

Smoking, Snuffing and Oral Health with Special Reference to Dental Caries

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Avhandlingen är av sammanläggningstyp och baseras på följande fyra delarbeten:

- I. Hellqvist L, Rolandsson M, Birkhed D, Hugoson A. Tobacco use in relation to socioeconomic factors and dental care habits among Swedish individuals 15-70 years of age; 1983-2003. *International Journal of Dental Hygiene*, 7: 62-70, 2009.
- II. Hugoson A, Hellqvist L, Rolandsson M, Birkhed D. Dental caries in relation to smoking and the use of Swedish snus: epidemiological studies covering 20 years (1983-2003). *Acta Odontologica Scandinavica* 70: 289-296, 2012
- III. Hellqvist L, Rolandsson M, Hugoson A, Lingström P, Birkhed D. Dental caries and associated factors in a group of Swedish snus users. In manuscript.
- IV. Hellqvