratio was one to one. In contrast, during World War Two only one American soldier died of disease for every 85 that were killed in battle (Simmons 1950). The image of a medical victory also stems from a number of remarkable medical discoveries and applications made by the Army, such as new drugs like atabrine and chloroquine

[122] "Statement by Brig. General James S. Simmons, Chief, Preventive Medicine Service, Office of the Surgeon General, U.S: Army (For presentation on 14 December 1944 before the Senate Sub-Committee on Wartime Health and Education)." RFA. R.G. 200 Series 61. Folder 732. RAC.

for malaria, the use of DDT against epidemic typhus and malaria, and the extensive use of sulfas.

One of the most important American agencies created with World War Two was the Office of Inter-American Affairs.[123] The office was created in 1940 after a proposal by the third child of John D. Rockefeller Jr., Nelson Rockefeller, who had had strong economic, political and cultural interests in Latin America since the 1930s. For example, until 1940 he was director of the Creole Petroleum Company, the Venezuelan subsidiary of Standard Oil of New Jersey, and made extensive visits to the region. After a 1939 visit to Latin America, alarmed by Nazi influence in the region, Nelson Rockefeller prepared a memorandum for President Franklin D. Roosevelt. He strongly recommended an active program of US cooperation, propaganda and development. Roosevelt responded by appointing Rockefeller head of the new Office of the Coordination of Inter-American Affairs.

The office organized a series of economic, health, and educational projects in the region that lasted about ten years. Under the supervision of the office hospitals, health centers, mosquito control measures, instruction of physicians, nurses and sanitary engineers, as well as water supply and sewerage systems were developed in Latin America. Anti-malaria campaigns included the control of larvae by ditching, draining and the use of oil. Later some of the first DDT spraying programs were carried out. These programs were directed by Major-General George C. Dunham of the US Army, an expert in tropical medicine with experience in Panama and the Philippines, who in 1945 published an illustrative article entitled "The Role of Tropical Medicine in International Relations" (Dunham 1945).

The health activities of the office were run by especially designed and well-funded institutions called Cooperative Services of Public Health (*Servicios Cooperativos de Salud Pública)* (Campos 1997). These were usually headed by an American expert who was responsible to the ministries of health. Most of the staff was locally hired and received full-time salaries. These salaries were usually higher than what equivalent public servants received. The decision was justified as a means of demonstrating the importance of sustaining a local career in public health. The *Servicios* were able to maintain their program and personnel through the frequent political changes that characterized the region. According to its director, a demonstration of their accomplishments was that in one Latin American country the program survived six different ministers of health (Dunham 1944, 1945).

By 1948 there were about 130 US health and sanitation experts in Latin America and an estimated 8,000 local physicians, nurses, technicians and unskilled

[123] The office, created in 1940 as the Office for Coordination of Commercial and Cultural Relations between the American Republics, changed its name to Office of the Coordinator of Inter-American Affairs in 1945 and in 1946 was called the Office of Inter-American Affairs. In this paper I am using the latest denomination.

workers employed in the *Servicios*.[124] In addition 600 Latin Americans received fellowships for training, usually abroad, in some of the medical and health fields. Initially, it was expected that the cost of these programs was going to be shared and that the national governments would take over the work when US cooperation came to an end. Namely, at the beginning the goal was to set an example, as the Rockefeller Foundation tried to do in the pre-war years. However, the *Servicios* faced some of the problems previously encountered by the RF, such as increasing local demands to enlarge their responsibilities. In addition, they were under pressure to obtain rapid results, because initially they were to exist for only five years (although the term was later extended to 1950). According to some contemporary observers, the uncertainty about the future complicated the recruitment of American officers with experience in the field.

There was also some tension, duplication and overlapping among American agencies. For example, a Rockefeller officer complained about the attitude of the Americans working at the *Servicio* in Uruguay:

> It rapidly occupied the fields in which we might have operated. […] They employed all our fellows, but did not conceal from us or the Minister their opposition to having us around.[125]

A corollary criticism came from other US institutions. Some believed that the IHD excluded them from their work and openly discouraged the integration of Rockefeller programs with local official institutions.

By 1951 the Office of Inter-American Affairs had spent 30,403,103 USD on health projects during its ten years of existence. This was far more than all the grants given by the RF in Latin America during the pre-war years. Of the 661 original projects of the office, 547 were still being carried out after 1951.[126] It is also important to stress that, after 1951, many of these programs continued under the auspices of the Foreign Operation Administration, and, later, from 1961, were part of the US Agency for International Development. Consequently, the office provided the framework for American health projects in Latin America that would continue during the second half of the twentieth century.

Certainly, the *Servicios* had a lasting influence in the region by replacing existing government agencies or becoming the most powerful programs in the health ministries. Their administration of significant resources and personnel with a high degree of autonomy gave them strong political influence. In Mexico, for example, water supplies were built by the *Servicios* without consultation with the State Health Department, because the whole bureaucratic process was considered too cumbersome and slow. In Colombia the government just abolished its original Division of Sanitary Engineering and turned these activities over to the *Servicio*.

---

[124] "NX Cables SA by Harry W. Frantz, United Press Staff Correspondent, 23 January 1948." NAR, Series 114. Box 111 Folder 932. RAC. See also Bliss 1985.

[125] Hackett, "Interrelationship of IHD." RAC. p. 7.

[126] United States Public Health Services. Bureau of State Service. (1953) *Ten Years of Cooperative Health Programs in Latin America, an evaluation*. Washington D.C. Library of the New York Academy of Medicine.

With a much smaller budget, but a clear leading role in the region, the World Health Organization (WHO) appeared in 1946. It replaced a number of European organizations and made an alliance with the Pan American Sanitary Bureau that changed its name to the Pan American Sanitary Organization and became WHO's regional office for the Americas. The latter increased its prestige, resources and political influence under the leadership of Fred L. Soper, who was appointed director of the bureau in 1947, a position he retained until 1959 (Soper 1970). In consonance with the new international trends, Soper was convinced that the organization should move from "border and port quarantine […] [to] a general direct attack on communicable diseases in their endemic haunts".[127] Soper organized important campaigns to fight malaria, offered fellowships to train Latin Americans in US medical and public health schools, and obtained a magnificent building for PAHO in Washington, D.C. However, it was really in the mid-1950s when he appeared as a true regional and global leader with the gigantic operation to eradicate malaria.

Contradictions

An important event that had an impact in the shaping of international health was the decision of the Rockefeller Foundation to close its International Health Division in 1951. In terms of visibility, staff, autonomy and resources, the IHD was the most important of the five divisions of the foundation (IHD, Medical Sciences, Natural Sciences, Social Sciences and Humanities). In 1951 the IHD was officially merged with the Medical Sciences Division, and a new Division of Medicine and Public Health appeared, inheriting part of the IHD's final obligations. What really happened is that, since the 1940s, the foundation has placed less emphasis on public health and paid greater attention to agricultural development. After a survey, Mexico was the first country to receive a substantial program to improve its food plants through plant breeding, better soil fertility and the control of insect pests. The decision suggests that for the trustees of the foundation food and nutrition had replaced infectious diseases as the main problems of backward societies.

The reasons for the closure of the division were complex and political and go beyond the range of this article. However, it is pertinent to describe some aspects of the process. In April of 1950 the foundation appointed a commission to review the IHD and make recommendations for the future.[128] The meetings took a year of work for three sub-committees on policy, program and finance that delivered a final report in June 1951. The commission was formed by present or former trustees, including Henry Allen Moe, Secretary-general of the John Simon Guggenheim Memorial Foundation; Thomas Parran, former US Surgeon General

[127] Fred L. Soper. "International Health Work in the Americas, 3 May 1948." NAR Series 114. Box 111. Folder 932. RAC.

[128] Chester I. Barnard (1951) President's review. *The Rockefeller Foundation Annual Report, 1951*. pp. 1–98, on p. 16. New York: The Rockefeller Foundation.

and then Dean of the School of Public Health at the University of Pittsburgh; John D. Rockefeller III; and three officers of the Foundation, including Alan Gregg (then vice-president of the foundation) and Warren Weaver, director of what would become in 1951 the powerful RF Division of Natural Sciences and Agriculture and latter appointed vice-president of the foundation (1955–1959).

The RF commission also included twelve outstanding academics who had worked with the foundation before, among whom were Paul C. Mangelsdorf of the Botanical Museum of Harvard University, the epidemiologist Kenneth Maxcy of the Johns Hopkins University and Hugo Muench from the Harvard School of Public Health. A number of leading agricultural experts were also part of the commission, such as William I. Myers, dean of the College of Agriculture of Cornell University, Richard Bradfield of the Department of Agronomy of Cornell University and E. C. Stakman, chief of the Department of Agriculture of the University of Minnesota.

There were numerous reasons given for closing the IHD. First, the foundation considered that its work on yellow fever, one of its major interests, was done (Strode 1951). In addition it was a success story. This meant that the scientific origin of the disease was identified, an effective vaccine was available and a practical method for its manufacture on a commercial scale was worked out by officers and researchers of the RF and the Rockefeller Institute of Medical Research (Corner 1964). However, the elimination of the disease, envisioned by the foundation in the 1910s was then considered impossible, since there was a natural reservoir in the jungle, primates intervened in the transmission, and more than one mosquito could infect people. Yellow fever was by that time not considered a major menace, since it no longer interrupted commerce or affected ports and urban areas. In addition, in May 1951 one of the main characters of the Rockefeller yellow fever story, George K. Strode, discoverer of the virus that produces the disease and former scientific director (1944–1949) and director (1944–1951) of the IHD, retired after 34 years of work with the foundation.

Secondly, the RF considered that new health agencies were doing the same work as the IHD, with larger budgets and greater willingness to work with or interact with American foreign policy. The Rockefeller concern for competition, overlapping and duplication is clear in the discussions of the commission. In addition, there was a strong tradition in the foundation of working only on undertakings where their pioneer role could make a lasting impression. This idea was also instrumental in creating the perception of the IHD as the matrix of new developments in international health. According to the scientific directors of the IHD, agencies such as the WHO could not have come into existence "had it not been for the International Health Division which had the original concept and blazed the trail".[129]

There was also a political component in the decision of the RF. It appears that it was difficult for the leaders of the RF to accept all the political changes of the

[129] "World Health Organization and the IHD, 25 October 1948." RFA. R.G. 3 Series 908. Box 12. Folder 127. RAC.

post-World War Two period. Before the war the foundation operated under the assumption that western philanthropy, science and medicine were supreme universal aspirations for all cultures. Its relationship with American foreign interest was subtle, even at times reluctant. Before World War Two nothing appeared to contradict the conviction that all societies were moving along the same lines of modernization. However, the termination of capitalism in China with the 1949 revolution, the tension between Argentina and the US, and the emergence of the "Iron Curtain", dramatically changed the world within which the foundation led philanthropic endeavors. The Cold War tension between the Soviet Union and the US made it extremely difficult for any agency to maintain a low profile and formal independence from political goals during the 1950s.

Another political reason for RF to terminate the IHD was related to a new perception of what was needed in developing countries. There was a growing realization among some officers of the foundation that an integrated social development was absolutely necessary in backward countries in order to make health programs effective. In the discussions of the commission this idea was expressed by some as a vague concept called "human ecology".[130] For other RF officers the solution for underdevelopment was a concentrated effort in improving agricultural techniques.

Finally, the desire to integrate all activities of the foundation in fewer divisions served to diminish internal tensions. One source of internal tension was the fact that for years the IHD received annually a lump sum to be disbursed by its own Board of Scientific Directors. It also worked as an operating division, whereas the other divisions were dispensing agencies not directly engaged in the running of field programs. There were also officers who truly believed that this was a unique opportunity for new medical developments. According to Morrison the decision to create a new division was:

> a good reply to those outsiders who feel that the Foundation has tended to become more and more conservative […] the new arrangement gives us all a chance to do something really original in the way of integrating the preventive and curative aspects of medicine.[131]

Another consideration that played a role in the decision of the RF was the concern that international sanitation improvements were causing a problem of overpopulation in less-developed countries. In the opening remarks made by the President of the RF to a meeting of the commission reviewing the IHD, there was mention of the need for population control due to "the increasing amount of criticism of public health work because there is no corresponding limitation on birth rate".[132]

---

[130] Report of the Rockefeller Foundation Commission on Review of the International Health Division, November 1951." RFA. R.G. 3. Series 920. Box 1. Folder 3. RAC.

[131] Excerpt from letter of 6 April 1951, R.E. Morison to R.R. Struthers. RFA. R.G. 3 Series 290. Box 1. Folder 1. RAC.

[132] C. I. Barnard intervention in "Meeting of the Rockefeller Foundation Commission on Review of the International Health Division, 19 May 1950." RFA R.G. 3. Series 908. Box 13. Folder 140. RAC.

A more blunt statement was made in another of the meetings of the committee. Andrew J. Warren, declared:

> In some quarters, the finger is being pointed at the IHD something like this. You are going into […] backward countries where […] you are reducing the death rate while the birth rate is remaining high, and you are adding to the social and economic burden.[133]

A corollary idea emerged from the medical departments of American industries operating abroad. Among some contemporary experts there was a preoccupation with the overuse and expenses of the medical facilities provided by US companies and philanthropies abroad. For example, the General Medical Director of Standard Oil Company, who was in charge of 24 hospitals and 92 clinics for 34,000 employees and 166,000 of their relatives, complained that the medical expenses for the Latin American affiliates of the company had risen from a little less than three million dollars in 1940 to over nine million in 1950. He also confessed that in many of their oil camps:

> Hospitals are bulging with invalids – not with employees, but with their dependents – wives, children, aunts, uncles and grandparents. […] In the Netherlands West Indies not long ago, I heard the remark: "I don't know why she came to the hospital for this one. She had the other 13 at home." […] This case illustrates the trend, medical service, whether good or bad attracts. When it is excellent, it is impossible to curtail it […] Is this good business? (Collier 1950).

A similar concern was expressed by the chief of the Medical Department of the United Fruit Company that administered 2,000 beds in 14 hospitals, sick camps and dispensaries in Latin America. These served the health needs of their 90,000 employees and 250,000 of their family members. The number had grown from 1948 when the total number of employees and relatives attended by the Medical Service amounted to 195,910 (Salisburry 1948).

Legacies

As a result of these developments, a new framework for international health in the Americas emerged during the 1950s. This framework was not necessarily coherent or complementary, nor did it have clear leadership. It was certainly diverse and somewhat fragmented, but had some common goals. Among these goals was an increased Americanization of Latin American public health, medicine and society. It was only during World War Two that European medical influence declined in Latin America. In addition, after this war the links between politics and international health were more clearly expressed than in the past. Between the two world wars the Rockefeller Foundation avoided clear political connotations in

[133] J. Warren intervention in "Meeting of the Program Committee of the Commission on Review of IHD Program, 30 November 1950." RFA. R.G. 3 Series 908. Box 14 Folder 142. RAC.

its work or expressed a general interest in the development of Western civilization. After the war it was clear that for some politicians and public health leaders that international health had a role to play in the Cold War.

The idea of international health as a tool of the Cold War was probably not shared by everyone in the US, but it was clearly expressed by James Stevens, the former Chief of Preventive Medicine of the US Army and later dean of the School of Public Health at Harvard University. From 1950 he organized a series of fascinating meetings on "Industry and Tropical Health". In the welcoming address of the first meeting, attended by delegates of 23 industries and ten agencies, Stevens explained:

> Powerful Communist forces are at work […] taking advantage of sick and impoverished people, exploiting their discontent […] to undermine their political beliefs. Health is one of the safeguards against this propaganda. Health is not charity, it is not missionary work, it is not merely good business – it is sheer self preservation for us and for the way of life, which we regard as decent. Through health we can expand industrial production, strengthen our military forces and maintain the high morale of all our people. Through it we can prove, to ourselves and to the world, the wholesomeness and rightness of Democracy. Through health we can defeat the evil threat of communism (Simmons 1950).[134]

References

Bliss J.C. (1985) *The initiation of U.S. Technical Assistance to Latin America: The Health and Sanitation Programs of the Institute of Inter-American Affairs*. Bachelor thesis, Harvard University.

Campos A.L. (1997) *International Health Policies in Brazil: The Servicio Especial de Saúde Pública, 1942, 1960*. Doctoral dissertation, The University of Texas at Austin.

Collier P.R. (1950) "The Road Ahead" In: *Industry and Tropical Health, Proceedings of the First Tropical Health Conference sponsored by the Harvard School of Public Health, 8–10 December 1950*. Pp. 109–113. Boston: Harvard School of Public Health & The International Council for Tropical Health.

Corner G.W. (1964) *A History of the Rockefeller Institute, 1901–1953; Origins and growth*. New York: Rockefeller Institute Press.

Cueto M. (ed.) (1994) *Missionaries of Science: The Rockefeller Foundation and Latin America*. Bloomington: Indiana University Press.

Cueto M. (1996) "Tropical medicine and Bacteriology in Boston and Peru" *Medical History,* 40: 344–364.

Dunham G.C. (1944) "The Cooperative health programs of the American Republics" *American Journal of Public Health,* 34, 8:817–827.

Dunham G.C. (1945) "Role of Tropical Medicine in International Relations" *Science,* 102, 3 August:105–107.

Faust E.C. (1944) "The American Society of Tropical Medicine" *The American Journal of Tropical Medicine,* 24:63–69.

[134] In 1969 the VIIth Industry and Tropical Health Meeting was held in Boston.

Howard-Jones N. (1980) “The Pan American Health Organization: Origins and Evolution” *WHO Chronicle,* 34:419–426.

Kickbusch I. et al. (2001) “Global influences and global responses: International Health at the turn of the 21st Century” In: Merson M.H. et al. (eds.) *International Public Health*. Pp. 701–737. Gaithersburg, MD: Aspen Publishers.

Pan American Health Organization (1992) “Pro Salute Novi Mundi: Historia de la OPS” *Boletín de la Oficina Sanitaria Panamericana,* 71:373–576.

Pollan A.A. (1947) *A Business Man Views Tropical Medicine*. New York: American Foundation for Tropical Medicine.

Ramirez de Arellano A. (1989) “Columbia’s Overseas Venture: The School of Tropical Medicine at the University of Puerto Rico” *Medicine’s Geographic Heritage,* 5:35–39.

Reid D. & Gilbo P.F. (1997) *Beyond Conflict: The International Federation of Red Cross and Red Crescent Societies, 1919–1994*. Geneva: IFRC & RCS.

Rockefeller Foundation (1941) *Annual Report of the IHD, 1940*. New York: The Rockefeller Foundation.

Rockefeller Foundation (1943) *Annual Report, 1943*. New York: The Rockefeller Foundation.

Rockefeller Foundation (1948) *International Health Division, Annual Report, 1946*. New York: The Rockefeller Foundation.

Salisburry E.I. (1948) “Health and Medical Services in the Tropics” In: *Proceedings of the Fourth International Congress on Tropical Medicine and Malaria, Washington, D.C., May 10–18, 1948*. Vol. II. Pp. 1444–1445. Washington D.C.: Department of State.

Simmons J.S. (1947) “Tropical Medicine and the Challenge of War” *The American Journal of Tropical Medicine,* 27:1–9.

Simmons J.S. (1950) “Welcoming address” In: *Industry and Tropical Health, Proceedings of the First Tropical Health Conference sponsored by the Harvard School of Public Health, 8–10 December 1950*. Pp. 11–15. Boston: Harvard School of Public Health & The International Council for Tropical Health.

Soper F.L. (1970) *Building the Health Bridge: Selections from the Works of Fred L. Soper*. Austin Kerr J ed. Bloomington: Indiana University Press.

Steere W.C. (16 February 1946) “The Botanical Work of the Chinchona Missions in South America” *Science,* New Series 101, 2616:177–178.

Strode G.K. (ed.) (1951) *Yellow Fever*. New York: McGraw-Hill.

Williams R.C. (1951) *The U.S. Public Health Service, 1798–1950*. Washington: Commissioned Officers Association of the United States Public Health Service.

Wilson C.M. (1942) “Deeks of Canada” In: *Ambassadors in White, the Story of American Tropical Medicine*. Pp. 156–183. New York: H. Holt and Company.

15: Tangerian Ghosts and Riffian Realities: The Limits of Colonial Public Health in Spanish Morocco (1906–1921)[135]

Francisco Javier Martínez Antonio, Postdoctoral Fellow, Laboratoire REHSEIS, Paris

Introduction

In May 1930, the internationally-renowned Italian parasitologist, Gustavo Pittaluga, (who had settled in Spain) and one of his disciples, Francisco Ruiz Morote, visited the Spanish Protectorate in Morocco after attending the International Conference on Malaria held in Algiers. They were accompanied by Captain Dr. Joaquín Sanz Astolfi, Director of the Laboratory of Clinical Analysis of the Tettouan Military Hospital, who had also travelled with them to Algiers as representative of the Protectorate's Health Services (Sanz Astolfi 1931–1932). During their short trip, Pittaluga and Morote got a glimpse of the Protectorate's health organisation and institutions, its sanitary conditions as well as the plans and outcomes of the first anti-malarial campaign launched the previous year. After the visit, they published a paper in Pittaluga's journal, *Medicina de los Países Cálidos*, which also appeared in *África*, the journal of the Spanish Army in Morocco.

In that paper, Pittaluga claimed that Spanish health initiatives in Morocco had been

> guided in an excessively military sense, abandoning some of the main scientific and public health orientations which must be the base, never to be forgotten, of every doctor's actions […] (Pittaluga & Ruiz Morote 1930).

But he added "that all prevention has vanished on contact with a cosy, full-of-promises reality" (Pittaluga & Ruiz Morote 1930). Morote confirmed this impression when he wrote that

> remembering the visit is enough to eagerly wish that the work developed there would become better known in the metropolis and to know to what extent public health work has contributed and is contributing to improving the population health status and to easing Protectorate's duties.

Out of all initiatives, for Morote

> the most impressive ones are those concerning rural dispensaries [strictly called "dispensaries for natives"]. They are advanced posts of civilization, now

[135] This work was begun as part of a research project of the Spanish Ministry of Science and Technology (Ref: BHA2001-2979-C05-03) directed by Prof. Jorge Molero Mesa and has been completed with the aid of a Postdoctoral Fellowship from the Spanish Ministry of Education and Science (Ref: EX-2005 060). I would like to thank Arantxa Martínez Antonio for her translation.

enjoying the peace they contributed to sow in such an efficient way (Pittaluga & Ruiz Morote 1930).

In fact, by the time of Pittaluga and Morote's travel, there existed a network of 58 "dispensaries for natives" in Spanish Morocco, ten of them in the towns and 48 in the countryside, spread throughout the Protectorate's territory. They were run by Spanish doctors and Spanish and Moroccan auxiliary personnel. They generally had exploratory, analytical and surgical equipment and small infirmaries, and they were provided periodically with drugs, vaccines and, when necessary, with disinfection devices. These dispensaries had begun to offer outpatient, clinical and surgical care and were used as the basis for the launching of the first health campaigns against malaria, typhoid fever or syphilis (Delgado 1930). The network of dispensaries may be taken as a symbol of the deployment of a health system in Spanish Morocco. Its presence was represented throughout the 20,000 km^2 of territory, and its coverage of a population that overall was estimated at between 600,000 and one million inhabitants.

But things had been quite different in the years prior to the Rif War (1921–1927) and, obviously, in the course of it. Despite a tradition of medical activities in Morocco since the last quarter of the 19th century, Spain was unable to establish more than four urban and sixteen countryside dispensaries in its Protectorate zone before 1921. In this first period of existence, activities of dispensaries for natives were hindered by personnel and equipment problems, by the lack of proper facilities and funding, and by the lack of administrative co-ordination between the ministries of State and War and between Tettouan and Melilla. Spain also acted under pressure of measures taken by France in its much larger Moroccan Protectorate, exhibited in either its inability to match developments there, or in the constant menace of French interference in the Spanish zone (Martínez Antonio et al. 2003; Molero Mesa et al. 2002; Molero Mesa 2003).

However, as this paper attempts to show, another major obstacle for the creation of dispensaries for natives during this period was the relative persistence of Morocco's public health structures and agency. Since the 19th century, Moroccan public health action had been expressed in different forms, ranging from government participation in modern state-wide organs, such as the Sanitary Council of Tangiers, to popular rejection of foreign intervention. Most historiography on the French and Spanish Protectorates in Morocco has tended to ignore or underestimate the development of the Moroccan state prior to and after 1912, though as it will be seen, Moroccan agency proved resilient and influenced public health developments in the Spanish and French Protectorates for many years after they were formally established.

When this agency is systematically taken into account, the question of the colonial character of the Spanish (and French) Morocco's health system arises. Many historians have argued that the Protectorate regime was only a façade for direct colonial action (Hoisington 1995; Rivet 1996; Gershovich 2000; Pennell 2000; Villanova 2004). However, the impact of events taking place in Morocco was too strongly felt in metropolitan Spain (and France) to consider them as

"merely" colonial. Conversely, Spain (and France) had to display too much direct intervention to control Moroccan authorities and territory to describe their activities as "mere" colonization. In the case of Spain, it seems especially clear that differences were not of such a degree as to explain its relationship with Morocco in colonialist terms. Their interaction resembled more a conflict between countries of similar (weak) power: similarity led to war, not to colonization, and to expropriation or seizure of local authority, not to its intervention. An attempt will be made to clarify this crucial issue, although present conclusions cannot be but tentative, as they are based almost exclusively on Spanish and French sources. The main hypotheses may nevertheless be taken into consideration while the process of gathering data from Moroccan archives is carried out. Specific public health developments concerning the Jewish community are not addressed in this paper, an absence which should also be corrected in future works.

Caring for the Ports and the Army
Public Health and the State in 19th Century Morocco

Did Moroccan Public Health Exist?

In order to understand the weight of the Moroccan "factor" in the creation of dispensaries for natives in Spanish Morocco, it is first necessary to examine the trajectory of Morocco's public health during the 19th century. In broad terms, the period 1822–1894 was an epoch of relative stability for the country, especially the last twenty years (Laroui 1993). Such stability, however, far from being static, was a fruit of a constant, tension-filled compromise between the numerous forces which operated on the Moroccan stage. Internally, the Sultan and the *Makhzan* (Moroccan government) interacted with local actors (*caïds* = governors, *zawias* = religious brotherhoods), social groups (*ulamas* = religious experts, commercial bourgeoisie, urban artisans) and certain territories (Rif, High Atlas, Saharan oasis) in order to reach some degree of cohesion for Moroccan society. Externally, the autonomy and sovereignty of Morocco evolved through relationships with several European and Western states as well as other Arab-Islamic countries (mainly the Ottoman Empire and Egypt) and with nearby colonies (French Algeria and Senegal), foreign enclaves (Spanish strongholds in the north and factories on the Saharan coast) and British Gibraltar. The international status quo on the so-called Moroccan question (parallel to other *questions d'Orient* such as the "Ottoman question" and the "Chinese question") was maintained to some extent throughout the century.

Out of this dynamic and troublesome balance, a number of administrative, economic, military, institutional, legislative, cultural or political transformations materialised. However, they are usually interpreted as the outcomes of "informal" or direct imperialism exerted on the country, whose only chance was to resist and delay them as much as possible. But in accordance with authors such as Abdallah Laroui or Wielfried Rollman, it could be said that the role played by Moroccan authorities in those transformations seems more active than mere resistance. In the field of public health the following questions must be asked: what was Moroccan

in Morocco's public health, if anything? And what were the effects of such "Moroccanness" in the health system, if any? Based upon this author's PhD research (Martínez Antonio 2005a) it will be first argued that "Moroccanness" or Moroccan agency consisted of two coupled mechanisms of multiple *diversification* and personal/oligarchic *authoritarianism*. On the one hand, attempts were made to keep unstoppable European intervention in matters of medicine and public health at bay by fostering participation of as many foreign countries as possible so that competition between them arose, along with a complication of administrative procedures. On the other hand, increasing internal fragmentation of Morocco's health system was somewhat slowed down by an authoritarian concentration of competencies in the hands of the Sultan and the Makhzan. In this way, sanitary measures could be taken and imposed without negotiation with social, local or territorial actors, while administrative procedures were eased. In sum, Moroccan weakness did not lead to dependence and anarchy in public health but rather to a kind of fragile autonomy.

This particular Moroccan agency led, in the second place, to a predominance of the *maritime* and *military* components of the health system. In my opinion, health systems in the 19th century were generally composed of four branches (navy, army, maritime and land-based public health) or, in other words, they were configured along a double civil-military and internal-external axis (Martinez Antonio 2005). Maritime and army public health were prominent in Morocco because in both spheres a balance could be kept between international and Moroccan sanitary interests and also between the extension of the health system to a wider population and territory and the tendency of some localities to different degrees of self-management. Such balances were not possible in navy and land public health, which suffered from a high degree of foreign dependence and internal heterogeneity. In some way, the first two branches tried to compensate the lacks of the latter, often assuming part of their competencies and tasks, though this did not mean that they succeeded in achieving their own goals. However, it seems certain that the most complex and comprehensive structures of Moroccan public health were those caring for the ports and the Army.

This analysis can provide perspective on colonialist (and post-colonialist) accounts which have pictured the Moroccan authorities and people as having no interest in public health issues or merely resisting and conditioning imposed European initiatives in different ways. Colonialist accounts have promoted an unfair view of Morocco as a "medieval" country regarding health and medicine, reduced to a fossilised mosaic of classical Arabic medical institutions and practitioners, Muslim charity, folk healers and "superstitious" practices. All of these existed, of course, but so too did other more comprehensive and newly-created public health structures, whose existence was, at least in part, sought and enabled by the efforts of Moroccan authorities. On the other hand, it is also necessary to keep a distance from nationalist (and Islamist) historiographies which construct Moroccan medicine as free from European influence and homogeneously based on the Arab tradition or which regard foreign influence just as an imposition. In general, it is

more useful to consider the differences between the history of public health in Morocco and in European countries as differences of degree and not of kind. On these conceptual grounds, a basic picture of the higher structures and most relevant institutions of 19th century Moroccan public health are presented in the next two paragraphs.

The Reigns of Moulay Abderrahman (1822–1859) and Sidi Mohammed IV (1859–1873)

An improved system of maritime public health began to be set up in Morocco during the reign of Sultan Moulay Abderrahman. The so-called International or Maritime Sanitary Council of Morocco, based in the port city of Tangier (also called the Council of Tangier), obtained a formal delegation of power from the Sultan (*firman*) in 1840 to "be responsible for the maintenance of public health on the Empire's littoral, to elaborate all regulations and take all measures to carry out this purpose" (Raynaud 1900; El-Bezzaz 1982–1983). Though its precedents went back as far as 1792, the Sanitary Council of Tangier was essentially contemporary to others created in the main ports of the Arab-Islamic Mediterranean countries, such as Tunis (1835), Istanbul (1838–1839), Alexandria (1843) and Tripoli (Gallagher 1983; Panzac 1986; Schepin & Yermakov 1991; Moulin 1995; Mizrahi 2003). In the following years, the Council improved its internal organisation through a permanent commission and a secretary. In addition, delegations were established in the other "imperial ports" (Tettouan, Larache, Rabat, Casablanca, Mazagan, Safi and Mogador) from 1846 on. Medical personnel was gradually attached to the Council, and revenues were raised by charging fees to ships for sanitary inspection. Finally, a provisional quarantine station was established on the isle of Mogador in 1865, so that pilgrims returning from Mecca could be isolated if cholera was suspected.

It has usually been argued that the Council of Tangier was in fact a foreign institution, given that its members were the foreign diplomatic representatives in the city and its main budget was provided by foreign governments. Thus, its measures would have been dependent on the plans for foreign "penetration" in Morocco, the "civilisation" of the country, the promotion of European commercial exchanges and the protection of European communities in the port cities (Raynaud 1900; El-Bezzaz 1982–1983). But this picture, though partly accurate, is nonetheless too reductionistic. To begin with, the Sultan had only "delegated" power in maritime health affairs to the Council, a precaution which would long be regretted by European representatives. For example, when it came to sensitive matters such as the control of maritime pilgrimage to Mecca, the Sultan often imposed his decisions upon the Council's recommendations, because he still held executive power. Morocco also received foreign representation comprised of up to fourteen countries (Great Britain, France, Spain, Russia, Norway, Sweden, Portugal, Denmark, the Netherlands, Belgium, Austria-Hungary, the United States, Italy and Germany) that were obligated to making equal economic contributions and to rotate among the posts periodically. Agreement was naturally difficult and the threat of one country's imperialist interests being predominant was neutralised

to a certain extent. Furthermore, in regard to pilgrimages to Mecca, the Sultan had appointed consuls (*wakils*) in Gibraltar, Tunis, Alexandria and Cairo, which probably allowed the Tangier Council to keep regular contact with its counterparts of those cities, as did the Council of Tunis (El-Bezzaz 1985; Gallagher 1983). Undoubtedly, cooperation with other Arab-Islamic countries was the most effective way of avoiding European inherence.

On the other hand, a degree of direct control over the Council was exerted by Moroccan authorities through the *naib*, the Sultan's official representative in Tangier since 1848, who acted as a *de facto* Minister of Foreign Affairs (Rollman 1983; Pennell 2000). All the Council's resolutions had to be submitted to his office, the *Dar al-Niaba*, and then sent to the Sultan for approval. This resulted in increased centralisation and co-ordination of maritime sanitary affairs throughout the country. Besides, slow and long official procedures could reduce the actual efficiency of European proposals when necessary. Finally, the *naib* could influence measures proposed by the Council so that they were not only of benefit to foreign residents and European commerce, but also to the fast-growing native population of port cities and to the new Moroccan commercial bourgeoisie. In the port cities, the *caids* and *pachás* were charged with controlling the Council's delegates and their approval was necessary for any measure taken in case of epidemics.

The relative development of maritime public health in Morocco was used as a basis for proposing changes in land public health. In Tangier, the Council tried to extend its measures from the port to the city itself and also to support initiatives taken by civil doctors of the growing European community. It became common in this period for European settlers to propose sanitary reforms in case of epidemics of cholera or other diseases and to seek the support of the European consuls in the Council. A similar process occurred in the port cities (Raynaud 1902). However, the *firman* of 1840 had not allowed the extension of activities of the Council towards urban public health. The risk was higher for Moroccan authorities in this field because the number of foreign countries would have been reduced and control over local authorities would have been more difficult to achieve. The same happened for European countries because they would have been obliged to increase their expenses, competence between them would have increased and popular rejection of their influence would have been more serious. Therefore, no confluence of interests took place. On the one hand, Europeans attempted modest initiatives; on the other, traditional Moroccan institutions persisted. In Tangier and in the other ports, there existed urban assemblies composed of local authorities (*caïd*, *pachá*), merchants, *ulama*, doctors (*tobba*) and the market inspector (*muhtasib*) which had traditionally been in charge of proposing anti-epidemic measures. For example, in Tettouan during the plague epidemic of 1799–1800, "eminent city notables, including the *ulama*, decided that it was necessary to close the city gates so that it would be preserved from any contagion" (El-Bezzaz 1985). The assemblies still kept some of their power during this period and were

also responsible for the good conditions of streets, buildings, slaughterhouses, the water supply and food sold in markets. In Tangier, for example, the *muhtasib*

> for cleaning the streets and squares, raised a little tax on the slaughtered cattle and directed a brigade of ten workers who swept the streets and gathered the litter, which they put on a limited number of donkeys to be taken to the orchards surrounding the city (Laredo 1994).

Parallel to the Council of Tangier, the sultans Moulay Abdehrraman and Sidi Mohammed IV also started the transformation of military public health as part of their general reform of the Army (*nizam al-askr*) which followed Moroccan defeats against France (1844) and Spain (1860) (Rollman 1983). In this matter they followed the path established by the Ottoman Empire and Egypt (also by Tunis and by the army of the Algerian resistant, *Abd al-Qadir*). In the Ottoman Empire Sultan Mahmud II had created schools of military medicine and surgery in 1827 and 1828 respectively, which were unified in the Imperial School of Medicine (*Mekteb-i Sahâne-i Tibbiye*) in 1839, directed by the Austrian Dr. Bernard (Lewis 1984; Ishanoglu 1992; Panzac 1995). In Egypt Pasha Mehmet Ali had founded the School of Military Medicine at the Hospital Abu Zabal in Cairo in 1826–1827, directed by the French doctor Antoine Barthèlemy Clot, also known as Clot Bey (Panzac 1989).

Moroccan developments seem to have been much more modest than those in the Ottoman Empire and Egypt in this period, although further research is still needed on the subject. However, it is quite certain that Morocco contacted both countries in order to limit European influence in its military public health, as was the case for the maritime branch. Driss Mossaoui has shown that some Moroccan students were sent to study in the schools of Cairo and Istanbul during this period (Mossaoui 1995). They should have been attached to the new military regiments (*'askar*), which increased from their original number of 900 to more than 3,000 men in 1870. Moulay Abderrahman requested of Mehmet Ali that scientific and military works be translated into Arabic from European languages (mainly French), and a number of them could have been medical books, perhaps the same that Clot Bey had sent to Tunisian authorities in 1854 (Gallagher 1983). European influence in the Moroccan army medicine already existed in this period, though it was split between different countries. Since the end of the 18th century, it had been usual for Spanish military doctors, as well as naval surgeons from Gibraltar, to travel to Morocco at the request of the Sultan (Justel 1991). In 1861, a big supply of drugs that was probably addressed to the Army was acquired from France (Amster 2003). An important question which has not been systematically posed is the role of "renegades" (converts to Islam), especially of Spanish origin, as practitioners in the Moroccan army.

For most of this period, there was no formal Ministry of War. The *katib al-jish* (chief of the *jish* or *guich* regiments) remained the highest military officer, although in 1845 Moulay Abderrahman relied on his son, the future Sultan Mohammed VI, for directly supervising and fostering the modernisation of the army. It was in the first years of his reign that Sidi Mohammed created the post of

wazir al-harb or Minister of War (Rollman 1983). Greater military centralisation was then achieved, and it went along with a more permanent organisation of the army throughout the country, because *askaris* were distributed in the Sultan's guard and in garrisons in the main cities. These developments should have affected sanitary and medical structures as well, in the sense of a greater control by central authorities, although there is a lack of specific data about this issue. In addition, it seems plausible that Moroccan military doctors did not enjoy much executive power compared with their military chiefs, as this was also true in most European armies. This consultative character limited the extent of European interventions in military public health, as was the case with the Sanitary Council of Tangier. Finally, the army tried to be used as basis for extending reforms to land public health. A clear example is that the army was usually charged with implementing "sanitary cordons" around cities or areas in case of epidemics (Raynaud 1902). However, results were quite modest.

The Reigns of Moulay Hassan I (1873–1894) and Moulay Abd el-Aziz (1894–1906)

During the reigns of Moulay Hassan I and Moulay Abd el-Aziz, maritime and military public health continued to be predominant in Morocco and their development was achieved by similar mechanisms as in previous decades. However, Morocco's "sanitary autonomy" in the international context and "sanitary cohesion" inside the country became more and more precarious from the 1880s onward. By then, Western health systems were swiftly moving to a new basis. The former system of quarantines, sanitary cordons, sanitation and disinfection had been mainly consultative in character. It had concentrated its activity on temporary epidemic outbreaks and had relied on contagionist or miasmatic interpretations of disease. This system started to give way to one of *inspection*, which was based on a permanent health administration, where the increasing executive power of doctors was displayed through new institutions such as laboratories and supported by the new scientific doctrines of bacteriology and experimental hygiene (Rosen 1958; Porter 1994, 1999). Moroccan authorities were interested in these new developments, but were also aware that they enabled a greater degree of European intervention in the country's public health which risked eroding the cohesion of traditional public health structures and the support of practitioners and people alike.

In maritime public health, for example, European doctors played an increasing role in the Sanitary Council of Tangier. "Medical advisors" had begun to be appointed regularly from the 1860s onward, mainly in Tangier, and the consuls relied more and more on their technical expertise. For example, they assumed the sanitary inspection of the port of Tangier and elaborated the Council's quarantine regulation, approved in 1878. In the beginning these doctors were private practitioners working for the European communities but, for example, from 1885 onward, Spain officially attached doctors to its Moroccan consulates (Felipe Ovilo, Enrique Rebolledo, Severo Cenarro and Antonio Jordán among others). European doctors were also appointed to the Mogador lazaret so that they directly

supervised the quarantine of Mecca pilgrims. The Spanish doctors Cenarro and Rebolledo assumed this task in the 1890s, although still under strict control of the Moroccan authorities. In 1900, under the increasing menace of a plague outbreak similar to the one that had affected Porto in 1899, the French doctor based in Algiers, Louis Raynaud, was recruited by the Sultan for that mission. Once he had reorganised the lazaret in 1901, he appointed another Algiers health officer, Dr. Gagé, and a Council medical advisor to supervise the quarantine under his instructions (Raynaud 1902).

It was following doctors' suggestions that the European consuls systematically pressed the Moroccan government to have the Mogador lazaret organised on a more permanent and scientific basis. They also counted on the force of agreements reached at the International Sanitary Conferences of Dresden (1894) and Venice (1897). For example, the second article of the Venice Sanitary Convention stated:

> It will be recommended to the competent authorities in Morocco to implement, in the country's ports, measures in harmony with those stated in the general [international] sanitary regulations, in order to prevent the invasion and diffusion of plague.

The distant placement in Mogador and the inadequacy of its building and equipment never fully satisfied Europeans. Dr. Enrique Rebolledo was the first to make a report suggesting the need for creating a new lazaret. Soon after his arrival, Dr. Louis Raynaud sent a new report to the Council and to Moroccan authorities proposing the establishment of a *lazaret definitif* in Tangier, the ten-mile distant Punta Malabata being regarded as an ideal setting (Raynaud 1902). It was not until 1909 that an international commission was appointed to study the exact location and characteristics of the future lazaret, although it was probably never built (Laredo 1994).

The creation of a modern lazaret was a main concern of the Tangier Sanitary Council, but new public health developments spoke less for this kind of institution than for a permanent health administration in the port cities. By means of such administration the hygienic conditions of streets and buildings, slaughterhouses, sewage systems, water systems or garbage removal could be controlled in order to improve the general urban health status, thereby strengthening the city's defences in case of epidemics. In this sense, the Council succeeded in supporting the creation of the Hygiene and Sanitary Commission in Tangier in 1892 (with a brief predecessor in 1884) based upon a formal delegation from the Sultan to the Council of the responsibility "for assuming the cleansing of the city of Tangier, the street paving and the repairing and building of sewage collectors" (Marco 1913). Although this measure could not be extended to other port cities, the new commission and the lazaret project served as arguments for European consuls to propose a reorganisation of the Council in 1899 so that it truly acted as a permanent maritime health "service", that is, was given real executive powers.

In general all these new transformations in maritime public health ran strongly against Moroccan interests because they tended to shift executive power in health

affairs into the hands of foreign technical experts which the country could not provide itself (or, at least, not in sufficient numbers). However, Moroccan authorities strived to keep their agency in sanitary affairs. For example, the centralising role of the *naib* was assumed by the new Ministry of Foreign Affairs because "daily contact with the consuls had allowed him [the *naib*] to take on more and more power" and to pursue his own particular interests (Pennell 2000). On the other hand, Moulay Hassan re-confirmed the 1840 "delegation" to the Council by means of a new *dahir* (official decree) in 1879, thus keeping his personal authority in sanitary affairs. Dr. Raynaud complained that the *dahir* kept on restricting the Council's jurisdiction, allowing it only "to admit or reject the ships arriving from the ports of the Empire, to put them in quarantine and fix its duration according to the regulations of sanitary affairs". Thus, the Council's action remained "exclusively limited to the sea and not to land" (Raynaud 1902).

Impotence caused despair and, sometimes, rage in European representatives. An 1899 memorandum of the Sanitary Council complained about the "almost insurmountable obstacles, which render its aims and its deliberations useless". The memorandum continued:

> The *Makhzan* will not modernise itself, the Moroccan statesman in power is not sensitive to the best intentioned and most disinterested advice. The axiom which has been confirmed up to now, that 'the Sanitary Council is but an organ of the Sultan', who has the power to sanction or reject any agreed resolution, not only avoids consequently any fertile activity, but casts a doubt over its own right of existence.

Moroccan authorities also managed to slow down the creation of the Hygiene Commission of Tangier and later to exert significant control over it. Until 1903, the Commission remained mainly a private initiative of local European doctors. Only then, an organic regulation was approved and European consuls participated for the first time in its sessions (Marco 1913). The 1879 *dahir* made it difficult for the Commission to count on the Council's support, while the persistence of local functionaries, such as the *muhtasib,* did much to discourage its work. In the words of their members themselves, the first attempt to create it in 1884 failed because

> [...] the *muhtasib* and his personnel first, the administrator of Sultan's properties and the different market members, the *nadir* or administrator of the Mosque's properties, the select Israelite board, the governor and his Khalifa, all in one word conspired against the existence of the Commission [...] (Marco 1913).

Finally, institutions most representative of the new "hygienist" model of European public health, such as disinfection stations or bacteriological/analytical laboratories, had to wait longer to be created. Only after the Protectorate regime was established in 1912 could the French Pasteur Institute and a Spanish Laboratory start their activities in Tangier.

Nevertheless, in spite of Moroccan efforts, the number of foreign countries with actual weight in maritime public health affairs shrank to France, Great Britain,

Spain and perhaps Germany. The connection of Dr. Raynaud and Dr. Gagé with French Algeria revealed that French expansionism in the Maghreb was severely threatening Morocco. For Spain, doctors Felipe Ovilo and Enrique Rebolledo achieved significant influence due to their role as medical advisors of the Council, and the same could be said of Severo Cenarro, strongly committed to the Hygiene Commission until his death in 1898. Great Britain reinforced its involvement, always relying on its commercial and naval power and on the links with Gibraltar, while Germany's influence was mainly felt at the turn of the century. This fact, combined with the loss of contacts with other Arab-Islamic countries, revealed a stronger and more incisive European influence on Moroccan maritime public health.

On the other hand, Hassan I continued the process of transformation of the Moroccan army begun by his father and his grandfather. Military public health was not an exception. A medical student, Abd al-Salam al-'Alami, was sent to the School of Military Medicine *Qasr al-Aini* in Cairo to become a military doctor, as others had been before him (Mossaoui & Roux Dessarps 1992; Amster 2003). However, initiatives under the influence of European countries became predominant in this period over collaboration with other Arab-Islamic countries. In 1886, an School of Military Medicine was created at Tangier under the direction of the Spanish Army doctor Felipe Ovilo Canales, that functioned until 1899 (Martínez Antonio 2005c). At least twelve Moroccan students are recorded as having started a two-year course focused on anatomy and therapeutics and complemented by practical clinical and surgical assistance under surveillance of Drs. Ovilo and Cenarro in the attached dispensary that was founded the same year. Some of them did not complete their studies for several reasons, but others such as Mustapha Essandi, Hamed Romani and Mohammed Dukaly, whom Ovilo soon began to treat as "disciples", prolonged their training. They even travelled to Spain in 1888 to pass university exams and to become acquainted with Madrid's main research and clinical centres.

Ovilo's pupils soon participated in *harkas* (minor armed expeditions) sent by the Sultan to punish northern *qabilas*, as Si Ahmed Temsamami did in Boccoia in 1896. According to Ellen Amster, he

> was designated by the *Makhzan* military doctor attached to the expedition of Moulay Abdesselam el Mrani, of Ben el Bagdadi and of Mahboub, where he fulfilled his role using European methods (Amster 2003).

Felipe Ovilo himself was appointed chief of the health services of the *harka* sent against the *qabila* of Anghera in 1892. A project to establish a military hospital in Tangier was also foreseen in connection with the school, the Spanish Dispensary being the first step in its realisation. But "the first Muslim Hospital to be created in Morocco for centuries" was not finally created. However, the Spanish Dispensary, as well as the English Mission Hospital and the French Hospital in Tangier, assisted Moroccan troops on several occasions and served then as part-time military hospitals.

France also became strongly involved in Moroccan military public health and managed to achieve a privileged position among other European countries. Dr. Fernand Linarès, a member of the French Military Mission in Morocco (sent in 1877 under the direction of Jules Erckman), entered the personal service of the Sultan in Fez from 1882 onward and accompanied him on different occasions, for example, in the *mhalla* to Tafilalet in 1893. Linarès became a key agent for French policy in Morocco during his long stay in the country (1877–1902). His influence upon the Sultan and the *Makhzan* was strongly felt, and it was most probably at his suggestion that the new Sultan Moulay Abd el-Aziz, *de facto* his Grand Vizir and regent Ba Ahmed (1894–1901), decided to take Arab graduates from the School of Medicine of Algiers for the army service (Amster 2003). Through Linarès, France became the main foreign influence in Moroccan military public health. His role was much more decisive than that of other European doctors formally attached to the court, such as Dr. Adolfo Ladrón de Guevara (1889–1892 and 1894–1897), who could never achieve significant influence (Rollman 1983). Finally, a number of the military officers periodically sent to Gibraltar by Hassan I were trained as "medics" for service in the *askar* regiments (Rollman 1983). Purchase of medical equipment or products as well as the sending of students to military schools of medicine in Europe or America have not yet been confirmed, but should not be discarded as possibilities, given that other countries were still involved in different ways in Moroccan military reforms during this period (Pennell 2000).

Moroccan authorities managed to keep a degree of control over these initiatives which tended to take military public health out of their hands. For example, centralisation of military affairs was reinforced by Hassan I through the strengthening of the Ministry of War (*wazir al-harb*). The Sultan also succeeded in keeping European military doctors far from him and the central *Makhzan* for some periods. Adolfo Ladrón de Guevara was usually confined to the area of Tettouan and Tangier, as were the other members of the tiny Spanish Military Mission in Morocco. Felipe Ovilo, due to his work at the School of Medicine, remained most of the time in Tangier, even if he met Hassan I there in 1889 and participated in Spanish embassies to Rabat in 1887 and to Marrakech in 1894. Dr. Linarès was already in Morocco in 1877, but it was only from 1882 onward that he could settle in Fez as the Sultan's personal physician. Besides, he could not accompany the Sultan in all his *mhallas,* as he did, for example, in 1893. European military doctors were also assigned to different branches of the Moroccan Army, so that their influence was diversified. Finally, the School of Tangier was only officially recognised when the Sultan visited Tangier in 1889. It was the Moroccan government which paid the students a grant and gave them an "annual suit", thus keeping them under its control, although more important in this regard was that these school-educated military doctors were themselves Moroccan. Control of this institution was so significant that, in 1899 the Spanish Minister in Tangier complained that

> the *Makhzan* and the Moors in general think that its creation and tolerance [of the school] are signs of excessive benevolence towards Spain, which they tend to correct from time to time with a systematic opposition and intransigence [...]. Thus, instead of diffusing Spanish influence in the Empire, this Legation is obliged to spend what it has in periodic begging and supplications to the *Makhzan* so that the students are given the modest grant and the annual suit that were fixed by the deceased Sultan.

The last quarter of the 19th century thus saw the situation of Moroccan public health worsen. In comparison with the middle decades of the century, there were no dramatic events as the wars with France and Spain but new developments in international public health pushed Morocco's health system to its limits. Exchanges with other Arab-Islamic countries virtually ceased; the number of European countries with decisive influence shrank; central authority moved to the very person of the Sultan; and local resistance grew stronger. Instead of allowing controllable changes, the Moroccan tactic gradually shifted to avoiding any change at all, as almost all helped undermine its interests. This policy of "obstruction" was stigmatised by foreign representatives although it continued to be a form of Moroccan agency to their profound despair.

Between *Makzhan* and *Siba*. Provincial and Local Public Health in Northern Morocco at the End of the 19th Century

Thus far a brief sketch has been drawn of the central (or state) level of the public health framework as it was configured in Morocco during the 19th century. An attempt has been made to show how Moroccan agency acted at this level by fostering diversification of the inevitable Western influence and authoritarian concentration of power in the hands of the Sultan and his central *Makhzan*. It has also been shown how this agency resulted in the preferential transformation of the maritime and military branches of Morocco's health system, in contrast to much weaker public health changes in naval and land public health. However, if the creation of dispensaries in Spanish Morocco is to be understood, lower levels of Moroccan public health must be also analysed. The north of the country has been chosen for this examination because it will increase the focus on the future Spanish "zone of influence", actually the main interest of this study. However, this analysis could be applied to Morocco as a whole. Instead of the whole 19th century, just the final decades will be studied.

To speak of public health levels means that in the usually alleged breach between *bilad al-Makzhzan* (government controlled areas) and *bilad al-Siba* (autonomous areas only recognising the Sultan as spiritual leader) or between the cities and the countryside in Morocco, there existed in fact an articulated chain of administrative, institutional or political organisms and authorities – no matter how thin it might have been. Even if this chain did not reach a significant part of Morocco's population and territory, it showed the existence of a Moroccan public health system broader than most descriptions account for. This study shows that

there were four levels – the Sultan-central Makhzan, provincial, local, and the *siba* – the latter being in fact the limit of reach and showing particular characteristics. This general framework proved to be resilient, having an undeniable impact on the French and Spanish Protectorates when they began to be established in 1912. At all four levels, diversification and authoritarianism, as well as predominance of military and maritime public health prolonged themselves, though this kind of "fractality" was expressed in particular developments at every level.

The "Provincial" Level: Tangier

In northern Morocco, a number of loosely defined provinces, whose centres were cities such as Tangier, Fez, Oujda or Ouazzane, were defined in the second half of the 19th century. In Tangier, provincial power crystallised around the *naib*. This post was transformed from a *de facto* minister of Foreign Affairs into a functionary subordinated to the actual minister established by Hassan I in 1879 because he pursued his own interests more than those of the Sultan (Pennell 2000). However, this change was not so clear, as nothing was in the city of the Strait, and the *naib* actually stood at an intermediate position between the *wazirs* (ministers) of the central *Makhzan* and local officers such as the *caid* (military governor) and the *pachá* (civil governor). The post had been "provincialized" because it could no longer have a state-wide influence but it became (and was tolerated as) the "hand" of the Sultan for everything occurring between Tangier and Melilla (Zaim 1988). It is not strange that the post became a virtual monopoly of two important families of Andalusian descent of Northern Morocco, first through Mohammed Bargach of Salé (1860–1886) and later through Mohammed Torres of Tettouan (1886–1908).

In the same period, and not by chance, the position of foreign consuls in Tangier in relation to their metropolitan governments' activities in Morocco changed as well. For many decades the main foreign actors in Morocco, the Tangier consuls began to lose their primacy by the last quarter of the 19th century. European governments managed to directly reach the Sultan, either by more and more frequent embassies, or by permanent missions settled in port cities or in any of the imperial capitals – Fez, Marrakesh, Meknes and Rabat. Those new representatives assumed the main role in the policy of "peaceful penetration" and "civilisation" displayed in the Moroccan administration. The cases of Harry MacLean or Fernand Linarès are most representative of this shift (Des Cilleuls 1959; Pennell 2000). Tangier's consuls became increasingly "provincialized" and their activities were more and more confined to the north of the country.

This provincialization of the *naib* and the foreign representatives was also reflected in public health. In the case of maritime public health, the Sanitary Council of Tangier remained a state-wide organism but new developments were increasingly achieved through direct contacts of European representatives with the Sultan and central *Makhzan*. For example, the 1892 "delegation" of Hassan I that allowed the creation of the Hygiene Commission was a result of the embassy of the French Consul, Count of Auvigni, to the court (Marco 1913). The Council could but acknowledge the "sterility of its efforts to veil for Europe's public health" because it worked "as an organ of the Sultan and needs the sovereign

sanction to make agreements effective." The appointment of Dr. Raynaud in 1900 was probably made directly by the Sultan after a suggestion from Dr. Linarès.

The project of the quarantine station in Tangier reflected very clearly the ambiguity of the Council as a vehicle of state and provincial interests at the same time, an ambiguity that may have influenced its final failure. On the one hand, the new location was favourable for Tangerian notables (the *naib* – first and foremost) and the merchants of Tettouan and Larache who worried about the sanitary dangers associated with their growing commerce with Spain or France. Spanish commerce with Morocco focused also in practice on the northern area of the country as reflected in the establishment of regular sea connections by the *Compañía Transatlántica* in 1887, whereby Tangier occupied the central position (geographic and economic) in the traffic between Cádiz, Málaga and Barcelona in Spain and Rabat, Mazagan and Mogador in Morocco (Rodrigo 2002). The Spanish population in Tangier rose to 6,000, by far the largest European community in the city, and Spaniards were also predominant in Tettouan. The Spanish Legation in Tangier had accordingly a growing interest in protecting the southern shores of the Iberian peninsular and Spanish citizens in those cities rather than Morocco's littoral as a whole. On the other hand, Tangier was also a more adequate location than Mogador for controlling maritime health in rapidly developing ports such as Casablanca and Rabat, where Makhzan and French interests were predominant. Finally, the Sultan and Great Britain were interested in maintaining the Council as a guarantee against any dismemberment of Moroccan public health and as a guarantee of persisting influence due to the proximity of Gibraltar.

In military public health, the School of Military Medicine is most representative of the increasing provincial detour of Tangerian actors. During his visit to Tangier in 1889, Hassan I issued a *dahir* by which he compromised by recruiting students for the school from throughout Morocco, but, in practice, future doctors continued to be mostly, if not exclusively, Tangerians. Dr. Felipe Ovilo confirmed this in 1891:

> On occasion of the great Muslim feast of *Aid Seguer*, the pupils of this School of Medicine, supported by His Shariffian Majesty, marched for the first time grouped and uniformed, taking their place in the military ranks that accompanied the Governor of Tangier. This fact has had the strongest effect on the authorities and the Moorish people, *even more as they are sons of this city*, who by order of His Shariffian Majesty have been chosen as the future doctors of the Moroccan Army (Lourido Díaz 1996).

It was also very significant that on the occasion of Hassan I's audience with Dr. Felipe Ovilo in 1889 in Tangier, the Sultan was accompanied by his Ministry of Foreign Affairs, Si Fedul Garnitt, and not by the *naib*, Mohammed Torres, who had been directly involved in the creation of the medical school through his contacts with Spanish representatives. In a way, the Sultan was trying to reaffirm his control over the initiative and that of his minister. Nevertheless, he failed and Torres's interests prevailed. Pupils were recruited from good families of the city (Temsamami, Dukkali) and were nominated or at least approved by him, as he

was in the position of "dispensing favours" to local notables, therefore reinforcing both his position and theirs.

Another relevant sign of provincialization was that the school's doctors were sent mostly, if not exclusively, to serve in military expeditions taking place on the northern fringe of the country. These became very frequent and included, for example, those against the Anghera in 1892, the Ibuqquyen in 1889, 1896 and 1898, and the Guelaia in 1880 and 1893–1894 (Pennell 2000). Most of these were not *mhallas* commanded by the Sultan, but smaller *harkas* led by Sultan's relatives, such as Prince Moulay Arafa or Prince Moulay Bu Beker and accompanied by secondary *Makhzan* authorities, local *caïds* and military chiefs. In the case of Anghera, the *harka* was completely organized from Tangier. In the other cases, there was usually co-operation between Tangier, which sent troops by sea to disembark in Melilla and move to the hinterland, and Tadla, Oujda or even Fez, which sent troops by land. To sum it up, Tangerian military doctors acted regionally in a defined area of the country, while, in contrast, Algerian doctors recruited by Ba Ahmed at the suggestion of Fernand Linarès probably acted in a wider territory.

Similarly, the Spanish Legation and, in general, all Spanish representatives in Tangier pressed for the school to be created in this city and not in Ceuta, where the Spanish government had been thinking of establishing several institutions in the 1880s. The failure of the Spanish Military Mission in Morocco, which had its base in Ceuta and Tettouan, may also be explained by the lack of support from Spanish representatives in Tangier. In this way, these Tangier residents retained their power even if they could no longer act on a general Moroccan level and limited themselves to contacts with the *naib* and local notables. Provincialization resulted in Spain finding it increasingly hard to reach the Sultan and have a significant impact on Morocco's general public health.

In summary, the provincial level of Moroccan public health essentially reproduced the characteristics of the state level, though through different actors. The *naib* and the consuls became subordinated to the Makhzan and foreign embassies or missions, though they retained a degree of autonomy. Some periodical efforts were made to control this situation but, in general, autonomy posed no serious threat because regional actors did not intend to question higher authorities, and these, in turn, let them act with relative freedom for their interests. The project of the quarantine station in Tangier and especially the creation of the School of Medicine in this city reflected the increasing provincial detour of Tangerian initiatives.

The Local Level: Anghera and Guelaia

If most analyses tend to subsume the provincial level into the central Moroccan government, the local level is usually reduced to the *siba*. It is true that in the second half of the 19th century, it became increasingly difficult for the Sultan and for Tangier authorities to keep *qabilas* such as Anghera and Guelaia under control. For the first time, local leaders managed to concentrate power in whole *qabilas* (or in most of their fractions) and managed to act on their own, often

creating problems to the Sultan and *Makhzan*. The difference with the provincial level was that local autonomy posed a much more serious danger. Whether they set up irregular forces to defend their territory from European expansionism, organised seasonal migration to nearby European enclaves and colonies, or engaged in smuggling, local leaders threatened the Sultan's authority and legitimacy. Nonetheless, what they actually intended was to assume functions of defence and organisation that they considered the Sultan was unable to render in their areas. This fact connected them, though weakly, with the rest of Moroccan structures.

In addition, Moroccan central and regional authorities managed to neutralize local autonomy to a certain extent by using authoritarian measures supported by strong use of force, either military or diplomatic. For example, it has already been mentioned that *harkas* were periodically sent from the 1880s on to control the above mentioned *qabilas*. As a result, more or less strong garrisons under the command of *caids* were established in the vicinity of Ceuta (Anghera) and in Silwan (close to Melilla) (Pennell 2000). Their missions included preventing armed incidents with Spanish enclaves, preventing *qabilians* from settling and cultivating neutral land around Ceuta and Melilla, regulating commercial exchanges through customs, and controlling migration to European enclaves and colonies. In the course of time, garrisons tended to become disorganised and new local leaders turned again to concentrate power. However, when armed incidents re-appeared or denunciations of smuggling were made by European countries, new expeditions were sent which either re-established the garrisons and dissuaded the *qabilians* or repressed them. On the other hand, the Sultan managed to keep on acting as the exclusive representative of Moroccan interests, preventing local leaders from participating in international negotiations such as the Spanish-Moroccan Treaty of 1894 which followed the armed clashes between the Guelaia and the Spanish military units in Melilla.

Changes in the northern *qabilas* were paralleled by those in nearby European enclaves and colonies, which also became increasingly autonomous from the metropolitan governments and their higher representatives in Morocco. In the case of the Spanish enclaves, for example, the military authorities in Ceuta and Melilla became officially or *de facto* separated from the Commandant Generalships of Andalusia and Granada in the last quarter of the 19th century. There was little coordination with the Spanish representatives in Tangier, a lack of communication that resulted in local military authorities developing an increasing mentality of expansion which did not fit well with the Spanish *status quo* policy towards Morocco. In addition, smuggling of products (guns included) accounted for a significant percentage of the enclaves' otherwise restricted economy and the creation of military units composed of *qabilians* (*Compañía de Moros Tiradores del Rif* in Melilla in 1859, which was transformed into the *Milicia Voluntaria de Ceuta* in 1895) was fostered (Arqués & Gibert 1992). The armed conflict near Melilla in 1893–1894 was triggered by the construction of a new post in the *campo* that had been ordered by the Military Governor, General Margallo, who was killed by Riffians in the course of combat. Similar developments were taking

place in the French Algerian region of South Oranais, where, for example, military officers often decided on their own new operations or advances into the Moroccan-Algerian border zone.

In other words, European enclaves and colonies tried to pursue expansionist objectives that they thought their governments were not implementing as they should. Increasing autonomy posed a more serious threat for metropolitan governments than the autonomy of the Tangier consuls. In the case of Spain, the enclaves' aggressive initiatives could potentially cause the failure of the politics of *status quo* and "peaceful penetration" by forcing Morocco first to limit Spanish activities and second to grant new privileges to other European representatives after the inevitable protests. Thus, Spain tried to reinforce coordination of the enclaves with its general policy in Morocco by developing their military administration and institutions, by establishing duty-free ports or by creating customs. These measures could not prevent periodic armed incidents or smuggling but at least reduced them. As it is seen, both Morocco and Spain tried to keep local actors under control, even if Moroccan measures were more drastic than those in the Spanish enclaves.

All these events were also reflected in public health. At the local level, foreign intervention was clearer. For example, Eastern Riffian seasonal migration to agricultural complexes in French Algeria intensified in the second half of the 19th century. There were two main itineraries: by sea, through the port of Melilla towards the ports of Oran and Nemours or by land, through the frontier adjoining Oran province. Migration involved thousands of Riffians every summer, with the consequent danger of spreading epidemics. That is why, for example, French Algerian health authorities began to take measures concerning migrants, such as compulsory smallpox vaccination and disinfection of ships and personal effects, which enhanced the development of their maritime public health services. On the other hand, increasing regulation of commerce between the Spanish enclaves and Oran province, on one side, and the nearby *qabilas*, on the other, led to the establishment of customs by the Europeans, as in Melilla from 1867 on (Zaim 1988). Commerce regulation improved sanitary control because, for example, the marketplace was located outside the town, in the *campo*, preventing *qabilians* from reaching the city and Spaniards from travelling to the countryside. Other measures for *qabilians,* such as smallpox vaccination, may also have been used.

Military public health followed a similar path. This period saw an increase of Spanish garrisons and also of the units of Riffians under Spanish command (*Milicia Voluntaria de Ceuta*). Accordingly, from the middle of the 1880s, the Spanish government had decided to improve the military hospitals in the area so that they had better facilities and equipment, more personnel and larger capacity. The hospitals of Ceuta and Melilla increased in size to 200 beds, while in the Peñón de Alhucemas, Peñón de Vélez and Chafarinas Islands, there were 50 places (Larra 1900). But these institutions also had the purpose of "attraction" for nearby *qabilas*. According to the military doctor Ángel de Larra Cerezo, more than one thousand Riffians had been assisted in those hospitals between 1885 and

1900, a number that included not only civilians but also, for example, "100 Riffians" who had fought against Melilla troops in 1893–1894 (Larra 1900). In fact, assistance to Riffian combatants, either involved in clashes against Spaniards or inside their *qabilas*, seemed to be very frequent, because Larra confirmed that in the military hospitals "the Moors cured of serious wounds and operated on are very numerous" (Larra 1900). Smallpox vaccination may also have been done on Riffians. Besides, Spanish Army doctors travelled from time to time to the "Moorish camp" to carry out surgical operations or provide clinical care to local notables, though "the risk for their lives" limited this measure to isolated cases. Similar developments, though surely on a larger scale, may have taken place in the region bordering on French Algeria.

For Morocco, these facts implied a severe threat to its control over local public health. Though some degree of control could be achieved, the local agency of the *qabilas* could not be completely channelled. In maritime public health, the fact that migrants followed different routes reveals the attempt to avoid *Makhzan* control, as well as dependency exclusively on one European enclave or colony and therefore a form of diversification. The same could be said for commerce. Local leaders of *qabilas* sought to acquire some control over the flux of migrants and products, so that they could benefit most from them and reinforce their authority. Clandestine migration and smuggling also provided a means of thwarting the effectiveness of Spanish and French sanitary measures, as well as *Makhzan* control. In this context, official *harkas* sent to Anghera and Guelaia systematically tried to ensure legal commerce of these *qabilas* with nearby enclaves. Fighting against smuggling was an indirect means of achieving more "sanitary security", and it is not strange that the Sanitary Council of Tangier considered it a priority for avoiding the risk of epidemics. Morocco also interacted with competence between the Spanish enclaves and French Algeria in the area.

In military public health, *qabilas*' agency was again not absent and was reflected first in travels to both Spanish and French military hospitals in order to avoid dependency on one or the other. Smuggling of drugs and medical material with foreign enclaves should not be discarded. Local leaders could also severely hinder sanitary measures by launching hostilities which prevented people or combatants from travelling to the enclaves. Moroccan central and regional authorities tried to ensure control through the military doctors sent to these areas as part of the *harkas*. These were mainly the doctors trained in the School of Tangier, although, as mentioned earlier, Felipe Ovilo himself participated in the expedition to Anghera in 1892. It is possible that these doctors offered their services to the Riffians and Jbalians immediately after the fighting, but we do not know if any of them remained in the garrisons for a more prolonged time. Algerian doctors recruited through French influence could also have a role in the region, thus allowing Morocco not to depend exclusively on one country.

The bilad al-siba: Ibuqquyen

Beyond the local level, the analysis of Moroccan public health becomes even more complex. In the Tangier province, *qabilas* such as Ibuqquyen, Ait Warya-

ghar, Beni Arus, Ait Said or Ajmás, in fact, up to two thirds of the future Spanish Protectorate, were only linked to the system described here too loosely to properly become a part of it. Structurally, this happened mainly because these *qabilas* did not manage to act collectively externally and establish a single authority internally. This fact prevented them from having a *collective* link within the chain of Moroccan power and to interact *collectively* with European countries, representatives, colonies or enclaves. It is a matter here of a "microscopic" dimension of society – fractions, sub-fractions, clans – which have usually been analysed with the help of anthropological concepts by a long list of anthropologists of Moroccan society, such as Robert Montagne, Ernst Gellner, David M. Hart, David Seddon or Henry Munson Jr.

However, this shift from historical to anthropological analysis should not be overemphasized. If applying the term "public health" at this level may seem excessive, there existed nonetheless health structures to meet the care needs of groups of people – even if their complexity was very small. Apparently, events seemed to be confined within *qabilas*, conveying a sense of isolation and fragmentation. But it could be said that transformations taking place at this level were a simplified version of those occurring in Anghera and Guelaia and, therefore, parallel to the general changes in the rest of Moroccan public health. This meant nonetheless a higher degree of autonomy in the face of Moroccan and European central, provincial and local authorities, that was very close to virtual independence. This was reflected in the very slow pace of maritime and military developments in comparison with traditional importance of "naval" and civil interests.

In the last decade of the 19th century, the *qabila* of Ibuqquyen, located in the central Rif, provided a most representative example of developments found in the area. Ibuqquyen armed activities still seemed to focus mainly on the coastline and the sea. The particular balance of European naval power in the Eastern Mediterranean and the almost non-existence of the Moroccoan Navy allowed local fishermen to engage in gun smuggling with the Spanish enclaves of Peñón de Vélez and Peñón de Alhucemas and, more important, directly with foreign ships sailing near the coast. Smuggling was so widespread that by 1889 more than 50,000 guns a year were being sold on the whole Rif coast (Pennell 2000). It was this combination of guns and sea skills which led to "piratical" actions, that is, modest naval activities (in the sense of a military navy). In Ibuqquyen, small boats (*carabos*) manned with a bunch of armed *qabilians* or simply armed men hidden on the coast were able to create a sustained series of incidents with foreign ships from the 1880s on, with their cargo being confiscated, their crews, ransomed or the ships sunk. It is probable that some of these incidents were triggered by Europeans not respecting smuggling deals (exchange of foodstuff, skins or wax for guns and products) and showed that *qabilians* were able to ensure their position to a certain extent in front of abuses. Smuggling and other naval activities allowed the *rais* (chief or boss) Mesaud ibn Amar, aka "Sibara" (a corrupted form of

Civera, the name of a famous Spanish Admiral) and his associate Abdelkrim ben el-Hayy Ali Luh to become very powerful men in Ibuqquyen (Pennell 2001).

On the other hand, the concentration of power in Ibuqquyen took place mainly around religious or civil leaders, such as *cheikhs*, not around military *caudillos*. The roots of this fact rested in the persistence of traditional social structures of Riffians in a context of weak articulation of civil administration in Morocco and lack of civil influence by European countries. If the internal authority of the Sultan and the *Makzhan* relied on and was mainly exerted through the army, the importance of religious and civil leaders in the central Rif could only reflect its limits or, to put it in positive terms, Riffian ability of affirming its identity and traditions. The fact that local *qadis* (Islamic judges), such as the father of Abdelkrim in Ait Waryaghar, were confirmed in their posts by the Sultans and were asked to support them through the *bay'a* (an oath of allegiance paid by all Moroccan authorities and groups to every new Sultan), does not contradict the fact that their authority was derived mainly from the dynamics of local society and not from the central power.

Accordingly, health care in Ibuqquyen had mainly a naval and civil orientation. On the one hand, the relative weight of "piratical" activities and smuggling, plus alternative routes of seasonal migration, kept them quite out of reach of the French Algerian and Tangier maritime health services. It could happen that drugs or basic medical material were obtained in deals with the Spanish enclaves and foreign ships or by pillage, although it has not been possible to confirm this fact. On the other hand, traditional practitioners of various sorts and scattered *djemas* (mosques), *dar dmanas* (houses of religious brotherhoods or *tariqas*) and *shurfa* (saints) shrines continued to provide for the needs of most local inhabitants. As long as significant irregular forces were difficult to organize, military health care remained secondary in importance.

The autonomy of action of Ibuqquyen towards Moroccan authorities was matched by similar developments in the Spanish enclaves of the area towards peninsular authorities. The Legation of Tangier supported the *harkas* sent to punish *qabilians* by allowing Moroccan troops to disembark in Melilla or its surroundings and then move to the central Rif. However, it was also the *peñones* of Alhucemas and Vélez that needed control, because they acted almost independently given their insignificance. Though formally in a state of hostility towards coastal *qabilas*, both *peñones* were in practice supplied with foodstuffs by them and, in turn, allowed the smuggling of Riffians with foreign and Spanish ships (and engaged in it) (Villalobos 2004). In this way, they fostered Ibuqquyen autonomy as much as their own, thus hindering *Makhzan* and Spanish general interests at the same time.

In public health, military hospitals located in Vélez and Alhucemas had a predominantly civil function. The military garrisons in both enclaves were so reduced (one Infantry company in theory) that state functionaries (teacher, telegrapher, lighthouse keeper, customs officer), their families and the families of the Army officers, plus a tiny Jewish community, accounted for most of the work of the

army doctors. The Spanish military hospitals of Alhucemas Vélez also carried out a task of "attraction" similar to that in Ceuta and Melilla but with the difference that benefits were mainly for civilians and not for Riffian irregular combatants. Up until 1909, Lieutenant Dr. Manuel Bastos Ansart observed that the coastal *qabilas* "used to bring us for assistance all ill people who were not cured by the potions and magic of their saints" (Bastos 1969).

Both the *Makhzan* and the Spanish authorities tried to put an end to this situation. In the first case, the maximum degree of control was achieved after the 1898 *harka*. The brutality of this expedition reflected the degree of force Moroccan authorities had to display in order to exert some control on the area. It was also characteristic of the strongly authoritarian character of the Ba Ahmed regency in his efforts to keep the country united. The first objectives of the *harka* were to supress naval activities and disorganise civil society because those were the key mechanisms for Ibuqquyen autonomy. The two Moroccan gunboats supporting the expedition, the *Hassani* and the *Turki*, confiscated two *carabos* used by local people. On the other hand, *Makhzan* troops executed four local *cheikhs*, burnt fields, destroyed houses, imposed heavy fines and took almost 400 prisoners to Fez (Pennell 2000). In the second place, the brutal use of force was intended to integrate incipient military and maritime structures under Makhzan authority. For example, Ibuqquyen had managed to organise a force of 500 armed men to oppose the *harka* (Hart 1976) while its "commerce" free from taxes such as those imposed in the imperial ports had disliked the Makhzan since the 1840s (Pennell 2000). Besides, the Ait Waryaghar had been engaged in a "seven years war" during the 1890s, in which fractions of nearby *qabilas* (Temsamam, Ait Ammart, Ait Tuzin and also Ibuqquyen) had also been involved.

Military and maritime structures had made slow developments in previous years as an extension of naval and civil power, but now the goal was to promote them under Makhzan control because that would allow connection with the rest of Morocco and subordination to central and provincial authorities. The *harka* imposed Makhzan military authority in the area by repressing Ibuqquyen forces and integrating combatants from Ait Waryaghar and other *qabilas*. On the basis of military force, a reform of civil structures was made through the appointment of new *amils* or *imgharen* (local governors of fractions). After the punishment, the *harka* remained camped in the fraction of Izimmuren and its presence discouraged naval activities, compelling *qabilians* to commerce through the customs stations of Melilla or Ceuta and to increase seasonal migration to French Algeria and Tangier. Through both exceptional methods, the Ibuqquyen (and the central Rif in general) seemed to join the general frame of the Moroccan state, but this did not last long. The *harka* retreated one year later to Tafersit in the Eastern Rif and in 1904 to Taza and Fez. This quick fading of *Makhzan* authority enabled local autonomy once again, this time led by the Ait Waryaghar, who had traditionally had "their backs turned on the sea" (Hart 1976). Military and maritime structures had advanced but were now beyond control of the Sultan and the *naib*.

In public health, the army doctors who travelled with the *harka*, Mahboub and Si Ahmed Temsamami, embodied the extension of the activities of the School of Tangier to the central Rif. In Ellen Amster's words, Temsamami used "European methods" in a task which comprised assistance to official troops and local contingents. As the *harka* itself, the presence of military doctors probably did not last long. On the other hand, repression in Ibuqquyen provoked part of the local population to migrate temporarily or definitively to Tangier, French Algeria and even to continental Europe, thus being subjected to health measures of the respective maritime authorities. After the retreat of the *harka*, a number of local inhabitants resumed their naval activities and escaped again the control of maritime health.

In the case of Spain, the strategy consisted of linking the *peñones* with Melilla under a single military command, especially during and after the incidents of 1893–1894, and of reinforcing the Spanish military institutions and garrisons in Vélez and Alhucemas. On this basis, smuggling diminished and the business of civilians and Jews with the army increased. In public health, the army doctors had to focus more on officers and soldiers. However, the almost incredibly tiny size of both enclaves and the impossibility of extending activities to coastal *qabilas* prevented major changes. Assistance to Spanish and Riffian civilians continued to be a relevant part of the doctors' work.

If there is one thing that should be remembered from this brief presentation of the different levels of Moroccan public health is that there existed an articulated transition between central institutions and the areas beyond their reach. The provincial and local levels of the Moroccan state and public health actually existed and should not be relegated into the extremes of *makhzan* and *siba* as is usually done. Despite autonomous tendencies, these intermediate levels were connected to the general frame of Moroccan public health through more or less authoritarian procedures. Similarly, despite strong European influence, Moroccan authorities managed to keep a degree of initiative in public health affairs at all levels. As a result, diversification and authoritarian concentration, and the predominance of military and maritime public health were reproduced as general characteristics of the Moroccan health system. Only at the level of *siba* were these characteristics reversed, and only there, did a breach with the rest of the country occur. A more complex picture arises from this perspective, which helps better explain the future difficulties of Spain and France in reorganising public health in their Protectorates.

Tangerian Ghosts and Riffian Realities
The Limits of Colonial Public Health in Spanish Morocco

After the signing of the Act of Algeciras (1906), the doors were finally open for Spain and France to intervene more directly in Moroccan public health in their respective zones of influence. The Protectorate treaties between France and Morocco (March 12, 1912) and France and Spain (November 27, 1912) were a new step in this direction. As a theoretical result of these agreements, the unified Moroccan public health regime should have given way to separate health systems

in each zone. The challenge for French and Spanish authorities was not to create structures out of nothing, but rather to reform pre-existing levels in each zone. Europeans would now lead the process and have the executive power, thus finally ending Moroccan initiatives. Territories and population that had been out of reach would become integrated. A more balanced development of public health would also be encouraged, so that all four branches – maritime, military, naval, land – had similar weight. Direction of public health affairs would be more technical, based upon the expertise of doctors and upon scientific institutions such as laboratories. In theory, the Protectorate regime would allow more Moroccan participation in the health system than a colonial regime, but ultimately Moroccan institutions and personnel would be subordinated to French and Spanish authorities.

In practice, neither Algeciras nor the Protectorate treaties ended Moroccan agency. Abdallah Laroui has affirmed, against colonialist narratives, that the initiatives of the Moroccan state lasted until 1912: only from then on did "initiatives" give way to "reactions" (Laroui 1993). This study argues, however, that though most fragile and more tenuous than ever, Moroccan initiatives continued to exert a persistent influence in the newly established French and Spanish Protectorates until the late 1920s. (In fact, one could wonder if initiatives ever disappeared, as the nationalist movement gained momentum already in the early 1930s.) In Spanish Morocco's public health, perhaps the clearest proof of this was that the maritime and military branches kept on being pre-eminent in the newly established health system. This had to do with the fact that the new system continued to be influenced by the Sanitary Council of Tangier (which was still functioning), while a significant part of the territory and population managed to stay out of reach. The so-called "Tangier question" and "Rif question" – which I have termed the Tangerian ghosts and Riffian realities – were the paradigmatic examples of the difficulties created for Spain by the continuity of Moroccan agency and institutions during this period. Only by an increasing use of force, diplomatic and military, and by an increasing authoritarian concentration of power could Spain slowly begin to solve both "questions" and to establish a health system in its zone. But in this way, it moved away from the very Protectorate regime it sought and was obliged to deploy.

"Tangerian Ghosts"

The Persistence of the Sanitary Council of Tangier

From Consular Doctors to Urban Dispensaries (1906–1912). The Algeciras Conference marked the beginning of a new phase in the "Morocco question" and paved the way for the future establishment of Protectorate regimes. In their tacitly acknowledged "zones of influence," France and Spain compromised to support the authority of the Sultan and the *Makhzan* in order that the necessary modernisation of the army, finances, industry, commerce and health system could be achieved. In practice, this meant an unprecedented degree of intervention of those two countries in Moroccan institutions. However, as Abdallah Laroui has shown, the Act of Algeciras was the "last victory" of the Sultan against foreign powers,

which would serve as a basis for future moves towards independence in the 1940s and 1950s (Laroui 1993).

One of the main reasons for this was that Tangier remained outside both zones of influence. The city stood at the same time as the last site of Moroccan authority and as the last site where multiple foreign influences could be overtly exerted. Some of the old international and *Makhzan* institutions remained, while other new "international" organisms were planned or created. It was countries such as Great Britain and Germany who were especially interested in supporting the autonomy of the city and in still recognising some authority to the Sultan. That was a means for them to maintain some intervention in Moroccan affairs and to prevent France and Spain from exerting exclusive control in their zones of influence. The so-called "Tangier question" would prove influential in all spheres, including public health.

Health issues were not among those regulated by the Act of Algeciras, which limited itself to the following agreements: 1) Creation of a police force in Tangier and other ports; 2) Fight against smuggling; 3) Creation of a Moroccan State Bank; 4) New taxes and improvement of the financial system; 5) Reform of the customs; and 6) Public works and public services. However, this very absence implied that an institution so important and with such a long trajectory as the Sanitary Council of Tangier remained untouched. In fact, the Council was once mentioned in the text, in the fourth chapter, article 61, regarding the question of a new tax on urban properties which should be used for public works in the main cities:

> A Tanger, cette quotité sera versée au Conseil Sanitaire Internationale, qui en réglera l'emploi jusqu'á la création d'une organisation municipale.

Nothing was said about the Council's authority in public health, which dated back to the times of Sultan Moulay Abdehrraman. Nor was anything said about its possible replacement by other equivalent institutions in the French and Spanish zones. So the Council was subtly acknowledged, and its functions were neither denied nor reshaped. Far from disappearing or being dismantled, it started to become a kind of "ghost", as did the zone of Tangier as a whole, its structures and its old regulations of 1840 and 1879 inevitably interfering with the maritime health institutions France and Spain planned to create in their respective zones of influence.

In fact, the impact of the "Tangier question" for Spain (and France) was multiple. On the one hand, the persistence of the Council meant that Spain could not concentrate its efforts exclusively in its zone of influence. Spanish representatives had to be kept in Tangier and in ports of the French zone as part of the old system which had not disappeared. In addition, other European countries could keep influencing maritime public health in both zones. On the other hand, the Tangier Legation kept an important role as co-ordinator of Spanish delegates in the ports of the Spanish zone. Its power would interfere with a future maritime health authority based in Spanish Morocco. Third, the traditional weight of the Larache delegation could transform it in the centre of maritime health in the

Spanish zone, but this would probably allow too much Moroccan participation because Spanish presence and influence in this city were weak in comparison, for example, with Tettouan. Finally, urban public health, of which dispensaries for natives were to become a most representative component, was also disrupted because the Council had not received authorisation from the Sultan to create health institutions in the cities – except for Tangier itself. In this context, it is not strange that the control of maritime public health became of extreme importance for the development of a health system in Spanish Morocco – at least in the Western zone.

These "shortcomings" of Algeciras' resolutions implied that maritime public health in the Spanish zone did not change much in the years 1906–1912 from former decades. Curiously, the most immediate and almost exclusive effect of Algeciras was the creation of dispensaries for natives in the Atlantic coast cities. They were set up on the basis of the "consular doctors" who had been working in Moroccan ports since the 1880s. One of them, Captain Dr. Francisco García Belenguer, who worked in Larache, was the first to suggest in June 1906 that a dispensary should be built in that city. It was necessary to extend medical services to a wider population of "poor Moors and Israelites" so that Spanish influence was consolidated and the work of the French doctor recently sent to the city, neutralised. (France would keep a dispensary in Larache and a doctor in Tettouan for many years). Following this proposal, the doctor of the Spanish Legation in Tangier, Major Dr. Francisco Triviño Valdivia presented to the Ministry of State a project for creating dispensaries in the Spanish zone four months later (*Proyecto de instrucciones para la organización y funcionamiento de los dispensarios médicos de España en Marruecos*). Two years later, the new doctor in Larache, Captain Dr. Carlos Vilaplana González, wrote a new tract entitled *Bases para los dispensarios de Marruecos. Dispensario de Larache*, another attempt at defining the characteristics of the dispensaries.

The centrality of Larache was not only expressed by its leading role in proposing the creation of dispensaries. In 1911, Spain launched a military operation to secure that city and Ksar el-Kebir in the face of French moves near the unofficial borders of the Spanish zone of influence. After this operation and many delays and bureaucratic proceedings, three urban dispensaries were created in the Atlantic region. The first was started in Larache in 1908, under the direction of Carlos Vilaplana González (1908–1911) and afterwards Ángel Jack Ocampo (1911–1919); the second, in Asilah in 1911 with Francisco Moreno Sáenz (1911–1921); and the third in Ksar el-Kebir in 1912, with Ramiro Torreira Martínez (1912–1913) and Manuel Ocaña López (1914–1921). They had nonetheless a provisional character, lacking proper equipment, auxiliary personnel and even buildings of their own in some cases during the first years. The directors of dispensaries were dependent on the Spanish consuls in those cities and subsequently on the Spanish Legation in Tangier. All administrative paperwork, medical registers and sanitary initiatives had to be submitted to Tangier for knowledge of

and eventual approval by the Legation and by the Ministry of State in Madrid. The role of the Tangier Legation would persist in the following years.

In fact, the creation of dispensaries was not so paradoxical because obtaining control of the Council delegations was much more difficult than making a slight extension of the work of consular doctors. However, the very provisionality of dispensaries showed that such control was necessary for obtaining financial resources and improving their facilities and equipment. This was not the only problem. As it was said before, Spanish initiatives were not restricted to its zone of influence. That is why, for example, Dr. Francisco García Belenguer was sent to Fez in 1908, where he stayed at Moulay Abd el-Hafid's (1908–1912) personal service until the Protectorate treaties were signed. His main task was to try and influence the Sultan and the *Makhzan* and to send reports to the Tangier Legation, informing about their activities. But it was too late for him to exert an influence similar to that of Fernand Linarès at the end of the 19th century. Spain also kept consular doctors in Casablanca and Mogador. At least in the first of those cities a dispensary was established which was connected to the Tangier Legation. The military doctors who served in Casablanca were Antonio Moncada y Álvarez (until 1910), Carlos Amor y Rico (1911–1917) and Vicente Vidal Frenero (1921–1931), while those in Mogador were José Blanco Larruscaín (until 1911), Práxedes Llisterri y Ferrer (1912–1913) and Gabino Gil y Sáinz (1914–1915). Resources and personnel were used to keep Spanish influence in the whole of Morocco until the 1920s with the subsequent dispersion of meagre resources.

The Strategy of the Juntas Locales (1913–1915). The French and Spanish Protectorates were finally established in March and November of 1912, respectively, but Tangier and its surroundings confirmed their autonomy from both. The city was assigned a vaguely international character, which would take almost fifteen years to be legally defined. This fact deepened the impact of the "Tangier question" on the Spanish Protectorate's maritime public health. On the one hand, it confirmed the persistence of the Sanitary Council, whose existence and jurisdiction were once again taken for granted. Spain should then keep its activities in Tangier and other ports of Morocco. On the other hand, Spain could not use the Legation of Tangier to lead public health in its zone of influence. Tangerian ascendancy in the Northern region would have provided a powerful legitimacy, an administrative basis and a unity of action for Spanish health activities in its new Protectorate. Instead, a new centre had to be "invented" that would not enjoy Tangier's pedigree and would suffer from interferences of the Legation. Tettouan was officially chosen as new centre but Larache possessed similar, if not more favourable, conditions for the task. The Council's delegation in Larache had been traditionally more important and, as has been shown, the first dispensaries for natives had been established in Larache and nearby cities. Finally, the problems of creating urban health institutions and extending their reach into the countryside would remain.

In these unfavourable circumstances, Spain began to define its Protectorate health system. The French-Spanish Treaty of November 1912 lacked any refe-

rence to public health matters, and it was necessary to wait for a provisional Protectorate regulation approved by Royal Orders issued in February and April 1913. According to these regulations "public health and hygiene" affairs were assigned to the Delegation of Native Services (later, Native Affairs), one of the three offices of the Spanish *Alta Comisaría* (High Commission) in Tettouan. In addition, *Juntas locales de Higiene* (Local Hygiene Boards), were to be established in the main cities. Apart from the regulations, a new urban dispensary was created in Tettouan just after the occupation of the city in February 1913 under direction of the military doctor Leopoldo Martínez Olmedo (1913–1919). Finally, Dr. García Belenguer was appointed as "intimate consultant" of the new Khalifa (higher Moroccan representative for the Spanish zone), Moulay el-Mehdi. He was supposed to carry out the same tasks as under the Sultan Moulay Abd el-Hafid in previous years.

These initial measures could not hide the persistent debility when faced with the Sanitary Council of Tangier, which was explicitly reflected in the specific orders given to the Delegation of Native Services in the 1913 provisional regulations. According to them, the main task of this organ in health affairs was to strive for the "confluence of the Spanish public health action (dispensaries of Larache, Ksar el-Kebir, Asilah, Tettouan, Nador and Zoco el Had [the latter being two countryside dispensaries run by the Army in the Melilla region] with the delegations of the Sanitary Council of Tangier, and its expansion in due terms". Debility was quickly given a more proper name. On the occasion of a plague outbreak in the Atlantic region in September 1913, a sanitary commission was sent from Spain by the Ministry of State, headed by the Spanish Maritime Health Inspector himself, Manuel Martín Salazar. Some months before, the ministry had already proposed that Martín Salazar should present a design for organising the health services of the Protectorate (following a plague outbreak in the Canary Islands). The *Proyecto de Organización de los servicios sanitarios de la zona de influence española en Marruecos* was finished in May and published in November and became the first detailed legal text on public health for Spanish Morocco.

Among other things, the plan proposed the creation of the Hygiene Institute in Larache, whose director would become the Protectorate's Health Inspector. Subordinated to him, medical officers in Larache, Tettouan, Ksar el-Kebir and Asilah would be in charge of the maritime health stations in the ports as well as the urban dispensaries. They would also serve as members of the local boards of those cities in order to take general hygienic measures. Larache's Institute would also serve as basis for the creation of a Spanish School of Tropical Pathology in Africa. However, the plan failed because Martín Salazar ignored the implications of the Sanitary Council of Tangier. During his stay in Morocco, he finally realised that neither Spain nor France could adequately organise their Protectorates' public health

> because they lack the indispensable *sanitary autonomy*, due to the existence of an International Treaty that assigns such a delicate matter in the Moroccan Empire to different national representatives, badly suited for this kind of

> services, prone to disagreements based on interests beyond public hygiene and besides often sterilised by the technical incompetence of officials charged with a task which is essentially unknown to them.

Thus, *sanitary autonomy* was still the real challenge for Spain, even though the Protectorate had been already established, and maritime public health was the key to this autonomy because the more control exercised in this field, the more the development of urban and countryside health services would be possible. As a result of the commission, two provisional "sanitary parks" were established in the ports of Larache and Asilah, but its work ran parallel to that of the Council delegations and they depended directly on the Spanish Maritime Health Inspection. This measure was clearly insufficient and Martín Salazar asked the Ministry of State to reach an agreement with France in order to obtain sanitary autonomy and also to press for a reform of the Sanitary Council bureau so that Spain could increase its influence in it. More realistically, Martín Salazar also proposed a local strategy to start bringing sanitary power into Spanish hands. He stated that

> as long as the Sanitary Council of Tangier does not acknowledge our sanitary autonomy in the ports of our domain, it could be demanded from the Consular Corps of the different cities that the right to intervene in the sanitary examination of ships would be delegated to this Spanish doctor [the dispensary doctor].

In fact, that right was not "demanded" but taken by force. Spanish authorities decided to use the newly created *Juntas de Servicios Locales* (Local Boards) as bases for the use of diplomatic force against the Protectorate legal frame. The first *Juntas* had been established in Tettouan, Larache, Ksar el-Kebir and Asilah by a *dahir* of June 10, 1913 (Cordero Torres 1943). Despite their initial financial and legal problems, they provided the institutional space for Spanish consuls to act apart from other European representatives and from Moroccan authorities. In the absence of specific Local Health Boards, they assumed public health competencies, placing urban dispensaries under their control. More important, they tried and pre-empt maritime health competencies from the Council delegations. It was a way either to avoid interference from the Council of Tangier, or to increase the role of the Delegation of Native Services of Tettouan in front of the Tangier Legation and Larache.

This process took a particular form in each of the three main ports of the Spanish zone. The first move was made in the least important, Asilah, during the second half of 1913. The Spanish Consul, who acted then as Council delegate, appointed the dispensary doctor, Francisco Moreno Sáenz, as his successor. This was a challenge to the Council, as it was this organ that still had the power to appoint its delegates. This action provoked official protests of the government of Austria-Hungary to the Spanish Ambassador in Vienna in May 1914. The argument was that, although the Council had not been created as a result of an international convention, it was "an institution acknowledged by many international

treaties", among them in the "article 176 of the International Sanitary Convention of Paris, signed by Spain, and the article 61 of the International Act of Algeciras".

Spain tried to act more carefully on the next occasion to avoid such diplomatic incidents. This time, the objective was Larache, the main port of Spanish Morocco. On January 1, 1914, the Spanish Consul José Buigas Dalmau was to start his term as Council delegate for the next six months. A doctor from Martín Salazar's commission, Benigno García Castrillo, was still in the city in charge of the provisional "sanitary park" that had been installed in the port, and the Council health official was a Spaniard named Ildefonso Hernández. Buigas first tried to "obtain" the post of delegate from the Belgian consul in December following secret instructions from the Ministry of State, but the consul refused to act without previous authorisation by the Council. Then, on January 1, Buigas received his post and immediately ordered Dr. Castrillo to assume the sanitary inspection of ships, while Hernández would become his "substitute". Buigas planned to keep this situation beyond June 30, as he expected no protests during the following term of the French consul, because "France seeks for its zone the same independence we seek for ours". These legal subterfuges proved effective: France did not protest, Dr. Castrillo inspected the ships, equipment and facilities were improved and the money raised through ship inspection was not sent to Tangier.

Despite all precautions, the economic importance of the port of Larache made protests from other countries all the more expected. This time it was Great Britain that complained to the Spanish government. On January 1, 1915, the British consul in Larache began his term as delegate, and the same day the British consul in Tangier became president of the Sanitary Council. Besides, Great Britain had not yet officially acknowledged the Spanish Protectorate. To respond to British protests, the Ministry of State asked for a copy of the 1840 Council regulations to the Tangier Legation, and some time later sent a note to the British Ambassador in Madrid with a wide array of arguments defending the Spanish position. For example, the Council was not the result of an international agreement; Spain had been charged with implementing a public health administration in the name of the *Makhzan*; and a sanitary station had been set up in Larache that provided a preventive service that had not existed before. In addition, the 1861 Treaty of Commerce with Morocco, still in force, also allowed Spanish consuls to issue sanitary certificates for boats on the Rif coast. Finally, the international conventions stated that consuls were not prepared to render adequate health service, which should be assigned to trained personnel as Spain had done in Larache.

The First World War, which had already started, also provided a powerful argument. It was necessary to maintain the *de facto* situation in Larache and Asilah in order to ensure the "neutrality" of the ports of Spanish Morocco, because a British or French consul "could raise problems with ships of belligerent countries". Sanitary inspection by Spain would be more "objective" because "a foreign consul may be a self-interested party in the present European conflict". So, the Ministry of State could affirm that "the war was the cause of Mr. Buigas keeping the delegation post". Finally, in October 1915, the consul in Larache sent

a copy to the Ministry of State of the sanitary certificate made by the French consul of Kenitra for an English ship. If sanitary inspection in Kenitra was done by the French consul and not by the Council delegate, the Spanish initiative in Larache seemed not so unjustified. Strictly, both problems were not equivalent because the port of Kenitra had had no Council delegate prior to the Protectorate. However, the fact that France made moves to control maritime public health in its zone supported Spanish demands for its own.

The problem did not disappear and was brought to the fore every time a new foreign diplomat began his term as president of the Sanitary Council. In November 1915, it was the Russian diplomatic agent in Tangier who, as Council president, again demanded a solution for the delegation of Larache. He proposed that the Spanish consul could "incidentally and given the present circumstances keep the post of delegate as long as he sent the money raised by ship inspection since mid-1914 to Tangier". The Ministry of State and the Tangier Legation were eager to accept this proposal but only if it was taken as "definitive and not provisional", that is, the Spanish consul in Larache "would always be the Sanitary Council delegate" and the doctor of the *Junta* would be responsible for ship inspection. No agreement was reached and the situation remained as before.

In the view of the Ministry of State, it was only a matter of time before a similar problem arose in the third main port of the Spanish zone, Tettouan. Despite being the Protectorate's official capital, in Tettouan's port, Martil, maritime public health still remained in the hands of the Council delegate. On January 1, 1916 the French delegate was to surrender the post to the German consul for the next six months. But as these two countries were at war, the French consul suggested to the *Alto Comisario* (High Commissioner), General Francisco Gómez Jordana, that the Spanish consul became the delegate. Gómez Jordana sent the proposal to the Ministry of State, which accepted the idea. However, at the last moment, France decided to propose the consul of the Netherlands as the new Council delegate, with the subsequent deception and protests of Spanish Protectorate authorities.

This fact just confirmed Tettouan's secondary role in relation to Larache between 1913 and 1915. The lack of centralised control on maritime public health was reflected in new plague outbreaks. In addition, Tettouan could not stop the activities of the Spanish Legation in Tangier, which carried much of the weight of the strategy of the *Juntas*. Besides, Spanish activities continued in other parts of Morocco. Just after the Protectorate was established, a Spanish Laboratory of Bacteriology had begun its work in Tangier almost simultaneously and in direct competition with the French Pasteur Institute headed by Dr. Paul Remlinger (Moulin 1997). The military doctors Celestino Moreno Ochoa (1913–1917) and Francisco Mora Caldés (1917–1921) were its first directors. Consular doctors continued to be appointed to the Spanish Legation and often served in the Spanish Hospital that had been in operation since 1888. In this period, the military doctors Federico Baeza and Francisco Triviño were replaced by Enrique Pedraza de Vivanco (1914–1918) and Emilio Crespo y García de Tejada (1915–1917). On the other hand, Spanish doctors in Casablanca and Mogador continued their task in

both cities during these years, though with uncertain purpose, while the southern zone of the Spanish Protectorate (Cape Juby/Tarfaya) still awaited effective occupation.

Despite all problems, the pre-emption of maritime health competencies by the *Juntas* provided the "umbrella" for the start of the later so-called *Sanidad Majzén* (*Makhzan* public health), that is, the health services created and controlled by Spanish authorities but addressed to the Moroccan civil population in the name of the Khalifa, in other words, the Protectorate health system as such, directed from Tettouan and addressed to Moroccans. The *Juntas* were able to acquire financial resources from ship inspection and from the Ministry of State (since 1915). The posts of Officers of Local Health Services or Local Boards Health Officers, that is, a kind of municipal health inspectors, were created the same year. The "sanitary parks" of Larache and Asilah were officially integrated in the *Juntas* and the first statistics of ship inspection were collected and sent to the High Commission. Urban dispensaries were officially recognised as "*Makhzan* dispensaries" by a *dahir* of January 1, 1915. The number of people ("Moors", "Israelites" and Spaniards or Europeans) treated in these centres grew significantly. But more important, public health measures could be planned on a regular basis and a wider scale. For example, in October 1915, the High Commission ordered the Officer of Local Health Services in Larache to design a form to collect statistical data "for a better knowledge of the salubrity of this city", which was subsequently extended to the other main towns. Morbidity and mortality data were then ranked according to a standard nosology, and included information on nationality and religion. As a result, monthly statistics started to be submitted to the High Commission and published in the *Boletín Oficial de la Zona de Protectorado de España en Marruecos (BOZPEM)*, providing a first picture of the Protectorate's epidemiology.

Preventive measures such as smallpox vaccination increased. For example, just a few weeks after Tettouan was occupied and its dispensary created, the Spanish consul in the city asked the Ministry of State to send 800 doses of smallpox vaccine "so that the doctor attached to the Consulate may vaccinate for free those natives who ask for it". It was clearly a propagandistic measure, although it was justified due to the "appearance" of some cases of smallpox and the "necessity of diffusing among the native population the use of vaccination". In Larache the consul Buigas asked in June 1914 that a "depot of sera and vaccines" be installed in the city, and that smallpox vaccine be sent. The petition was written, not by chance, just a few days before the consul started the procedure to try seize the Council delegation post and was justified using the same arguments as in Tettouan. Apart from these opportunistic occasions, vaccination was done regularly as public health structures stabilised. For example, a "vaccination service" was organised in the dispensary of Larache from June 1915. Its announcement stated:

> In the dispensary of Larache, vaccination will be offered for free to all indigents of every nationality, from 10 to 12 in the morning and 2 to 4 in the after-

noon. Apart from smallpox vaccine, anti-typhoid vaccine and anti-diphtheria serum will be provided to the poor, also for free.

Dispensaries also offered the poor population drugs for free, which were supplied by the Military Hygiene Institute in Madrid. Finally, projects for new water conducts and sewage collection began to be planned and discussed by the *Juntas* of the main cities.

The Creation of the Health Inspection and the "Denunciation" of the Council of Tangier (1916–1918). The 1915 budget of the Ministry of State for Morocco included for the first time a sum for a "doctor, General Health Inspector". Administrative documents confirm that both Spanish peninsular and Protectorate authorities planned the appointment of a Protectorate Health Inspector during the second half of that year. In contrast with former projects for Larache, the new post was presumably be given to the director of the Tettouan's civil infirmary, which had been created for the assistance of the Spanish population of the city already in 1914. In November 1915, a public call was issued by Manuel Martín Salazar and some time later Dr. Eduardo Lomo Godoy, director of the civil infirmary of Tettouan, was appointed to the post. The selection committee included Jorge Francisco Tello, head of the Epidemiology Section of the "Alfonso XIII" Hygiene Institute of Madrid who had accompanied Martín Salazar in the 1913 commission; the Spanish Representative in the *Office International d'Hygiene Publique* of Paris, Dr. Ángel Pulido, former Spanish General Health Inspector, 1901–1902; Dr. Víctor Llorente, a specialist in sera and vaccines who owned an important laboratory in Madrid; and the Professor of Parasitology and Tropical Pathology of Madrid, Gustavo Pittaluga (Rico Avello 1969). Such an imposing group of hygienists was surely intended to give the candidate the full support of the Spanish public health establishment.

This fact reflected the increased legitimacy and power that Tettouan had gained as the public health centre of Spanish Morocco. In fact, the promotion of Tettouan was a main objective of the High Commissioner Francisco Gómez Jordana during his term from July 1915 until December 1918. Soon after his appointment, the first official regulation for the Spanish Protectorate was approved on January 24, 1916. In public health, this regulation confirmed the creation of a General Health Inspection inside the Delegation of Native Affairs, whose main function was to act as consultative board for the High Commission in "public health and hygiene affairs". Periodical visits were also to be made to the health services by the inspector in order to suggest possible reforms, while a general report had to be submitted to the High Commission at least every two years. Dependent on the Health Inspection, the directors of civil hospitals and infirmaries would become "delegates for the services of health intervention".

However, the 1916 regulations had quite a limited effect in creating a technical public health authority with actual executive power. The inspection and its delegations remained a consultative body, so final decisions were in the hands of the Delegate of Native Affairs and the local consuls-interveners. Dependence on

metropolitan public health was still high. To that date, the civil hospitals and infirmaries built or planned were still intended exclusively for Spanish citizens, leaving dispensaries as the sole *Makzhan* services. This last fact is very important because the Ministry of State would give more and more support to institutions exclusively directed to Spaniards, instead of promoting Protectorate centres. The risk began of grow of negating Spain's international compromises towards Morocco which would develop in the years to come.

In these circumstances, new acts of force for acquiring maritime health competencies were necessary to further strengthen the Health Inspection and Tettouan's central role. The international context would prove decisive for this process. Shortly after the 1916 regulations were approved, French authorities in Morocco decided to "denounce" the 1840 *firman* by which the Sanitary Council of Tangier had been established. The state of war was crucial in this action against legal agreements, which was probably intended to stop German interference in Morocco, so strongly felt prior to and during the war period. The decision was conveyed to the foreign representatives in Tangier through the delegate of the Sultan in that city. The *Residence Generale* (French High Commission in Morocco) had decided to take full control of its zone's maritime public health, which was to be governed through a new legal regulation to be approved after the "denunciation" had gone into effect.

Immediately, the Spanish Legation in Tangier contacted the Ministry of State and expressed its dissatisfaction that France had not informed Spanish authorities "so that both governments would have simultaneously acted in both zones". However, it was not too late to co-ordinate Spanish initiatives with those of French authorities. The "denunciation" of the 1840 *firman* was a very convenient move for Spanish Morocco's interest in achieving its "sanitary independence". Thus, the Legation began planning a parallel "denunciation" to be published on the same date as the French statement which would put an end to the Council's interference in the Spanish zone. Soon afterwards, a regulation "reorganising maritime health police" would be approved which would serve as the basis for "the future sanitary regulations". The Legation felt confident of this manoeuvre, as no diplomatic protest, especially from Great Britain, had followed the French decision.

The plan was put into action through a Khalifian *dahir* published in the BOZPEM on March 13, 1916 – the same day as the French Sultanian *dahir* – which was to go into effect on March 19. The law established that the *pachás* of the port cities would assume the responsibilities of the Council's delegates in maritime public health, "though they could, nonetheless, delegate this function in benefit of the service". A royal decree from the High Commission March 29, 1916 put into effect this new delegation of authority from the *pachás* to the Spanish Consul-Interveners. In sum, jurisdiction in sanitary matters had been removed from the Council and returned to the *Makhzan* (reversing the events of 1840), which, in turn, had re-delegated the power in this field to the French and Spanish Protectorate authorities.

However, the effect of these measures was not as decisive as it was planned. This was largely due to Great Britain's will to continue its support of the Council. Just a month after the French and Spanish *dahirs* were published, the British ambassador in Madrid, Sir Arthur Hardinge, addressed the Minister of State, the Count of Romanones, to convey the opinion of the British government that the suppression of the Council would cause serious inconvenience due to the absence of a central organ that could co-ordinate quarantine policy and the application of sanitary regulations in the Spanish and French zones and Tangier. To avoid this, Hardinge proposed the creation of a new "Sanitary Council of Morocco" on the basis of articles 27 and 102 of the planned Tangier Statute, which was then being negotiated between France, Great Britain and Spain.

Hardinge reiterated his proposal to the new Minister of State, Amalio Gimeno, in August. Some days later, the French ambassador in Spain transmitted the complete agreement of its government with the British plan. Caught by surprise, the Minister of State requested a report from the chief of the Tangier Legation, F. Serrat, who was also surprised because, in his opinion, there was nothing in article 27 to support the French-British proposal, and he had no knowledge of the existence of an article 102. He nonetheless found a clear explanation for the "paradoxical fact" of "re-creating a Sanitary Council or restoring the existing with its former powers": it would mean again accepting foreign intervention "after having paid with sacrifices for the independence of our action in Morocco". For Great Britain, it was a way to retain its intervention in Moroccan public health, while the benefit for France would be that the new Council would favour its never-abandoned ambition of controlling the whole of Morocco at the expense of the Spanish zone. Serrat thought that Spain should reject this proposal and defend its decisions against the two countries. If a co-ordinated action on quarantine or any other issue was considered necessary, "it would suffice to follow the corresponding international regulations adopted in the different Sanitary Conventions". Besides, it would be more important for Spain to co-ordinate maritime public health in the ports of Spanish Morocco "with regulations in force in the *península* and Spanish African enclaves" than with the rest of Moroccan ports.

As a result of these diplomatic manoeuvres, maritime public health was still unable to achieve sufficient autonomy in Spanish Morocco. The provisional "sanitary parks" installed in Larache and Asilah after the end of 1913 had not become "sanitary stations", although such projects were planned since 1915. Consequently, the *Sanidad Majzén* directed from Tettouan kept its modest development. Interference from the Tangier Legation continued. For example, the Spanish bacteriological laboratory in that city increased its activities in Spanish Morocco. In 1915 its services included diagnosis and assistance in rabies cases from Tettouan, Larache, Ksar el-Kebir and Asilah. In 1917, the laboratory asked the Institute of Military Hygiene to send antityphoid, anti-paratyphoid, anti-dysenteric and haemolytic sera, as well as smallpox vaccine, all for diagnostic purposes. Competition with the laboratory of Tangier still came mainly from Larache, not from Tettouan. As was mentioned above, in 1914 the Spanish consul Buigas had

asked for a "deposit of sera and vaccines" from the Alfonso XIII Hygiene Institute to be established in the city and "periodically renewed". This initiative did not succeed, but in 1916 the Commander General of Larache asked the Tangier Laboratory to send "anti-rabies marrows" for local treatment of the rising number of patients in the area. The director, Dr. Francisco Mora Caldés, refused partly on technical grounds and partly because he thought its laboratory was prepared to "treat all individuals coming from our zone of influence, either military or civilians, who need as the sole requisite their presence in this city during the time of the treatment". It seems clear that the laboratory wanted to keep its prerogatives at the expense of Larache.

The Authoritarianism of the High Commissioner (1918–1921). Two years had to pass for Tettouan to finally become the centre of Spanish Morocco public health. The defeat of Germany in World War I increased freedom of movement for France and Spain in Morocco, putting an end to more than a decade of German intervention after Algeciras. On September 24, 1918, a *dahir* was published with the heading *Dahir organizando el servicio sanitario de la Zona*. This *dahir* stated "that the power attached to the *Makhzan* in sanitary affairs would be permanently delegated to the Delegate of Native Affairs of the High Commission of Spain in Morocco". The "denunciation" of 1916 had failed because it had returned the jurisdiction of the Council to the hands of the *Makhzan*, but it had not made a distinction between the Sultanian (French) and the Khalifian (Spanish) *Makhzan*. This open flank had been used by the British and French authorities to exert claims for intervention in maritime health affairs in Spanish Morocco, as has been seen. The new *dahir* closed this door by making the Delegate of Native Affairs and not the *Khalifa* or its *Makhzan* the direct recipient of responsibility for maritime health issues in the Spanish zone. Thus, further interference was prevented, but it was at the cost of a new act of force on the Protectorate legal frame. Now it was plainly clear that Spain did not "protect" Moroccan authorities but directly assumed their competencies. It was all the more natural that, as a result of this decision, Dr. García Belenguer ended his mission as "intimate consultant" near the *Khalifa*.

The *dahir* created a Central Board of Health (*Junta Central de Sanidad*) composed of ten members and located in Tettouan. Its president was the Delegate of Native Affairs. The other members included a functionary of the General Secretary of the High Commission, who was to represent the interests of civil authorities; a member of the Military Cabinet of the High Commission, who would represent the Army; the "doctor who acts as consultant of the Delegation of Native Affairs", that is, the Health Inspector; the Chief of Military Public Health in Tettouan; a doctor, a pharmacist and a veterinary appointed by the High Commission; an architect from the Delegation of Public Works (*Fomento*); and a secretary without a vote from the staff of the Delegation of Native Affairs. Subordinate to this central board, specific Local Health Boards (*Juntas locales de Sanidad*) were created inside the *Juntas Locales* of Tettouan, Larache, Ksar el-

Kebir and Asilah. Each of these boards contained 12 members: the *pachá*, who was the president; the local consul-intervener, who was the vice-president; a representative of the Army; the director of the civil hospital in Tettouan and Larache and of the civil infirmary in Ksar el-Kebir and Asilah; a military doctor; the chief of the municipal health services; a pharmacist and a veterinary appointed by the Delegation of Native Affairs with approval of the High Commissioner; three proprietors (one Spanish, one Muslim, one Jew) appointed in the same way; and a secretary from the local intervention office.

On the other hand, the *dahir* made reference to new institutions, the so-called "mixed infirmaries". In fact, the civil budget for Spanish Morocco published on the January 1, 1918 had included sums for the personnel and expenses of two "infirmaries for natives" (exclusively for Moroccans) in Tettouan and Larache and two "mixed infirmaries" (for Spaniards and Moroccans) in Asilah and Ksar el-Kebir. Such infirmaries had already started operation between 1917 and 1918, and their personnel included, in the first case, two Spanish doctors, two Spanish auxiliaries, two Moroccan nurses (one male, one female), a Moroccan cook and a Moroccan porter; and in the second case, a Spanish doctor, two Spanish auxiliaries, two Spanish nurses (one male, one female), a Spanish cook and a Moroccan porter. The infirmaries were considered a necessary complement to the dispensaries for natives, because they offered surgical services and a place for convalescence. This service could not be provided by dispensaries and, provisionally, had been assigned to military hospitals, as will be shown later.

Despite all, the situation had not changed so much. If the Health Inspector was modestly referred to as the "doctor who acts as consultant of the Delegation of Native Affairs", it was because he lacked executive power as well as the administrative, institutional, financial and technical means to plan and implement a public health policy. The Health Boards were to act "only as consultative bodies, from which the Delegate and its local representatives [the local consuls-interveners] would seek advice when an epidemic of bubonic plague or any of similar danger appears". In 1921 Spanish Morocco still lacked proper sanitary stations in its ports, an Institute of Hygiene and a central depot for medical material. No health campaigns against syphilis, malaria, typhus or tuberculosis had been launched. The budget for civil public health (for Spaniards and Moroccans) had risen to a modest six per cent of the total for the Protectorate (781,000 out of 13,699,322 pesetas) when the infirmaries were planned in 1915, but in 1918 it was reduced to a meagre 2.5 per cent of the global expenses (229,000 out of 11,956,822 pesetas), almost one third of which was for the personnel's wages. Some of these expenses were for Spanish-only or part-Spanish institutions (two civil hospitals, two civil infirmaries, two mixed infirmaries). Two "sanitary parks", four modest urban dispensaries and four small infirmaries, two of them "mixed", were clearly insufficient for *Makhzan* public health to ensure adequate assistance for Spanish Morocco's urban population, even though this group comprised only a 10–15 per cent of the zone's total.

The space allotted to the *Sanidad Majzén* was, then, small and clearly insufficient, a side-effect of persistent "Tangerian ghosts" that refused to disappear. Impotence led to further authoritarianism in front of the Khalifian Makhzan, which was regarded as the only way of acquiring control over health matters. Thus, in the 1918 *dahir*, the High Commissioner himself was given strong control over health affairs, even over the Delegate of Native Affairs. His formal approval was required before agreements of the Central Health Board were executed and also for the appointment of three out of nine voting members in the central board and five out of eleven in the local boards. This authoritarian manoeuvre was representative of the period when General Dámaso Berenguer served as High Commissioner (1919–1922). Berenguer managed to concentrate civil and military power in Spanish Morocco in the face of interference from the *peninsula*, from the Tangier Legation and from Moroccan representatives (Cordero Torres 1943). He did so in quite a "personal" way, as all initiatives were taken by him, and he appointed men in his confidence to key posts (Nerín 2005). In this way, the position of Tettouan was clearly strengthened in relation to Larache and Tangier, and it would be more so after the strong military campaign that took place from 1919 to 1921, which resulted in the complete or partial submission of the *qabilas* of Anghera, Wad Ras, Beni Hosmar, Beni Hassan, Beni Messauar, Jbel Hebib, Beni Said, Beni Gorfet, Beni Ider, Beni Arus and the holy city of Chefchauen in Ajmás. Most of the new territories under Spain's control were to be administered from Tettouan, while Chefchauen was not organised as a regional centre.

However, authoritarianism hindered even more the technical authority of the Health Inspector. It was usually the High Commissioner himself or his General Secretary who addressed the Ministry of State or the Ministry of War to deal with public health affairs. Thus, it is not strange that the Health Inspection was temporarily suppressed in the new Protectorate regulations issued on July 12, 1924. Concentration of power in the hands of the High Commissioner had other "collateral" consequences. The growing autonomy of Tettouan towards Spanish peninsular institutions meant that the Protectorate's health system would have to finance itself with the specific Protectorate budget, with less and less money being received as direct contributions from the Ministries of State and War. If the Spanish General Health Inspection and the Public Health Section of the Ministry of War could no longer intervene as much in Protectorate affairs, then their expenditures to the protectorate would be cut. Instead, both ministries focused more and more on purely Spanish interests.

For example, since 1918 the Military Hygiene Institute of Madrid refused to continue providing free drugs and vaccines to the dispensaries and to the Tangier Laboratory, thus limiting its services to military hospitals and infirmaries. In 1921 the Ministry of War decided to carry out a general reorganisation of its services and personnel in Spanish Morocco. Reorganisation meant reducing costs and relocating staff and institutions to better fit strictly military needs that were determined by the difficult campaigns underway in the Tettouan and Melilla regions. Military doctors serving in Tangier and in some Moroccan cities of the French

zone, as well as in the south zone of the Protectorate were an easy target. There were three consular doctors in Tangier, Francisco García Belenguer (1918–1921), Luis Sampedro Díez (1919–1921) and Carlos Amor y Rico (1918–1921) – the latter replaced that very year by Ignacio Fernández de Castro – plus the director of the Spanish Laboratory and a military veterinarian, Tomás García Cuenca. In addition there was the Casablanca dispensary and a consular doctor in Rabat, Carlos Amor y Rico (1921–1931), who had been appointed that year. Finally, the military doctor Salvador Sanz Perea worked for the Delegation of the High Commission in Cape Juby since the occupation of this area in 1916. The budgets for all these doctors were terminated. Besides, the countryside dispensary of Laucién, near Tettouan, was moved to Chefchauen in 1921, so that medical assistance was provided to the forces which had recently occupied the city.

On the other hand, the Ministry of State focused more and more on health services directed to Spanish citizens only. Thus, the Ministry kept on financing the civil hospitals and infirmaries established in Tettouan and Larache but made no attempt to increase its contribution to mixed infirmaries and infirmaries for natives, nor to urban dispensaries. The number of these centres did not grow from 1918 on and plans for transforming infirmaries for natives into hospitals, as well as for creating a new mixed infirmary in Chefchauen were not brought to fruition. The Ministry also refused any further effort to establish definitive maritime health stations in the ports. Yet, it assumed responsibility for the wages of the doctors and veterinarians serving in Tangier, Casablanca, Mogador and Cape Juby, so that Spanish presence in the whole of Morocco was not abandoned. In short, the growing autonomy of Spanish Morocco's health system and the financial shortages in the peninsula resulted in both ministries concentrating as much as possible on their particular (Spanish) interests in Morocco, limiting support given to institutions directed to Moroccans. It could not have been a worse moment, because Spain was occupying more and more territory, which called for a wider health organisation.

As a brief resume, maritime public health continued to be as important in Spanish Morocco as it had been before for Moroccan authorities. This fact revealed the persistence of external influences, namely the Sanitary Council of Tangier, which made it difficult to develop the *Sanidad Majzén*, which was reduced to two "sanitary parks" and a small number of urban dispensaries and infirmaries. Efforts of Spanish authorities to reverse this situation led to a growing authoritarianism towards the Mazkhzan and the Health Inspection alike and to diplomatic acts of force contrary to international agreements. Finally, the High Commission had to maximise its resources due to the decreasing or stagnating financial contribution from the Ministries of State and War, with the result of no more centres being created between 1918 and 1921 and preferential attention for Spanish citizens. In short, Spanish Morocco "sanitary autonomy" was only achieved by progressively moving away from the Protectorate's legal frame. This was not so paradoxical as it may seem: it just revealed that the degree of effort

needed to establish a health system in Morocco, was much more than a "typical" colony or even a Protectorate would have called for.

"Riffian Realities"
The Opposition to Spanish Presence in the Rif

The network of dispensaries for natives set up in Spanish Morocco comprised not only those in the cities, but also the ones created in the countryside. These dispensaries had to face equally strong problems as their urban counterparts during the period 1906–1921, although the challenges were of a different kind. They were the result of persistent armed opposition of some *qabilas* to Spanish military activities in the name of the Sultan and ultimately of a rejection of the Sultan's authority. The result was that military public health was soon regarded as crucial for using the new health system to control maritime jurisdictions. If interference from the Sanitary Council of Tangier was especially felt in the Atlantic region of Spanish Morocco, local armed opposition would become especially prominent in the Melilla region – though not exclusively.

Military Reform and the Fight against Smuggling. The "Rif Question". The Act of Algeciras had agreed to the creation of a "police force" in the eight main ports (or "imperial ports") of Morocco (Tangier, Tettouan, Larache, Rabat, Casablanca, Mogador, Safi and Agadir). This "Shariffian Police" would remain under the formal authority of the Sultan, and would be composed of Moroccan soldiers and European officers and sub-officers and it would be coordinated from Tangier by a Swiss chief. In Tettouan and Larache, the officers would be Spanish, in Tangier and Casablanca, they would be Spanish and French, and in the rest of the ports, they would be French. The new force would comprise between 2,000 and 2,500 men, many of whom would come from former *askar* units serving in those cities, which had been trained by foreign instructors in previous decades. It was a new step in the reform of the Moroccan army, though at the cost of a higher degree of intervention by European countries.

However, Moroccan initiative had been preserved to a certain extent. A military "Tangier question" had been created, which would cause serious trouble for Spanish military activities in Western Morocco, including public health. On the one hand, the formal persistence of Morocco's military structures implied a dispersion of efforts for Spain, as it was obliged to contribute to "Police forces" in Tangier and other ports which would probably be outside its zone of influence. Army officers were sent to their assigned ports and, in 1907, some Spanish army units accompanied French troops when they occupied Casablanca. On the other hand, the Legation of Tangier kept its role of co-ordination of army officers and personnel appointed to the Spanish consulates, even if the foreseen autonomy of Tangier would separate it from the Spanish zone of influence. This fact would hinder the autonomy of Ceuta military authorities or of the new military command Spain planned to set up in its zone. Third, the traditional weight of Larache (and of the Atlantic zone, in general) remained. Such a development could determine a central role of this city in the future military command of Spanish Morocco,

although this implied less control by Spanish authorities than the equivalent influence of Ceuta would ensure in Tettouan. Finally, the measures agreed in Algeciras concerned only military structures and this prevented Spain (and France) from deploying civil initiatives towards the population of the cities or the countryside. In short, developments in the Western region of the Spanish zone of influence continued to be strongly conditioned by the formal persistence of the Sultan's military sovereignty.

In principle, the reform of the Moroccan army agreed to in Algeciras did not reach the Eastern part of the Spanish zone, in general Eastern Morocco. It seems, however, that a unit of "Shariffian Police" was also created in Melilla, an exceptional case given that the rest of units were located in Moroccan towns. Besides, the military Governor of Melilla acted as a de facto consul in relationships with the Makhzan, as had been done for decades. A special "delegate of the Sultan" was projected in the failed Spanish-Moroccan Treaty of 1910 and, in fact, a Moroccan official named el-Bachir acted as such during the military campaign of 1911 to try and dissuade Riffians of attacking Spanish troops (Mesa et al. 2001). However, these measures were essentially taken as a result of more or less official agreements between Spain and Morocco and, therefore, were outside the new international legal frame. Instead, Algeciras had formulated a specific objective for the Rif and Eastern Morocco: the fight against gun smuggling. One of the six sections of the legal text was exclusively devoted to that issue, which comprised a wide array of dispositions, measures and punishments. Special attention was given to maritime smuggling, probably due to its importance since the end of the 19th century. According to the Act, "l'application du Règlement sur la contrebande des armes dans le Riff et, en général, dans les régions frontières des possessions Espagnoles, restera l'affaire exclusive de l'Espagne et du Maroc". The same was said for the regions close to French Algeria, where French and Moroccan authorities would have the exclusive responsibility of preventing the gun traffic.

It could be said that this distinction between military measures in the West and the East of Morocco showed the increasing debility of the country in the face of foreign intervention. In a way, Morocco was not only being divided in two main zones of influence, Spanish in the extreme North and French in the centre, but in each of them a longitudinal separation was being drawn. However, this measure also threatened to make difficult the creation of a unified military authority in Spanish Morocco and French Morocco, given the consequent separation and diversity of methods between Spanish and French authorities in Tangier, on the one hand, and in Melilla and the South Oranais, on the other. In spite of it all, the use of the term "gun smuggling" was an attempt to keep to some extent a link between the situation and institutions in both longitudinal extremes of the country. For Morocco, it was the way of preserving its military sovereignty, as the fight against the gun traffic could be considered a measure complementing army reforms, and the authority of the Sultan was not questioned. For Spain and France, it was the way of avoiding a lack of coordination of efforts in Morocco and also of ensuring that their action reached the whole territory of their zones of influence.

In the end, all actors involved in Algeciras and all measures agreed to the act attempted to deny the fact that some groups and territories in Morocco were in a process of self-determination towards the Sultan and had the ability to oppose serious armed resistance to him or to any of his "protectors". In Eastern Morocco, the acquiescence of the Sultan to foreign interference was regarded as demonstrating the demise of his functions. Besides, the exclusion of Tangier from the two zones of influence helped finally undermine the legitimacy and reach that Moroccan regional authorities had managed to display with great difficulties in previous decades. The autonomy of Tangier, that "last victory" of the Sultan in Algeciras, would be inseparable from his "first defeat", the move to independence of some areas of the country. The "Tangier question" would be inseparable of the "Rif question". However, Algeciras also attempted denying the particularities of Spanish (and French) presence in Eastern Morocco. As it is been shown, Melilla had the ability to launch its own initiatives, different from those favored by Spanish authorities in Ceuta and Tangier. Besides, as this city would probably be outside the Spanish zone of influence, it felt even less obliged to subordinate its actions to the new military centres that had been projected in Western Morocco. The "Rif question" had a Spanish side, much the same as the "Tangier question".

In these circumstances, and despite the "smuggling" rhetoric, the situation in the Eastern part of the Spanish zone of influence tended to define itself increasingly in its own terms. The link with the Atlantic region was weak. On the Moroccan side, the Sultan's military authority had virtually vanished in the area. Since 1904, the false pretender to the throne and supposed *Mahdi* (a millennial figure frequent in movements of resistance in North Africa) el-Roghi Bu Hamara had ousted the Makhzan garrison in Silwan and installed himself as actual authority in Guelaia (Pennell 2000). It was said before that the *harka* sent against the Ibuqquyen in 1898 had quickly abandoned the central Rif, leaving that area beyond the reach of Makhzan forces. However, given that Moroccan military integrity had been confirmed in Algeciras, el-Roghi lacked any official recognition despite his actual power in the Eastern Rif. If he could not promote himself as a valid representative of the Sultan in front of Spanish authorities, as long as the Sultan did not grant him a specific status inside Morocco, the only solution was to move away from his authority. In the case of the central Rif, social fragmentation avoided any collective leadership, but anyway, existing leaders neither had the authorisation to act in the name of the Sultan, nor wanted to obtain it.

On the Spanish side, Melilla, the Chafarinas Islands and the *peñones* of Vélez and Alhucemas had "smuggling" as one of their relevant occupations, another sign of their traditional marginalisation from Spanish action in Morocco. Guns coming from Gibraltar and from French Algerian and Andalusian ports were transmitted by the enclaves to *qabilians,* or at least they allowed the traffic. But beyond that, "smuggling" was just another aspect of the close relationship of Melilla and the enclaves with their surroundings. In some repects, it was difficult to say that they were strictly "Spanish". As it was shown before, the enclave was regularly used by Makzhan *harkas* in their way from Tangier to the central Rif

during the last quarter of the 19th century. A unit of "Shariffian Police" had been created there. The *campo* was a zone of transition where Riffians entered to sell their products in the market and buy other merchandise. The port of Melilla was increasingly used for seasonal migration of Riffians to French Algeria. It was in this city that the first military unit composed of Riffian soldiers (the *Compañía de Moros Tiradores del Rif*) had been created in 1859 (Arqués & Gibert 1992). *Qabilians* travelled to the *peñones* to supply them with foodstuffs and buy products. Besides, Spanish official institutions were almost absent. Melilla, and even more Chafarinas, Vélez and Alhucemas, were not proper "cities", as they lacked town councilsor other municipal services. While in Ceuta a Commandant Generalship existed since the last quarter of the 19th century, a Governorship was the only military command in Melilla, which also comprised Chafarinas and the *peñones*. As a consequence of this situation, a tendency persisted in Melilla to act apart from Spanish authorities in Tangier and Ceuta, which would prove difficult to suppress.

The interference of Algeciras smuggling regulations would not only be the cause of a division between Tettouan and Melilla, but also of a very complicated articulation of Spanish military action in the Rif. In some way, the problems were parallel to those created by the autonomy of Tangier in the Atlantic region. On the one hand, Spain had to spend some of its modest resources in reinforcing the Spanish character of Melilla and the other enclaves. A part of the human and material means invested by the army in those places was therefore directed to themselves and not to activities in Morocco. It could be said that the enclaves were being somewhat "re-occupied" even if they were formally Spanish possessions. On the other hand, if a new military administration was finally established by Spain in Moroccan territory, it would suffer interference from Melilla and the other enclaves. Their traditional military structures, which had dealt with the Makhzan and the Riffians until then, would persist, though they would now be separated from the zone of influence. Third, the traditional weight of Silwan in the region made that town a candidate for becoming the centre of the new military administration, but the cost would be a higher degree of local participation than Melilla was willing to accept. Finally, military activities could not be a pretext for initiatives towards civilians, as there had been no agreement on the issue in Algeciras.

From Military Hospitals to Countryside Dispensaries (1906–1912). All these events were reflected in military public health. If maritime health was the key for Spanish action in Morocco in the Atlantic region, its military counterpart would have the leading role in the Rif. However, the Algeciras regulations prevented major changes in the period 1906–1912. Substantial efforts were devoted, in the first place, to existing military hospitals in Melilla, the Chafarinas Islands and the peñones of Vélez and Alhucemas. For example, following the first military operations, the Ministry of War decided to raise the category of the hospital of Melilla (known as *Hospital Central*), which became "first class" in March 1908. It

was consequently given more personnel and equipment to be able to cope with the rising needs of new troops and foreseen operations. During the 1909 and 1911 campaigns, Melilla counted on two groups of military hospitals and several infirmaries, though most centres were provisional (army barracks, schools, theatres, churches). The Central Office of Military Public Health of the military Governorship of Melilla was transformed by an inspection inside the new Captain Generalship created the 1st of June, 1910. Evacuation of wounded and ill was done to the military hospitals of Chafarinas and Málaga. A deposit of medical material, a laboratory and a radiological cabinet were provisionally installed (Lapresa 1910). Despite all this, infrastructures and personnel were clearly insufficient for assisting a garrison where the numbers had risen to more than 20,000 men (Mesa et al. 2001).

The concentration of efforts on the military institutions of the Spanish enclaves left few resources for actions aimed at Riffians. Besides, they continued to be managed from the enclaves themselves to a great extent, even if the enclaves would probably be outside the future Spanish Morocco. Military hospitals in Melilla, Chafarinas and the *peñones* carried on with their task of "attraction" as they had been doing since the last quarter of the 19th century and even increased it. For example, Vélez and Alhucemas demanded more facilities and means in order to extend Spanish influence in the coastal *qabilas*. In 1910 or 1911, the military doctor appointed to Alhucemas, Manuel Bastos Ansart, argued in a report addressed to the Section of Military Public Health of the Ministry of War that the assistance of natives was in fact the main task of the hospital, as the garrison was very small. Thus, he asked for new clinical and surgical equipment, which was immediately sent from Spain (Bastos 1969). It seems that the new material was installed in a part of the military hospital, because a separate and permanent dispensary for natives was demanded in 1914. However, assistance could be provided for a growing number of Riffians.

A new health institution for Riffians was created in Melilla. Just after the Algeciras Act was signed, the Spanish Ministry of Public Works launched a plan to build a series of civilian infrastructures in Ceuta, Melilla and the Chafarinas Islands which would foster Spanish influence in its Moroccan zone. In Melilla, the trust of the Marquis of Comillas, one of the biggest Spanish capitalists, won the contract to build the port, as well as "a market with *fondak* [hostel] and cattle lodges, an store for grain and merchandise and an infirmary for natives" (Rodrigo 2002). Such an infirmary or hospital, the later-called *Hospital indígena*, began to be built in 1907 and was finished in 1909. Although it enjoyed civil status, its personnel consisted of military doctors and auxiliaries. It did not take long for it to be fully integrated in military public health. Its task was to assist Riffian soldiers, even though, during the campaigns, it served also as military infirmary for Spanish troops.

But the most important development in the enclaves was the creation of a Native Affairs administration of the army in Melilla. This was a consequence of the first direct operations of the Spanish army in Moroccan territory, launched in

January 1908. The justification of the military Governor General José Marina for these operations was the defeat of a *mhalla* sent by Sultan Moulay Abd el-Aziz against el-Roghi, which implied Morocco's inability of ensuring its compromise of direct control in the area. Spain would then assume the responsibility of preventing "gun smuggling" carried out by el-Roghi in Restinga (a site some 20 km from Melilla) and, in general, of ensuring the Sultan's authority in the Eastern Rif. A small fraction of Moroccan territory was occupied, where two military posts were established at Restinga and Cabo de Agua (in front of the Chafarinas Islands). The garrisons included a military doctor who, apart from assisting Spanish troops, started to offer his services to *qabilians*. As they lacked specific facilities and remained directly attached to Melilla's military health organisation, their task was a slightly more permanent version of previous (and scarce) travels of military hospitals doctors to assist local notables (Larra 1900).

The direct presence of Spanish troops outside Melilla altered the fragile balance of the area. El-Roghi tried to strengthen his position by expanding into the central Rif, but he was defeated. In December 1908, he was ousted from his headquarters in Silwan by the Guelaians and replaced by two new local leaders, Mohammed Amezzian and Chadly, his former lieutenant (Villalobos 2004). Following some incidents with Spanish workers in the mines of Ait Bu-Ifrur in the summer of 1909, the Spanish Army engaged in fighting against Amezzian and Chadly's *harkas* which resulted in the "Desastre del Barranco del Lobo" (July 27, 1909), where more than 150 Spanish officers and soldiers were killed and 900 wounded. More troops had to be sent from Spain (a fact that had already caused serious revolts in Barcelona and other cities in July), and, with their support, the 1909 campaign finally ended with the complete or partial occupation of the *qabilas* of Beni Sicar, Mazuza, Ait Bu Ifrur, Kebdana, Ulad-Settut and Ait Bu-Yahi. Later on, in 1911, new operations were initiated which resulted in the death of Amezzian. The Kert campaign ended in 1912 with the new boundaries for the occupied territory reaching the right bank of the River Kert and the inclusion of two more *qabilas*, Ait Sidel and Ait Bu-Gafar, under Spanish rule.

Just before the 1909 campaign, an Office for Native Affairs was created inside the military command of Melilla, with a subordinated information office in Cabo de Agua. The task of this office was to gather all kinds of information about the occupied territory and the nearby *qabilas* to ensure both control and future advances. It was the direct precedent of the so-called *Oficinas de intervención* or *Intervenciones militares* (the equivalent of the *Services de renseignement de l'Armée* in French Morocco). In close physical and administrative connection with these offices, the first units of the so-called *Policía indígena* (Native Police) were established just after the campaign in the *qabilas* of Guelaia and Kebdana. The Native Police consisted of Spanish officers and Riffian soldiers and combined the control of public order with the support to Spanish army units. Finally, Melilla authorities were "allowed to attach to the offices anyone who, as garrison doctors, may be necessary for the assistance of the Moors". This statement was the origin

of dispensaries for natives in the Eastern Rif area, which acted as the third element of the military Native Affairs administration set up in the Melilla region.

At the end of 1909, the first countryside dispensary was established in Zoco el-Had of the *qabila* of Beni Sicar under the direction of Lieutenant Dr. Sebastián Lazo García (1909–1914), later followed by Ángel Sánchez Sánchez (1914–1916), Alberto Conradí Rodríguez (1916–1918), Francisco Camacho Cánovas (1919–1920), Manuel Peris Torres (1921–1922) and Tomás de Fez Sánchez (1923–1924). It was still provisional by nature, a small wooden barrack with modest equipment, some drugs and ointments and no vaccines or sera. In July 1910, a part of the military infirmary built in the village of Nador (Mazuza) also started to serve as a provisional dispensary under the direction of Lieutenant Dr. José Valdés Lambea (1910–1915) and later of Nemesio Díaz Mena (1916–1918) and Octavio Gómez Salas (1919–1921). After these first steps, a project was drafted the same year for establishing four permanent dispensaries in Zoco el-Had, Nador, Atlaten (Ait Sidel) and Zoco el-Arbaa of Arkeman (Kebdana). A Royal Order of March 6, 1911 finally approved their creation and specific status, which was different in principle from military infirmaries and garrison service. Approval was also given some time later for another centre in Zoco el Tlatza of Ain Ben Rahal, close to Silwan (Ait Bu Ifrur). However, only those of Zoco el-Had and Nador were actually built before the Protectorate Treaty. In Atlaten and Zoco el-Arbaa, as in Restinga, Cabo de Agua and other posts, military doctors continued their work as before.

By then, dispensaries had become part of a more complex organisation of *intervención militar*, headed by the newly created Sub-inspection of Native Troops and Affairs of the Captain Generalship of Melilla (5th January, 1912), which already counted on several information offices, units of Native Police and groups of *Fuerzas Regulares Indígenas* (new colonial units created on the 30th June, 1911), as well as on the aforementioned dispensaries and doctors. It should be borne in mind that, despite the term "countryside", dispensaries were mainly directed to the assistance of Riffian soldiers of the two newly created corps (especially of the Native Police, because the groups of *Regulares* had their own attached doctors). Maybe for this reason they were assigned a different name in Spanish (*consultorios*) than the urban dispensaries of the Atlantic cities (*dispensarios*), a name already in use in Spanish military public health. In principle, Spain could not extend the service towards the local population because its action in the Rif had a purely military justification. However, dispensaries assisted civilians from the first moment, as the mission of "attraction" or "civilisation" was regarded as crucial. But it is also true that in the first years, many of them were the families and relatives of Riffian soldiers. This was not new for the Spanish army, given that in the *peninsula* the families and relatives of officers were assisted for free in military hospitals and had access to free drugs in military pharmacies (Martínez Antonio 2005a). If it is also considered that countryside dispensaries assisted Spanish soldiers, it is clear that the task of these centres, despite its importance, was too

huge to be achieved satisfactorily (Riffian soldiers + Riffian civilians + Spanish soldiers).

Apparently, the Native Affairs administration of the army had a colonial flavour similar to the famous "oil stain" strategy deployed by General Lyautey from the South Oranais (Hoisington 1995). However, it was not strictly colonial because it depended on the direct military expansion of the Spanish regular army. It is true that, due to Algeciras compromises, military actions in the Eastern Rif had to be justified in terms of "police operations" and "restoration" of the Sultan's authority. That is why the army presence had to be organised on the basis of military posts and systematic disarmament of the population could not be achieved. In principle, attacks were only launched in "response" to aggression and advances after a *qabila* had asked for "protection". Despite everything, the 1909 and Kert campaigns mobilised thousands of men and caused hundreds of casualties on both sides. Those campaigns were mainly carried out by the mobilisation of peninsular contingents, despite the creation of the first units of Native Police and *Regulares*. The Spanish army had crossed the limits of Melilla and established a permanent presence in some *qabilas*. In short, only through the direct use of military force, through the "seizure" or "expropriation" of Morocco's military sovereignty, could the first *intervenciones militares* be created. Collaboration of minor local leaders was then achieved through them, and Riffians began to be enrolled in the Native Police and *Regulares* or to participate in irregular *harkas* in support of Spanish units. In public health, the first dispensaries started their work, but they depended more on the Inspection of Military Public Health of the Captain Generalship than on the Sub-inspection of Native Troops and Affairs, which lacked a specific health section. Dispensary doctors lacked any specific status within the Army Medical Corps and they were often appointed to army units when necessary. Many of their patients were Spanish soldiers and, of course, the officers of *intervención*. The whole "colonial" system depended, then, on the Spanish regular army.

This was not exceptional. Spain was just following the example of France, whose advances from French Algeria progressed so quickly that they risked provoking the loss of the Eastern part of the Spanish zone of influence in Morocco. Since 1903, General Lyautey had relentlessly moved into Moroccan territory from the South Oranais. In 1907, the city of Oujda was occupied by French Algerian troops and, soon afterwards, the *qabila* of Beni Snassen was brought under control. The French had contacted el-Roghi for mining concessions and even sent a force against him which crossed the river Muluya but was defeated. In public health, Lyautey had begun to use military doctors to provide assistance to the colonial forces and local population, a crucial feature of his "oil stain" strategy. In 1910, the *Service de Santé des confines Algero-Marocaines* was created, which threatened to extend its influence to the left bank of the river Muluya (Cilleuls 1959). In practice, the South Oranais and Melilla were involved in similar problems and similar strategies and competed in the same area.

On the other hand, as it was said before, the Native Affairs administration of the army was directed from Melilla and was integrated in its military structures, though the enclave itself would probably remain outside the Spanish zone of influence. A new military centre in Moroccan territory would then suffer interference from Melilla and would also have to compete with Silwan, the traditional Makhzan military post in the area. Silwan enjoyed traditional legitimacy in Eastern Morocco and it is not strange that el-Roghi established his headquarters there. However, if Silwan became the Spanish military centre in the Rif, that would mean allowing more Riffian participation than Melilla was eager to accept. A first example of this was provided soon after Algeciras. In 1906, the *Sindicato Español de Minas del Rif* (SEMR) – a company where the Marquis of Comillas and another powerful businessman and politician, the Count of Romanones, participated – was given permission by el-Roghi to exploit iron ore in Uixan in the *qabila* of Ait Bu-Ifrur. A Spanish civil doctor, Víctor Ruiz Albéniz, was hired by the company to care for Moroccan and Spanish workers, but he was also unofficially charged by Melilla military authorities to act as an agent near the pretender. Ruiz Albéniz managed to become el-Roghi's "personal doctor" and, as such, he lived "under his protection" for ten months in Moroccan territory (Ruiz Albéniz 1922). It is not unlikely that he was also charged with the assistance of el-Roghi's *harka*, the most powerful in the area. As this irregular unit protected Spanish interests, it acted as a de facto colonial force in which Ruiz Albéniz could have worked as a kind of medical chief. However, the wish for more control of Melilla and the fear of international and Moroccan protests (el-Roghi lacked any official status) meant that Spain did not support el-Roghi's expedition to the *qabila* Ait Waryaghar in September 1908, which ended in an astounding defeat. Ruiz Albéniz complained that he had not been allowed to "go through Restinga and cure the [soldiers of el-Roghi] wounded gathered in the *alcazaba* [el Roghi's headquarters in *Silwan*]" (Ruiz Albéniz 1922). The retreat of el-Roghi from Guelaia put an end to this moves.

Spanish troops occupied Silwan in September 1909. A strong military garrison was established and a military infirmary was created. But there was no collaboration with Riffian leaders and, therefore, the new Spanish Silwan had no legitimacy among the local population. El-Roghi had been supported by Guelaians because he had assumed their interests. When Spain could not count on them, they were strong enough to oppose the Spanish army through the new leaders Amezzian and Chadly and through popular resistance. For complex reasons, namely the debility of Spain in regard to international agreements and its lack of control on Melilla, collaboration with Riffians was discarded, but "Riffian realities" refused to be denied and would cause serious problems in the following years. In this context, the town of Nador could only have little authority as embryonic centre of the newly occupied territories. The triangular relationship Tangier-Tettouan-Larache in the Atlantic zone had a close parallel in the Eastern Rif: Melilla-Nador-Silwan. Nador had previously had little or no importance in the Eastern Rif and in fact the town was almost made out of nothing, a kind of

colonial village if the presence of the army had not been so explicit. Trapped between the Native Affairs administration of Melilla and the regular army in Silwan and advanced posts, its theoretical role as regional centre during this period – and for many years – would be more virtual than real. In addition, Nador was theoretically dependant on Spanish authorities in the West, another fact which would deprive it of legitimacy when faced with Riffians and also with the Spanish army in the Melilla region.

To end this section, it should be added that this pseudo-colonial system also made possible the beginning of civil institutions. The first so-called *Juntas de Arbitrios* were created in the villages of Nador and Cabo de Agua in 1912. The *Juntas de Arbitrios* followed the model of the ones already existing in Melilla, Chafarinas and the *peñones*. They were a kind of municipal council of a lesser category than those of the peninsular municipalities and Ceuta, though they also depended on the Ministry of Interior (Cordero Torres 1943). As stated before, Melilla was not a proper "city" and therefore lacked a town council and a public health board, nothing strange in an enclave that had acted for centuries as a mere garrison-prison and lacked a significant number of civilians until after the Spanish-Moroccan War of 1859–1860. In fact, the *Junta* of Melilla was controlled by the army and presided over by a general, so it tended to confuse itself with the military administration. Its public health activities were extremely modest. A so-called sub-delegate of medicine worked at its service, but civilians were assisted either in the military *Hospital Central* or by private practitioners. If the *Junta* proposed any sanitary measures, it was the army which was usually most affected by them and which would put them to work.

The modest civil public health suffered problems parallel to those of the army. First, most of the scarce civil resources invested in the area aimed mostly at creating institutions in Melilla and the enclaves which had not existed previously. The main interest was to improve the situation of the Spaniards themselves, more than to act on behalf of the Riffians. Second, the *Junta* of Melilla kept on controlling measures towards civilians in the Rif, although the enclave would remain outside the Spanish zone of influence. For example, the *Hospital Central* continued to assist Riffians as it had done before. As early as 1910 two separate ten-bed wards for "*moros y moras*" (male and female Moors) were created. The hospital personnel included two Moroccan male nurses, who acted at the same time as interpreters, and a Moroccan cook, who prepared food according to medical instructions but adapted it "to the taste of natives". On the other hand, the creation of the new *Juntas* of Nador and Cabo de Agua made it difficult to establish *intervenciones civiles* (the equivalent of the *controleurs civiles* in French Morocco) in those villages. Their connection with Melilla hindered the central role of Nador in the area. As a result, their activities were mainly directed towards Spanish settlers. For example, in 1910, the director of the military infirmary of Nador asked Melilla if civilians could be assisted in that centre. He received a positive answer regarding Spaniards but nothing was said about Riffians. In 1911 the chief of the army health service of the "territory of Nador" informed Melilla authorities again

about the need for "regulating health assistance for [Spanish] civilians and moors" in the area. In his opinion, the village of Nador had to be provided with health services "in similar conditions as the *plazas menores* [Vélez and Alhucemas] and the rest of villages in Spain", because its population was rapidly expanding. The answer was that Spanish civilians could receive "first aid" in the military infirmary and be sent to the *Hospital Central* of Melilla in case of severe illness. Besides, a military doctor would visit patients at home, receiving for that work a supplement from the *fondo de arbitrios* (a precedent of the *Junta de arbitrios*). There were no regulations, however, concerning the Riffians.

The third problem was that public health action on civil Riffians should have relied on local leaders and institutions and allowed them a degree of participation. Again, el-Roghi could have been a crucial actor but collaboration was not possible in the end. As a result, private initiatives were launched in the area which, at the same time, aroused widespread rejection by Riffians, and menaced the development of a civil colonial public health centred in Nador. Those initiatives were represented by the CEMR. After the campaigns of 1909 and 1911, the company consolidated its mining activities in Uixán. Ruiz Albéniz had to care for the growing number of workers, many of them Riffians or Moroccans in general. The company had its own health care facilities, which were mainly intended for mild problems. In case of serious trauma or illness, patients were sent to Melilla. In addition, other complementary initiatives were taken. Dr. Ruiz Albéniz reported that in 1908 he promoted the creation of a "bread oven" which produced more than 500 kilograms of wheat bread a day, not only for workers but for "everyone who passed through Beni Bu Ifrur". He claimed that "in the whole *qabila*, the daily flapjack made of barley, nutritional basis of the native family, was abandoned" (Ruiz Albéniz 1922).

The conclusion of this section is that only under the "umbrella" of direct action of the Spanish regular army could a "colonial" military public health be sketched in the Eastern Rif during this period, of which countryside dispensaries were the most representative institutions. Local armed opposition made military public health the key of Spanish action in the area, much as maritime public health was in the Atlantic region. Then, the situation had not changed so much from former decades when Moroccan authority still prevailed. The direct use of military force in the name of the Sultan was the subterfuge to act on Moroccan territory but, at the same time, moved Spain away from a true "colonial" action which should have relied on local leaders and institutions to a greater extent. Besides, the connection with Spanish authorities in Western Morocco was problematic and, in fact, two different processes had started in each extreme of the Spanish zone of influence. The "Rif question" stood behind all this.

The Modest Growth of the Network of Dispensaries (1913–1915). The establishment of the Protectorate brought about some punctual changes that did not substantially alter the framework of Spanish action in the Rif. As stated before, in the provisional regulations of February and April 1913 the Delegate for Native

Services in Tettouan had been given responsibility for "hygiene and public health" affairs. The consuls in the cities would be his local representatives, except for the Melilla region, where the absence of diplomatic personnel made the Commandant General a *de facto* consul. On the other hand, a post of "Inspector of the Information and Native Affairs Offices" was also created inside the High Commission, which was supposed to centralise the work of the Sub-inspection of Native Troops and Affairs of Melilla and of the newly created Negotiates of Natives Affairs of Ceuta and Larache (transformed into Sections in 1913 and Sub-inspections in 1914). In principle, these measures would mean that the Delegate and the Inspector would co-ordinate existing countryside dispensaries in the Melilla region and those which were to be newly created throughout the zone in the following years. In practice, their power and resources were quite virtual and the connection with Tettouan remained very weak. In the Eastern Rif, existing dispensaries continued to be essentially directed from what was now called the Commandant Generalship of Melilla.

However weak it was, the connection helped Nador acquire some importance as the regional centre of public health in the Rif. The dispensaries of Nador and Zoco el-Had (but especially the former) increased their activity, which consisted mainly of small surgical interventions, smallpox vaccination, drug dispensing, the use of Elmerich ointment for scabies and 606 salvarsan injections for syphilis. There were also some beds for isolating patients with infectious diseases or for convalescence. The buildings were improved, auxiliaries were attached and houses for the doctors were built. During 1913, Zoco el-Had was already providing around 300 treatments per month, and Nador, almost 1,000. In addition, doctors often travelled to the nearby *duars* (small settlements scattered throughout the country) to assist patients and vaccinate people in an effort to extend "attraction". In November 1913 Dr. Valdés Lambea asked for and received laboratory equipment "to begin with the study of Riffian pathology" in Nador. This included a microscope, a centrifugator and a complete set of laboratory reactives, glassware and instruments. With the new equipment, he expected that

> the study of regional pathology could be based on solid grounds and the diagnosis will be more precise and scientific, the treatments and the task we have been assigned will be closer to the work a doctor can conduct from modern dispensaries (Valdés 1914).

In a way, Valdés was trying to act as head of Spanish military doctors in the area, though he was not officially acknowledged as such and lacked any administrative basis. Apart from obtaining the laboratory, he published a short Arabic-Riffian-Spanish vocabulary for doctors' use and, in 1914, the first annual report of his activities in the Nador dispensary. He also assumed the assistance of the Native Police unit called *Tabor de Alhucemas*, the former unit of "Shariffian Police" of Melilla which had been established in Nador. The other permanent dispensary, Zoco el-Had, was the second in importance, and its director, Dr. Lazo García, published his first annual report in 1913 in the Spanish medical journal *Los progresos de la clínica* with the title "La medicina militar española en el Rif", as

well as a leaflet published by the Military Hygiene Institute of Madrid (Lazo 1913). In the following years, Lazo and Valdés published a number of articles in other Spanish medical journals, such as the *Revista de Sanidad Militar*, *España médica* and *Revista Clínica de Madrid*. Their articles mainly consisted either of descriptions of rare clinical forms of diseases or of general information gathered about frequent diseases, without much scientific discussion or laboratory data.

In their annual reports, Valdés and Lazo gave preferential attention to the work oriented towards civil Riffians. However, the bulk of patients continued to be the soldiers of the Native Police and Regulares, their families and relatives. As Dr. Lazo acknowledged, his first group smallpox vaccination was made on the 120 soldiers of Zoco el Had's Native Police unit, "beginning, to be exemplary, with the Spanish officers" (Lazo 1913). In any case, the assistance of Riffian soldiers could be considered as the "military side" of the "civilising" role assigned to dispensaries in the newly established Protectorate, even if the Native Police and Regulares were not formally under the authority of the Khalifa. But it was more difficult to justify the use of dispensaries by the Spanish regular army. When reading the Army personal records of Valdés, Lazo and other dispensaries's doctors, it becomes clear how often they had to assist Spanish troops in the area and participate in military operations, with the subsequent neglect of their functions towards Riffians. Despite its persistence, this parallel work was seldom mentioned in their annual reports and caused problems. For example, the Ministry of State paid a supplement to doctors, constructed the buildings and provided a fixed amount for maintenance expenses (medical supplies). This compromise was confirmed after countryside dispensaries were labelled as "Makzhan dispensaries" in 1915, as were those in the cities. However, the ministry became reluctant to continue its support to countryside dispensaries as they served mainly military purposes. Besides, the ministry could not participate in the management of those centres or direct their activities because there were no consuls-interveners in the Rif, as there were in the Atlantic port cities. Finally, the ministry would have preferred giving preference to civil Riffians instead of Riffians soldiers.

Despite these problems, new dispensaries were established in the Eastern Rif in the period 1913–1916. In May 1914, the Commandant Generalship of Melilla proposed to the High Commissioner that the two permanent dispensaries which had been planned for Atlaten and Zoco el Arbaa of Arkeman in 1911 should be built instead in Monte Arruit (Ait Bu-Yahi) and Tauriat Hamed (Ait Sidel). The reason was that in those years the occupied territory had widened, and it was now more convenient for the dispensaries to be located on the borders with unoccupied *qabilas*. In the budget of the Ministry of State for 1914 and 1915, credits were assigned for the building of those two dispensaries, as well as for three other permanent centres in Zaio (Ulad Settut), Yazanen (Ait Bu-Gafar) and again in Zoco el-Arbaa of Arkeman (Kebdana). All those five dispensaries maintained, however, a provisional character as part of the military infirmaries installed in those posts or in nearby places. For example, the facilities in Yazanen consisted of a wooden barrack attached to the military infirmary located inside the perimeter of

the garrison camp. In Monte Arruit and Tauriat Hamed, assistance of Riffians was the responsibility of either the garrison doctors, or of doctors from the military infirmaries at Atlaten and Silwan. Silwan military doctors were also in charge of assistance in Zaio. In Yazanen, service was provided by the doctor of its own infirmary, first Octavio Palazón Yebra (1914–1915), later followed by Asterio de Pablo Gutiérrez (1916) and Luis Muruzábal Sagües (1917). The same happened in Zoco el-Arbaa, with Roberto Solans Labedán (1914), Mariano Graíño Noriega (1915–1916) and Domingo García Doctor (1917). A permanent installation of these five dispensaries had to wait until 1917–1918, and then some of them changed their location.

In the end, the extension of the network of countryside dispensaries continued to depend on the direct presence of the Army, a result of new operations, now not only launched in the Rif, but also in the regions of Tettouan and Larache. The difference from former years was their greater extent and scope. The rhetoric of "police operations" in the name of the Sultan and of "preventing smuggling" was set aside to a certain degree when the Protectorate was established, and Spain was able to act more freely in its zone. Thus, the years 1913–1916 saw an almost uninterrupted series of small moves aimed at the enlargement of the territory under Spanish control. However, the fact that military operations by 1916 had only resulted in the control of 600 km^2 in Melilla and in the presence of the Spanish Army in less than one fifth of the small Protectorate's territory shows the extent of Riffian and Jbalian armed opposition. In Melilla, General Gómez Jordana was in command during this period before leaving for the High Commission in Tettouan.

Jordana fostered the development of dispensaries for natives in collaboration with Tettouan but kept on relying on the army as the main basis of the system. Military public health in the enclaves continued to be improved. For example, a permanent laboratory was finally established in Melilla. Its origins went back to a provisional centre installed by the Military Hygiene Institute of Madrid during the "1909 campaign". When the combats was over, Melilla's authorities proposed that the material be kept in the enclave so that a proper laboratory could be established. Time passed until a provisional centre was attached to the first group of military hospitals in Melilla in 1911, during the "Kert campaign". Although analytical-bacteriological laboratories had been created in the eight peninsular Commandant Generalships after 1909, the Melilla laboratory had to wait until December 1913 to be organised on a permanent basis. Its first director was Major Dr. Antonio Redondo Flores (1911–1919?), later followed by Ángel Morales Fernández (1919–192?). Other personnel included a "chief of services", Captain Dr. Paulino F. Martos, five auxiliaries – instructed soldiers from the Military Health Corps Brigade of Melilla – and four assistants (Calatraveño 1916).

On the other hand, the enclaves continued to interfere on assistance of Riffians carried out from countryside dispensaries and on the central role of Nador in the area. In Melilla, the *Hospital Central* continued its task as well as the infirmary for natives, which, in Lazo's opinion, had been actually transformed into a real *Hospital militar indígena* for it provided assistance exclusively to Moroccan

soldiers of the Native Police and *Regulares* (Lazo 1913). However, the problem of who should pay for civilians' expenses began to appear, and military authorities and the *Junta de arbitrios* of Melilla often complained to the High Commissioner and the Ministry of State about the slow construction of civil centres. Through the Sub-inspection of Native Troops and Affairs and the new Sub-inspection of Military Public Health, Melilla kept its central role over Nador. In Vélez and Alhucemas, it seems probable that a specific locale for assisting Riffians was obtained from the government when the Protectorate was established. In Vélez, for example, a provisional barrack was set up in March 1914 on the lowest part of the rock "so that female Moors and children come in greater numbers without having to overcome their shame of going up to the garrison". In its first year of existence (March 1914 – February 1915) more than 800 patients were assisted, 23 of them requiring surgical intervention. Severe cases were sent to the military hospitals of Tettouan or Melilla. In general, the bulk of patients travelled to Vélez and Alhucemas from September to November, that is, the months when malaria was more intense. For example, 351 patients were treated in Vélez in September and October 1915 alone, 243 of whom were diagnosed with that disease. Serious malaria outbreaks were recorded in the area in 1914 and 1916. Among the military doctors working in Alhucemas in this period were Manuel Bastos Ansart (1911) and Antonio Muñoz (1915).

Finally, the army increased the number of military infirmaries and doctors in military posts, thus taking resources away from dispensaries and infirmaries for natives and overlapping with their role towards Riffians. In the Melilla region, there existed eight military infirmaries (Nador, Silwan, Cabo de Agua, Atlaten, Yazanen, Restinga, Zoco el Arbaa of Arkemam and Avanzamiento) and a good number of scattered military posts, in some cases with their own doctor. The direct presence of the army implied the complete lack of participation of Riffians and resulted in persisting opposition against Spanish doctors, even those of dispensaries. For example, the latter had to be systematically escorted by the Native Police when travelling to the *duars* due to the risk of being attacked by *qabilians*. Most patients continued to visit one or more traditional practitioners before going to the dispensary. Women seldom appeared, except for unmarried girls and older women. Doctors tried to combat this reluctance by publicizing success stories from clinical or surgical cases with spectacular symptoms, but good survival rates, in order to convince and "attract" people. For example, Valdés began to receive more frequent visits in Nador after he performed an amputation on a Riffian whose hand had been blown up by dynamite and after he removed a tumour from the back of another man (Valdés 1913).

The growth of military public health in the Melilla region, either direct or in the form of dispensaries for natives, allowed the increase of actions towards civil Riffians. The task of military hospitals in the enclaves has been already commented, as well as the "attraction" strategy of countryside dispensaries. Regarding the latter, the provisional regulations of 1913 had stated that the Delegate had to seek for the "confluence" of all dispensaries with the structures of the Sanitary

Council of Tangier. This allowed a certain participation of the Ministry of State in the area and a certain connection with Tettouan for the development of civil public health for Riffians. But results were modest. For example, the post of civil nurse was created in the Nador dispensary in 1914, due to the number of civilians assisted there. Antonio Burgos Berlanga was appointed to the post. The laboratory installed in Nador was partly financed by the Ministry of State given that its object was in principle the study of "Riffian pathology" in general, and, therefore, civilians could also benefit from their services.

In contrast, public health for civil Spaniards continued its development, fostered by the growing number of Spanish settlers in Melilla and towns such as Nador, Cabo de Agua, Monte Arruit and others. The *Junta de arbitrios* of Melilla substantially increased its budget and a new one was created in 1916 in the village of Zaio, which raised to three the total number existing in the Eastern Rif. But the connection with the Western urban *Juntas* under the central direction of the Delegation of Native Affairs was very weak and, in practice, they remained dependent on the *Junta de arbitrios* of Melilla. Their focus on Spaniards resulted in few or no initiatives towards Riffians and their Spanish character prevented their use by the Ministry of State or the High Commission as basis for civilian public health. To worsen things, the *Juntas* began using dispensaries for assistance of Spaniards, thus interfering with their task towards Riffians. For example, 308 of the 794 patients (39 per cent) assisted in Nador in a trimester of 1916 were Spanish settlers, while in Monte Arruit they comprised 60 of 137 (43 per cent). Finally, in advanced areas private companies continued to be important health care providers. In the iron mines of Ait Bu Ifrur, Dr. Ruiz Albéniz continued with his task until 1923, when he turned over the post to Dr. Lope García de Obeso. The number of miners working for the now called *Compañía Española de Minas del Rif* (CEMR) rose to some two thousand during this period. Many of the workers were Spaniards, but the rest came from all over the Rif and beyond. Local rejection to this initiative was probably even more intense than in the case of the dispensaries.

The Paradoxical Definition of Nador as Regional Centre (1916–1918). The Protectorate regulations of January 1916 confirmed the creation of the Health Inspection inside the Delegation of Native Affairs. In principle, this was a new step towards integration of countryside and urban dispensaries under a single technical organisation centralised in Tettouan. As it was said before, this measure was the result of a greater freedom of movement of Spain in Morocco due to World War I. Precisely, Spain had been able to increase diplomatic force against Morocco through the "denunciation" of the Sanitary Council of Tangier. Freedom of movement also allowed Spanish authorities to challenge Moroccan military sovereignty and have direct interaction with local leaders who lacked official or international status. But contacts could only be pacific and collaborative in this period because France pressured Spain not to undertake direct military operations while their own were prevented by the war.

The result was a modest reinforcement of Tettouan as military centre of Spanish Morocco, including public health. Although the Inspection of Troops and Native Affairs Offices of the High Commission ceased to exist in the new regulations, the newly created Sub-inspection of Native Affairs and Troops of Tettouan occupied its place in some way. Collaboration of General Gómez Jordana with the Jbalian leader Ahmed el-Raisuni led to the creation of dispensaries in Laucién (Beni Ider) and Ain Yir in September 1917, which served mainly to assist Spanish troops and Raisuni's *harka* in their joint operations against Anghera. The Sub-inspection of Tettouan was responsible for those dispensaries and was also in charge of assisting the first official Makhzan troops, the so-called *Mejalas Xerifianas or Mehalas Jalifianas* (created in 1913), though they were still reduced to little more than a personal guard of the Khalifa in Tettouan. Given that the chief of the Sub-inspection was the High Commissioner himself, it began to assume a central role in native affairs in some way.

Though essentially important, these changes were in the end more formal than effective for the Melilla region. In the first case, the reach of the Health Inspection was limited by the impossibility of appointing delegates in the Rif, due to the absence of civil hospitals, infirmaries or dispensaries in the area. In the second case, the Sub-inspection of Native Affairs and Troops of Melilla kept its position ahead of Tettouan. This weak connection with Tettouan implied that the role of Nador as a regional centre continued to be secondary. Collaboration with local leaders fostered by the new Commandant General of Melilla, General Aizpuru was far less relevant than in the Western zone and did not help Nador either. In fact, military operations were brought to a halt between 1916 and 1918, and no new countryside dispensaries could be created. The only change was that some of them were moved to more convenient places before the operations ended or just after. For example, it was proposed that the two dispensaries in Monte Arruit and Tauriat Hamed be re-located near the new borders with the non-occupied territory. In the end it was only the latter that was transferred, first to the post of Ras Tikermin (Mtalza) in May 1916 and afterwards to the post of Yarf el-Baax (Mtalza) at the end of that year or the beginning of 1917.

The annual report published in 1918 by Lieutenant Dr. Policarpo Carrasco about his work in the dispensary of Yarf el-Baax that appeared as a journal article in the *Revista de Sanidad Militar* provides an example of the work done in the countryside during this period (Carrasco 1918). In the last seven months of 1917, Dr. Carrasco assisted 1,152 patients, mainly from the *qabilas* of Guelaia, Mtalza and Ait Said. He prescribed sulphate and quinine chloride for malaria, Ehmerich ointment for scabies, opium derivates for pain, atropine for heart disorders or analgesics for headaches. He applied antiseptics to leg ulcers and recommended specific diets for different gastrointestinal disorders. He also conducted surgery on a native policeman to remove a bullet that was lodged in his abdomen. There was regular contact with the *Hospital indígena* and the Laboratory of Melilla. On the one hand, severe cases of illness, trauma and gun wounds were treated in Melilla after first being sent to the military infirmary in Kandussi. On the other hand,

Major Dr. Redondo Flores visited the area on several occasions to inspect the location and sanitary conditions of the military camps and proposed hygienic measures and works on the river beds to decrease the high incidence of malaria among the troops. Following his suggestions, Dr. Carrasco himself proceeded to treat wastewater dumps with petrol and ordered the periodic ventilation of tents.

Yet, traditional problems persisted. For example, the high price of quinine limited its systematic use, a treatment that mainly was used only "for the natives of the 10th unit of Native Police and for some civilian Moors". The most severe cases of trauma and wounds were in practice due to armed incidents (including bomb explosions) between *qabilians* and the native policemen. It is not strange that Carrasco made some remarks about the "great limitations" of his work and the influence of the "very peculiar characteristics of our relationships with the natives of non-submissive territory [namely, the *qabila* of Ait Said] on the number of patients assisted in the dispensary and on nearby military posts". The dispensary provided assistance, not only to Riffian soldiers of the Native Police and *Regulares* but also to a "considerable" number of Spanish troops, though statistics were not published because "this task is not a part of its official mission" (Carrasco 1918). In short, assistance to Riffian civilians must have been still quite reduced.

Traditional interventions also persisted in Nador. For example, the military laboratory of Melilla became more sophisticated. In 1916, it comprised six departments: 1) clinical analysis; 2) hygienic analysis; 3) bacteriology and parasitology; 4) normal and pathological histology; 5) sera and vaccines; and 6) general services. It acted as the depot for vaccines and sera sent by the Military Hygiene Institute of Madrid for Spanish troops and countryside dispensaries. Thus, it could proceed to deploy periodical vaccination campaigns against smallpox and typhoid fever, mainly on Spanish recruits. Other functions included the periodical inspection of military centres and camps and research on malarial *foci*, plague outbreaks and other diseases. Dr. Redondo expected that the laboratory would become an "Institute of Colonial Hygiene" in charge of the technical direction of the Protectorate's sanitary policy, from which the existing laboratories in Ceuta, Larache and Tangier would depend (Calatraveño 1916). However, the "great expectations" of Dr. Redondo were far from reality. The human and material resources of the laboratory were insufficient, and diseases such as malaria and syphilis remained extensive (Molero Mesa 2003). Competition between Melilla, Tangier and Larache resulted in a general lack of co-ordination. On the other hand, military hospitals of the enclaves continued their task of "attraction". In September 1916, the dispensaries of Vélez and Alhucemas received authorisation from Melilla to provide free medicines to "manifestly poor natives", as did countryside dispensaries. The number of patients assisted increased due to a new malaria outbreak in 1918. Finally, the network of military infirmaries and posts was not very much altered due to inactivity, except for the creation of a new infirmary in Kandussi.

However, a crucial process started which would become more important in the following years. If the higher definition of Tettouan as centre of Makhzan military

public health and of Nador as regional office was not relevant in absolute terms during this period, it began to be so in relative terms. The reason was paradoxical: the Ministries of War, State and Interior started to freeze their direct contribution to Spanish activities in Morocco. If Protectorate organisms were to enjoy more autonomy with the new regulation, then they would have to count only on their own financial, material and human resources without calling for direct support from those ministries. This meant, on the one hand, the impossibility of expanding the modest network of dispensaries and infirmaries for natives. By contrast, it meant also that they were assuming assistance to Riffians with less interference from Spanish institutions in Tangier and the Spanish enclaves.

In the case of the Ministy of War, the Military Public Health Section began to think if it should keep on providing free drugs for countryside dispensaries or if, on the contrary, they should be financed by the Ministry of State. Besides, the Military Hygiene Institute, which sent vaccines and sera to the laboratories in Melilla, Larache and Ceuta, complained about the burden it posed for the adequate operation of military laboratories in Spain. These questions were important because the army contribution for the assistance of Riffian soldiers and civilians must have been high in absolute and sometimes in relative terms. In 1915, for example, the health budget accounted for 4.3 per cent of the total budget of the Ministry of War destined for "Action in Morocco" (4.7 million out of a total of 108 million pesetas). In 1917 this percentage essentially remained at 4.2 per cent (4.2 million out of a total of 100 million pesetas). It has been impossible to know how much money was assigned exclusively for Riffians and how much for the Melilla region, because the budget for "Action in Morocco" was not detailed. But given that the army paid for wages of the dispensaries' doctors, for vaccines, drugs and equipment of those centres, for hospital care of Riffian soldiers and their families and relatives in Melilla, and for "attraction" from the enclaves, it seems clear that cuts in the budget should have been crucial. The army started to concentrate on Spanish troops and to abandon its traditional role of "attraction" from Spanish enclaves.

On the other hand, the Ministry of State kept its contribution to the *Sanidad Majzén* at a standstill. In fact, its financial support for the Melilla region decreased from 43,880 pesetas for seven dispensaries in 1915 to 31,950 pesetas for nine dispensaries in 1918–1921. The civil nurse in the dispensary of Nador had to leave his post in the summer of 1916 because the ministry stopped paying his wages. Finally, the *Junta de arbitrios* of Melilla asked for assistance to Riffians in the *Hospital Central* to be charged to the Protectorate's budget. The *Junta de arbitrios* reported that the expenses for hospitalisation in Melilla were equal to the whole budget of the *Sanidad Majzén* (about 68,000 pesetas) and were compromising measures directed towards the Spanish population. Both ministries focused more and more on Spaniards, either in the civil hospitals and infirmaries of the Western region, or in the activities of the *Juntas de arbitrios* in the Eastern Rif.

Military Expansionism and the Authoritarianism of General Silvestre (1918–1921). The Protectorate health regulations issued in 1918 deepened previous developments. Those regulations organised the consultative branch of the Health Inspection through the creation of the Central Health Board and the Local Health Boards. This measure extended the theoretical reach of Tettouan towards countryside dispensaries in the Melilla region. Despite the lack of consuls-interveners in the area and of civil hospitals or infirmaries, it was the head officers of the units of Native Police who were supposed to act as general representatives of the Delegate of Native Affairs for public health affairs. However, the relative connection achieved between urban and rural, civilian and military dispensaries, the relative extension of the *Sanidad Majzén* to the Eastern Rif in this period, owed more to the growing authoritarianism of the High Commissioner. As has been said previously, the regulations of 1918 allowed the High Commissioner to personally control the appointment of many members of the consultative boards, depriving the Health Inspector and even the Delegate of Native Affairs of much of their power.

In addition, a number of military regulations issued between 1918 and 1921 gave the High Commissioner greater control of the Native Affairs administration of the army. For example, on December 11, 1918, the Commandant Generalship of Larache became subordinated to that of Ceuta-Tettouan. This affected all departments, including the Sub-inspection of Troops and Native Affairs. A second decree, issued January 25, 1919, appointed General Berenguer as chief inspector of the Army, not only in the Protectorate but also in Ceuta and Melilla, with the honours of "Crown Minister". Among his new personal powers, he became head of a new Direction of Offices and Centres of Information and Police. Everything concerning the "recruitment, organisation and posts" of the Native Affairs administration of the army was decided by him directly, although he could delegate his authority to the General Commandants (Cordero Torres 1943; Villanova 2004). In July 1920, a royal order of the Ministry of War confirmed that countryside dispensaries were dependant on the Sub-inspections of Native Troops and Affairs and not on the Military Public Health sections of the Commandant Generalships, thus supporting the control of the High Commissioner.

As a result of his personal concentration of civil and military power, General Berenguer began to manage public health affairs by himself or through his secretary. He was in direct touch with the Ministries of State and War for these issues, leaving no technical autonomy to the Health Inspector. In the Eastern Rif, he managed to appoint a Consul-Intervener for Nador in 1919, who established the first *Junta local de intervención* in the area. This fact resulted in some important civil public health projects being planned for Nador, which attempted to finally make this town the regional centre of *Sanidad Majzén* in the area associated with Tettouan. First, a "service for analysis of food and drink" was demanded in July 1919, because the existing laboratory in Melilla was limiting its service to the city. The Consul-Intervener argued that some peninsular food factories selling their products in the area had been affected by trichinosis or lacked proper

sanitary conditions, with subsequent danger for human health. In his opinion, it was a fact that "beverages elaborated with industrial alcohols and oils (so much employed by the *qabilas*) made not only from olives, and drinks sweetened with saccharine" were being widely sold in the area. Thus, it was necessary to establish this service to control the hygienic quality of products. In fact, the consul proposed that a service to control the *cantinas* in the "European villages" be created under direction of the new *Junta comarcal* of Nador (former *Junta de arbitrios*) and another one for "native consumers and cantinas established outside the perimeter of military camps, which sell articles to the non-military public", under the direction of the Consulate-Intervention.

Second, the High Commissioner proposed to the Ministry of State the creation of a mixed infirmary in Nador in the spring of 1921, so that clinical and surgical care could be provided for all Eastern Rif patients. General Fernández Silvestre offered installation of a barrack of 45 x 10 m. in the town, but the proposal was rejected due to poor hygienic conditions. The Delegation of Public Works of the High Commission was charged with planning a project that would meet all the technical requirements and that would be financed by the civil construction section of the Protectorate budget. Its status would be the same as that of the mixed infirmaries built in Asilah and Ksar el-Kebir, and to the one being planned simultaneously for Chefchauen. Third, after February 1921, the Military Hygiene Institute of Madrid refused to send more sera and vaccines to the laboratory of Melilla for use in the countryside dispensaries. This fact moved the Commandant General Fernández Silvestre to request that the High Commissioner created a "depot of sera and vaccines" in the Eastern Rif, so that these products could be supplied to all countryside dispensaries in the area and vaccination campaigns could be launched. The High Commissioner agreed with the proposal and contacted the Ministry of State to decide where it should be located, though, in his opinion, "it seems natural that it was the dispensary of Nador, whose town is regarded as capital or head of that region".

In the end, none of these projects materialised before the Rif War. If they had succeeded, Nador would have been able to effectively lead and co-ordinate the network of countryside dispensaries in the area. But this network expanded, nonetheless, with the creation of two more centres in 1918–1921. One of them was located in Kaddur (Ait Sidel), whose director was Francisco Irañeta y Urriza (1919–1920) and later Severiano Bustamante y Fernández de Luco (1921). The other was located in Reyén/Hassi Berkan (Ait Bu Yahi), directed by Roberto Solans Labedán (1918–1919), Manuel Peris Torres (1920) and Elías Nager Martínez (1921). Besides, the five provisional dispensaries previously existing in the area were made permanent. In Monte Arruit, the directors were Benito Roldán Sevilla (1918–1919) and José Espina Rull (1920–1921); in Zaio, Francisco Rodríguez González (1918), Elías Nager Martínez (1919–1920) and Eugenio Martín Alonso (1921); in Zoco el-Arbaa of Arkeman, Domingo García Doctor (1918–1920) and Ramón Jiménez Muñoz (1921); in Sammar (previously, Yazanen), Luis Muruzábal Sagüés (1918), José Malva López (1919–1920) and

Damián Navarro García (1921–1922); and in Ras Tikermin/Yarf el-Baax, Policarpo Carrasco (1918), Juan García y Gutiérrez (1919–1920) and José Ventosa y Pasoda (1921). The last statistics collected of countryside dispensaries were those of 1919. In the first trimester of that year, Kaddur had made 334 treatments, Sammar, 294, Hassi Berkan, 360, Zoco el-Arbaa, 453 and Monte Arruit, 488.

Apart from the authoritarianism of the High Commissioner, the higher definition of the *Sanidad Majzén* in the Eastern Rif with Nador as its centre was favoured by less interference from Melilla and the other enclaves, whose task of "attraction" was substantially reduced. For example, the *Junta de arbitrios* of Melilla and military authorities refused to pay for assistance of Riffians on the *Hospital Central* and focused its resources on the growing Spanish population and the permanent garrisons. In the case of Vélez and Alhucemas, "attraction" had never achieved great success. For example, in Vélez, less than 1,000 patients were assisted in 1915, an insignificant number given that the central Rif and Ghomara, despite the lack of urban centres, were densely populated areas within which almost half of the population of Spanish Morocco was concentrated. It was not surprise, because Native Police and *Regulares* were always the main original impulse for dispensaries, but physical separation from the coast prevented their creation in the *peñones*. In fact, neither doctors, nor officers were ever allowed to travel or visit the *qabilas*. In contrast, dispensaries increased their work towards Spanish settlers, even if their number was inevitably small. In both enclaves, there existed *Juntas de arbitrios* which benefited from dispensaries intended in principle for Riffians. Finally, from 1918 on, periodical in-communication reduced even more their work of "attraction". A severe outbreak of malaria in the central Rif in September 1918 was not followed by an increase of the work of dispensaries as in the outbreaks of 1914 and 1916. Instead, it was decided to forbid the travel of patients to the dispensaries on the grounds of the "sanitary menace" they posed for the Spaniards. "In-communication" became a way of pressuring the Riffians, especially when hunger struck the area in 1919–1921, but it also revealed the tendency of both enclaves to concentrate on their own interests.

Direct interference from the ministries of State and War was also reduced, even if this had as many positive aspects as negative ones. The first ministry distrusted the experiences of past years, when its contribution to dispensaries had been distorted by the preferential assistance provided to Riffian and Spanish soldiers. When General Berenguer asked State to request laboratory products from the Alfonso XIII Hygiene Institute of Madrid for the future depot of Nador, the ministry declined the proposal on the grounds that expenses in Melilla and its region should be assumed by the Ministry of War or by the Ministry of Interior. The creation of the mixed infirmary and the laboratory of analysis were not supported on similar grounds, though another factor was also the general reduction of the Ministry's expenses in Morocco and its subsequent concentration on its particular "Spanish" interests.

On the other hand, the Ministry of War focused more and more in the interests of the regular army. The defeat of Germany in World War I resulted in Spain

being able to re-start more intense operations in its zone without the risk of being disturbed so much by complaints of Moroccan authorities or other foreign countries. The period 1918–1921 saw the extension of controlled territory as it more than doubled, reaching a peak of about 50 per cent of the total of Spanish Morocco. In Melilla, the campaign gained momentum under command of General Fernández Silvestre, who in less than one year (May 1920–March 1921) doubled the territory under Spanish control. The area rose to some 4,000 km^2 and included new *qabilas* such as Mtalza, Ait Said, Ait Ulishek, Tafersit and fractions of Ait Tuzin and Temsamam. The rapid advance of the Army required more resources, but the Spanish government sought to put a stop to the astronomical military budget (more than 40 per cent of total state expenses) and to the use of Spanish troops abroad (in consonance with European developments after WWI). Thus, the Ministry of War reduced its contributions to Protectorate public health, suppressed its activities in Tangier, French Morocco and Cape Juby and proceeded to a general re-organisation of the Army health service in Spanish Morocco which took place in 1920–1921. In the first case, the supply of drugs, vaccines and sera or medical equipment to countryside dispensaries was reduced, especially to Nador, which was increasing its civil activities by the decision of Tettouan.

In short, a unified, centralised public health system was about to extend itself to both extremes of Spanish Morocco after fifteen years of efforts. The authoritarianism of the High Commission and the decreasing direct role of the Ministries of War and State resulted in more administrative, institutional or political autonomy for the *Sanidad Majzén* and in a relative degree of connection between the Atlantic region and the Eastern Rif. This was achieved at the cost of less technical autonomy for the Health Inspector when facing the High Commissioner and doctors when facing consuls-interveners and military chiefs. However, the Protectorate health system seemed to be reaching its limits, even if half of Spanish Morocco was still outside its control. The *Sanidad Majzén* suffered from severe deficiencies in the Eastern Rif which provoked discontent in *qabilians*, either civilians or soldiers.

For example, in the "pacified" zone dispensaries which were at last in a position of increasing their action towards civil Riffians, had to act in unfavourable conditions. On the one hand, they could count on less money from the Ministry of State and less material from the Ministry of War. The possibility of suppressing some centres and the replacement of military doctors by civilians were even considered, given that the army needed more personnel on the vanguard. On the other hand, more effort was required to "attract" civilians to the dispensary than had been necessary for native troops. For example, dispensary doctors were given horses to be able to visit the *duars* and assist *qabilians* at home, probably because "spontaneous" visits were not so frequent. Finally, Spanish settlers began to use the dispensaries. The *Juntas* of towns outside Melilla had developed, especially the one in Nador, which became a *Junta comarcal* (county board). Doctors were hired to assist the Spanish poor and civil cemeteries were built in some of them. However, they lacked health facilities and therefore, in towns such as Nador and Monte

Arruit, a growing number of Spaniards was assisted in the dispensaries for natives, with the subsequent harm for the Riffians' interests. Finally, the delay of the projects of laboratory, infirmary and vaccine depot in Nador contributed to the discrediting of the Tettouan initiatives, which had never been viewed with enthusiasm in the Rif.

Assistance to Riffian soldiers also worsened. The growing number of Native Police units (those which had been newly created and those which had been moved to the front) and the two groups of *Regulares* were widely used for the new operations because the government had reduced the Spanish regular forces by one third. Native troops not only suffered from higher casualties in operations, but they were also badly assisted because of the lack of specific health facilities in the newly occupied territories. A project for creating dispensaries for natives in Dar Drius, Sidi Hossain, Zoco el-Telata and the *qabila* of Temsamam was considered in 1920 which could have helped solve this problem while starting the "attraction" policy in those *qabilas*. However, the project was finally postponed due to the lack of resources and personnel. The doctors in the dispensaries had been given horses for following Native Police units in their operations, but their multiple tasks made this measure clearly insufficient. Given the situation, Riffian soldiers could not be very content with Tettouan's decisions. In sum, the absolute number of Riffian civilians and soldiers receiving health care in the Eastern Rif had increased in the period 1918–1921 but, in relation to the total territory and population now under Spanish control, the percentage had decreased and, besides, the services provided became more precarious. This fact surely contributed to the increasing discontent in the occupied *qabilas* with a Protectorate system whose deployment was becoming so problematic.

In this situation, the impulse for consolidation of the *Sanidad Majzén* depended on new military advances which finally reached the central Rif, the ultimate objective of the Spanish army in Melilla for almost fifteen years. The modest success of Nador and of the network of countryside dispensaries in the Eastern Rif had been a result of military operations of the regular army. Only the new and rapid advances of 1918–1921 and the displacement of the bulk of the army and native forces deeper into Riffian territory had allowed the creation of a "pacified" zone around Melilla, leaving enough space for the *Sanidad Majzén* to appear. However, the cut of expenses prevented a real growth of the army health service and caused, instead, a redistribution of centres and personnel towards the front line. The military infirmaries of Restinga, Zoco el-Arbaa, Atlaten, Yazanen and Monte Arruit were suppressed while new ones were created in Kaddur and Dar Drius, plus two hospitals in Dar Drius and one in Annual. The infirmaries of Kandussi, Silwan and Cabo de Agua were kept. Dar Drius had become the new advanced centre of the army health service in the Rif instead of Silwan.

Concentration of forces and resources on the front was an attempt to achieve the decisive goal but showed the difficulties of Spain and the extent of local opposition. It was more difficult than ever to speak of a "police operation" as preparatives ressembled those for war. It seemed clear that the central Rif would have to

be conquered and defeated, even if that would imply a complete move away from Protectorate obligations, even from the usual procedures of the Melilla region. Important *harkas* of significant size begun to be organised by initiative of the Ait Waryaghar and some attacks were launched against Vélez and Alhucemas. For example, during the malaria outbreak in 1918, Spanish authorities in Vélez informed Melilla that

> On the occasion of the closure of this enclave due to the epidemic, a great effervescence dominates the nearby *campo*, to the point of menace of fire if they [qabilians] are not allowed to travel to the enclave. I have been told by some chiefs with whom I have got in touch that the most intransigent are the Beni Urriaguel, which are trying to gather *qabilas* to attack the enclave. [...] if the way is not left open for them, they will make war. I have received a proposal from the *qabilas* of Bocoya, Beni Iteft and Beni-Bu-Frah that if they are allowed to pass, they would stand guard to prevent the Beni Ammart from coming, as they are the only ones affected by the epidemic [...].

While waiting for combat, the Spanish profited from hunger in the Rif to obtain submission from local chiefs, even if this meant clearly abandoning its mission of "protection" (Madariaga 1999). In fact, the rapid advances of General Silvestre were based on this strategy, which suited well with the lack of means of the Spanish army. On the other hand, the supposed mineral riches of the central Rif moved some Spanish capitalists to try and obtain direct concessions for exploitation from the Riffians instead of through the French Sultan and the Spanish Khalifa. In this way, benefits would be higher and the subsequent monopoly would not be endangered by foreign intervention or Protectorate regulation. While Spanish military officers or even the dispensary doctors were not allowed to enter into the central Rif, a representative of a Spanish mining company, Antonio Got, travelled periodically to Ait Waryaghar in 1921 and contacted Riffian representatives to negotiate permission for exploitation (Ruiz Albéniz 1922). Mining activities would probably be accompanied by private health initiatives such as those displayed by the CEMR.

In short, brutalisation and abuses of different sorts were progressively seen as the only effective means of extending Spanish control into the heart of the Rif. If the increasing use of force had been essential for the development of public health in the Eastern *qabilas*, the only way of overcoming resistance in the central Rif was a greater degree of force. No room would be available for participation of central Riffians, less that there was once for el-Roghi and Guelaians. That was the authoritarian move made by General Silvestre, a personal detour that moved Spanish action in Eastern Morocco further away from the theoretical protectorate it had agreed to. It should be said, however, that this move was not exclusive of Melilla aurhorities because General Berenguer had been engaged in open war with el-Raisuni in Jbala since 1918. The difference was that the lack of means in Melilla and the embryonic situation of Protectorate structures in the area made brutal and abusive measures more clear.

Yet, these procedures were characteristic of Spanish Morocco as a whole, even if it was the decisions of General Silvestre that finally failed and the opposition of the central Rif under the leadership of Abd el-Krim that finally succeeded. Here, the expulsion of the Spaniards and the rejection of the Sultan were progressively seen as the only solution for ensuring respect for identity and autonomy of action. The only way for central Riffians to create a health system was to establish it themselves. This required a concentrarion of power over traditional social structures in the area in order to oblige people to fight as well as a complete rejection of "colonial" or "protectorate" collaboration with Spaniards and even of Moroccan sovereignty. That was the authoritarian move made by Abd el-Krim, and his success in 1921 was the final proof that "Riffian realities" could not be denied.

Conclusion
The Limits of Colonial Public Health in Spanish Morocco

After the events of Annual in July 1921 and the fall of the whole structure of Spanish action in the Melilla region, the Riffians and Ghomarians under the command of Abd el-Krim prolonged their triumphal march until they controlled about 80 per cent of Spanish Morocco by mid-1925 and a part of the French Protectorate in the vicinity of Taza and Fez. The "Republic of the Rif" was proclaimed and a Riffian government was established which carried out a series of administrative, religious, military and economic reforms to ensure its independence and the success of operations against the Spanish and French armies. Public health was included among these reforms. Medical material was obtained from the defeated Spanish Army, including a fully-equipped military hospital in Chefchauen, hastily abandoned as the army withdrew from the city in 1925. A number of Moroccan doctors as well as some foreigners, such as Dr. Walter Hutyens, worked for the Riffians, especially providing health care for the troops. As part of a campaign for international recognition, Abd el-Krim asked the International Committee of the Red Cross for medical aid and sought help from Muslim charities and civil associations in Great Britain and other parts of the world. He also attempted to be admitted to the League of Nations. His final defeat in March 1926 by the combined effort of France and Spain and the end of the Rif War in the following year put an end to the brief trajectory of an independent and modest "Riffian public health".

The end of the Rif War was paralleled by the signing of an agreement among the European powers about Tangier. A regulation was approved which gave the city and its surroundings the status of an "International Zone", to be governed by a complicated set of institutions in which French, British and Spanish representatives played different roles. The separation of Tangier from the French and Spanish Protectorates was finally confirmed. In public health matters, the most important consequence was the end of the Sanitary Council of Tangier, which was replaced by a Commission of Hygiene and Public Works whose actions were restricted to the international zone. Interference in sanitary questions from Tangier

was then reduced to a minimum, though probably not completely stopped. France and Spain could finally organise health services on their own in their respective Protectorates, although they kept their presence in the city on the Strait through different clinical and research institutions. The agreement concerning Tangier also brought about a better separation of both Protectorates which led to a reduction of, if not an end to, French public health activities in Spanish Morocco and vice-versa.

Perhaps the victory over Riffians and the agreement concerning Tangier did not put an end to Moroccan and Riffian initiatives against foreign domination, but that is another story. However, both events marked the end of a phase in Morocco's history, including the history of its public health. The present article has tried to clarify some important issues regarding this historical phase, first in Morocco as a whole during the 19th century, later in the Spanish zone of influence between 1906 and 1921. Perhaps the most important and general conclusion is that, contrary to what has been usually stated, Moroccan authorities worried about public health and had the ability to actively influence its development to a significant extent. The general mechanisms of authoritarianism and diversification and the primacy of the maritime and military branches of the health system reflected Moroccan agency and placed the country's public health in an intermediate position between that of a "typical" European country and that of a "typical" colony. As a result of those efforts, public health structures continued to influence the Spanish and French zones of influence after Algeciras and the protectorate treaties.

In this sense, the current analysis has allowed a definition of the Moroccan case on its own "intermediate" or "transitional" terms without relying, on the one hand, on colonialist schemes or on nationalist premises. The colonialist view has tended to deprive Morocco of much of its historical agency by magnifying European domination either to confirm or to deny its effects. Post-colonialist accounts often fail to grasp Moroccan initiatives because these were stronger, more autonomous and more organised than a mere resistance to or a distortion of European decisions. The lack of post-colonial studies for Morocco and for the Maghreb at large is probably not only a result of their academic "marginality", as Edmund Burke III puts it (Burke III 2000), but of the inadequacy of those schemes for the Moroccan case (although the author has criticised colonialism and nationalism as "essentialising narratives" that should be abandoned). Regarding nationalism, it has exaggerated the degree of autonomy and cohesion of Morocco over the influence of European countries reagarding traditional Arabic institutions or the specificities of certain regions and communities (Riffians, Berbers of the Atlas, Saharaouis, black population, Jewish communities). On this basis, the present analysis could also be useful for a better understanding of the history of public health in the Mediterranean countries in general, which were generally affected by processes of foreign influence and internal fragmentation. The Mediterranean of the 19th and first half of the 20th centuries would be better conceived as a zone where differences in public health between the North and the South, the East and the West,

the European and the Arab-Islamic countries, were more matter of degree than of kind.

Of course, differences existed and Moroccan agency was insufficient to finally ensure its "sanitary independence". However, it was the relative development achieved by Morocco's health system after the 19th century which explains why France and especially Spain had serious difficulties in establishing a new health system in their zones of influence. For Spain, these difficulties were paradigmatically expressed in the "questions" of Tangier and the Rif, which led to a never-ending series of incidents essentially reflecting its impotence to proceed within the framework of the legal regulations of Algeciras and the Treaty of the Protectorate. "Tangerian ghosts" and "Riffian realities" became a nightmare for Spanish action in Morocco well after 1912.

In the end, the health system in Spanish Morocco in the period 1906–1921 failed to be established on Protectorate/colonial grounds, despite its formal appearance. A protectorate public health seemed to exist through the creation of a General Health Inspection into the Delegation of Native Affairs of the High Commission and its consultative branch composed of a Central Health Board and Local Health Boards in which Moroccan authorities were represented. The so-called *Sanidad Majzén* comprised port services, urban and countryside dispensaries, mixed infirmaries and infirmaries for natives, all exclusively financed by the Protectorate's budget from 1918 on. Moroccan auxiliary personnel were employed in different institutions. This system managed to reach the Melilla region where, for many years, public health was essentially framed within a specific Native Affairs Administration of the army with a kind of colonial "flavour". Here, Moroccans enrolled as soldiers of the Native Police and *Regulares* were assisted in countryside dispensaries, as well as their families and relatives.

However, appearances were deceiving. The higher responsibility for public health was not merely an intervention imposed by Spanish authorities but was directly assumed by the Delegate of Native Affairs and the High Commissioner from 1918 on to avoid constant interference from Tangier and from the dangers of French expansionism. This was an act of diplomatic force that had started with the strategy of the local boards and was accelerated by the German defeat in World War I. So the *Sanidad Majzén* was not based on "protection" but on "seizure". On the other hand, the increase of military operations in the Protectorate from 1918 on led to mounting confrontation with local opposition in what seemed more a war than colonisation. Both tendencies were confirmed after 1921 with the almost simultaneous closure of the Tangier and Rif questions. The Tangier Statute was then negotiated directly by Great Britain, France, Spain and Italy without the participation of the Sultan of Morocco or its delegate. The Rif War became a "European style" campaign (Gershovich 2000) with tens of thousands of deaths on each side, with the first aero-naval joint operations in history and merciless gas-bombings. Despite Gustavo Pittaluga's and Francisco Ruiz Morote's opinions, dispensaries for natives had not succeeded in their tasks of "civilisation"

and "pacification", but rather could only be established throughout Spanish Morocco as a result of harsh combat and diplomatic force.

Therefore, the degree of diplomatic and military force used against Morocco and the Rif makes the terms "protectorate" and "colony" inadequate. The Spanish zone was rather an occupied or conquered area, with an authoritarian administration. Conversely, the tremendous effort required to finally achieve "pacification" had serious consequences for Spain, namely the establishment of the dictatorship of General Miguel Primo de Rivera (1923–1930), which had important effects in the field of public health. This impact at home is just another proof of why Spanish action in Morocco can hardly be defined as "colonisation".

References

Amster E.J. (2003) *Medicine and sainthood: Islamic science, French colonialism and the politics of healing in Morocco, 1877–1935*. Ann Arbor, MI: UMI Dissertation Services.

Amster E.J. (2004) "The many deaths of Dr. Emile Mauchamp: Medicine, Technology and Popular Politics in pre-Protectorate Morocco, 1877–1912" *International Journal of Middle East Studies,* 36:409–428.

Arqués E. & Gibert N. (1992) *Los Mogataces. Los primeros soldados moros de España en África*. Málaga-Ceuta: (Ed.) Algazara – Instituto de Estudios Ceutíes. Reedición.

Bastos Ansart M. (1969) *De las guerras coloniales a la guerra civil. Memorias de un cirujano*. Barcelona: Espasa-Calpe.

Burke III E. (2000) "Theorizing the Histories of Colonialism and Nationalism in the Arab Maghrib" In: Ahmida A. (ed.) *Beyond Colonialism and Nationalism in the Maghrib: History, Culture and Politics*. Pp. 17–34. New York: Palgrave.

Calatraveño Dr. (1916) "El laboratorio de análisis de Sanidad militar de Melilla" *Hygia,* [s.n.]: 69–75.

Carrasco P. (1918) "Labor realizada en el consultorio indígena de Yarf-el-Bas durante el año 1917" *Revista de Sanidad militar,* 8:393–398, 456–462, 489–499, 519–523.

Castejon Bolea R. (2001) *Moral sexual y enfermedad: La medicina española frente al peligro antivenéreo (1868–1936)*. Granada: Universidad de Granada-Instituto Alicantino de Cultura "Juan Gil-Albert".

Cilleuls J. des (1959) "La participation des Médecins des groupes sanitaires mobiles a l'Assistance Médicale Indigène et à la conquête du Maroc" *Histoire Médicale,* 9:5–39.

Cordero Torres J.M. (1943) *Organización del Protectorado español en Marruecos*. 2 vols., Madrid: Editora Nacional.

Delgado E. (1930) *La sanidad en Marruecos. Información somera de cuanto ha hecho España en materia sanitaria*. Ceuta: Alta Comisaría de España en Marruecos.

El Bezzaz M.A. (1982–83) "La chronique scandaleuse du pelerinage marocain a la La Mecque au XIXème siecle" *Hesperis-Tamuda,* 20–21:319–331.

El Bezzaz M.A. (1984) "Les debuts de la reglementation sanitaire du pelerinage marocain a La Mecque (1831–1866)" *Hesperis-Tamuda,* 22:67–77.

El Bezzaz M.A. (1985) "La peste de 1798–1800 au Maroc" *Hesperis-Tamuda,* 23:57–81.

Gallagher N.E. (1983) *Medicine and Power in Tunisia, 1780–1900*. Cambridge: Cambridge University Press.

Gershovich M. (2000) *French Military Rule in Morocco. Colonialism and its Consequences*. London-Portland: Frank Cass.

Hart D.M. (1976) *The Aith Waryaghar of the Moroccan Rif: An Ethnography and History*. Tucson: University of Arizona Press.

Hoisington Jr W. (1995) *Lyautey and the French Protectorate in Morocco*. New York: St. Martin's Press.

Ishanoglu U.E. (1992) "Ottomans and European Science" In: Petitjean P., Jami C. & Moulin A.M. (eds.) *Science and Empires*. Dordrecht-Boston-London: Kluwer Academic Publishing.

Justel Calabozo B. (1991) *El Médico Coll en la corte del sultán de Marruecos: año 1800*. Cádiz: Servicio de Publicaciones de la Universidad de Cádiz/Instituto de Cooperación con el Mundo Árabe.

Lapresa J. (1910) "Apuntes históricos de la campaña sanitaria de Melilla en el año de 1909" Unpublished manuscript.

Laredo I. (1994) *Memorias de un viejo tangerino*. S.l.: La Porte [Facsímil. Madrid: C. Bermejo, 1935].

Laroui A. (1993) *Esquisses historiques sur le Maroc d'aujourdui*. S.l.: Centre Culturel Arabe.

Larra Cerezo Á. de (1900) *Les Services sanitaires d'Espagne en Afrique*. Madrid: Imprimerie du Depot de la Guerre.

Lazo García S. (1913) "La medicina militar española en el Rif" *Los Progresos de la Clínica,* 1:193–248.

Lewis B. (1984) *Comment l'Islam a découvert l'Europe*. Paris: Gallimard.

Lourido Díaz R. (1996) "Las instituciones médico-sanitarias creadas por iniciativa del P. Lerchundi" *Archivo Iberoamericano,* 56:223–224.

Madariaga M.R. de (1999) *España y el Rif. Crónica de una historia casi olvidada*. Melilla: UNED.

Marco C. (1913) *La Comisión de Higiene y de Limpieza de Tánger. Historia de sus poderes, sus reglamentos, sus concesiones y otros datos de interés local*. Tánger: Imprenta de "El Porvenir".

Martín Corrales E. (2002) "El nacionalismo catalán y la expansión colonial española en Marruecos: De la guerra de África a la entrada en vigor del Protectorado (1860–1912)" In: Martín Corrales E. (ed.) *Marruecos y el colonialismo español (1859–1912). De la guerra de África a la "penetración pacífica"*. Pp. 167–215. Barcelona: Bellaterra.

Martínez Antonio F.J. (2005a) *El proceso de sanitarización en los Imperios español y marroquí durante las décadas centrales del siglo XIX*. Doctoral thesis. Barcelona: Universitat Autónoma de Barcelona.

Martínez Antonio F.J. (2005b) "La sanidad en Marruecos a mediados del siglo XIX" *Medicina e Historia,* 4ª época, Nº 2.

Martínez Antonio F.J. (2005c) "Higienismo, regeneracionismo, africanismo. El doctor Felipe Ovilo Canales y la Escuela de Medicina y el Dispensario de Tánger (1886–1899)" *Revista digital del FIMAM*. [www.fimam.org]

Martínez Antonio F.J., Jiménez Lucena I. & Molero Mesa J. (2003) "La política sanitaria del protectorado de España en Marruecos: El Informe Delgado (1927)" In: AA.VV. *Actes de la VII Trobada d'Historia de la Ciència i de la Tècnica (Barcelona, 14–17 novembre 2002*. Pp. 661-670. Barcelona: Societat Catalana d'Història de la Ciència i de la Tècnica,

Mesa J.L. et al. (2001) *Las campañas de Marruecos, 1909–1927*. Madrid, Almena.

Mizrahi J.-D. (2003) "Politique sanitaire et impérialisme à l'heure de la révolution pastorienne: le Conseil Sanitaire de Constantinople (1838–1923)" In: Kançal S., Mizrahi J.-D. & Saul S. (eds.) *Méditerranée, Moyen-Orient: deux siècles de relations internationales. Recherches en hommage à Jacques Thobie*. Paris: L'Harmattan.

Molero Mesa J. (1990) "Francisco Moliner y Nicolás (1851–1915) y el inicio de la lucha antituberculosa en España" *Asclepio* XLII, 1: 253-280.

Molero Mesa J. (2003) "Militares, "moros" y mosquitos: El paludismo en el Protectorado español en Marruecos" In: Roderíguez Ocaña E. et al. *La acción médico-social contra el paludismo en la España metropolitana y colonial del siglo XX*. Pp. 323–380. Madrid: CSIC.

Molero Mesa J., Jiménez Lucena I. & Martínez Antonio F.J. (2002) "Salud, enfermedad y colonización en el Protectorado español en Marruecos" In: Rodríguez Mediano F. & de Felipe H. (eds.) *El Protectorado español en Marruecos. Gestión colonial e identidades*. Pp. 181–216. Madrid: CSIC.

Moulin A.M. (1997) "Les instituts Pasteur de la Méditerranée arabe: une religion scientifique en pays d'Islam" In: Longuenesse E. (ed.) *Santé, médecine et societé dans le monde arabe*. Pp. 129–164. Paris: L'Harmattan.

Moussaoui D. & Roux-Dessarps M. (eds.) (1995) *Histoire de la Médecine au Maroc et dans les Pays Arabes et Musulmans*. Casablanca: Imp. Najah El Jadida.

Nerín G. (2005) *La guerra que vino de África*. Barcelona: Crítica.

Panzac D. (1986) *Quarantines et lazarets. L'Europe et la peste d'Orient*. Edisud: Aix-en-Provence.

Panzac D. (1989) "Médecine révolutionnaire et révolution de la médecine dans l'Égypte de Muhammad Ali: le Dr. Clot Bey" *Revue du Monde Musulman et de la Méditerranée,* 52–53:94–110.

Panzac D. (1995) "Vingt ans au service de la médecine turque. Le Dr. Fauvel a Istanbul (1847–1867)" In: Longuenesse E. (ed.) *Santé, médecine et societé dans le monde arabe*. Pp. 165–181. Paris: L'Harmattan.

Pennell C.R. (2000) *Morocco since 1830. A history*. London: Hurst and Co.

Pennell C.R. (2001) *La Guerra del Rif. Abdelkrim El-Jattabi y su Estado rifeño*. Melilla: UNED.

Pittaluga G. & Ruiz Morote F. (1930) "Una memoria interesante. Los doctores Pittaluga y Morote en Marruecos" *África,* 6:265–268.

Porter D. (ed.) (1994) *The History of Public Health and the Modern State*. Amsterdam: Clio Medica/Rodopi Ed.

Porter D. (1999) *Health, Civilization, and the State. A History of Public Health from Ancient to Modern Times*. London: Routledge.

Raynaud L. (1902) *Etude sur l'Hygiene et la Médecine au Maroc suivie d'une notice sur la Climatologie des principales villes de l'Empire*. Alger: Imp. S. Leon.

Rico-Avello C. (1969) *Historia de la Sanidad española (1900–1925)*. Madrid: E. Giménez.

Rivet D. (1996) *Lyautey et l'institution du Protectorat français au Maroc*. 3 vols. Paris: L'Harmattan.

Rodrigo y Alharilla M. (2002) "Una avanzadilla española en África: el grupo empresarial Comillas" In: Martín Corrales E. (ed.) *Marruecos y el colonialismo español (1859–1912). De la guerra de África a la "penetración pacífica"*. Pp. 133–166. Barcelona: Bellaterra.

Rodríguez Ocaña E. (2005) *Salud pública en España. Ciencia, profesión y política, siglos XVIII-XX*. Granada: Universidad de Granada.

Rodríguez Ocaña E et al. (2003) *La acción médico-social contra el paludismo en la España metropolitana y colonial del siglo XX*. Madrid: CSIC.

Rollman W.J. (1983) *The "New Order" in a pre-colonial muslim-society: Military reform in Morocco, 1844–1904*. 2 vols. PhD Thesis. Ann Arbor: University of Michigan.

Rosen G. (1958) *A History of Public Health*. New York: MD Publications.

Ruiz Albéniz V. (1922) *Ecce Homo. Prueba documental y aportes inéditos sobre las causas del derrumbamiento y consecuencias de él*. Madrid: Sucesores de Rivadeneyra.

Sanz Astolfi J. (1931–1932) "Resumen de las comunicaciones presentadas e impresiones recogidas en el II Congreso Internacional de Paludismo, celebrado en Argel del 19 al 21 de Mayo de 1930" *Revista de Sanidad Militar,* 21:329–332, 359–366; 22:13–22, 36–40.

Schepin O.P. & Yermakov W.V. (1991) *International Quarantine*. Madison: International Universities Press Inc.

Sims A.C.P. (1972) "The English Hospital, Tangier, 1883–1908" *Medical History,* 16:285–290.

Valdés Lambea J. (1914) *El dispensario indígena de Nador. 1ª memoria anual. Labor realizada y contribución al estudio de la Patología del Rif. Estadística*. Melilla: Tipografía de La Gaceta.

Villalobos F. (2004) *El sueño colonial. Las guerras de España en Marruecos*. Barcelona: Ariel.

Villanova J.L. (2004) *El Protectorado de España en Marruecos. Organización política y territorial*. Barcelona: Bellaterra.

Zaim F. (1988) "Le Maroc Méditerranéen au XIXe siècle ou la frontière intérieure" *Revue du Monde Musulman et de la Méditerranée*, 48–49:61–95.

Archives and libraries

Archivo General de la Administración. Fondo África. Alcalá de Henares (Madrid)

Servicio Histórico Militar. Fondo África. Madrid.

Archivo Histórico Militar. Sección Sanidad Militar. Segovia.

Archivo y Biblioteca del Protectorado español en Marruecos. Tettouan.

Biblioteca Nacional de España. Fondo García Figueras. Madrid.

Biblioteca de la Academia General Militar. Zaragoza.

Bibliothèque Nationale de France. Paris.

Bibliothèque Interuniversitaire de Médecine. Paris.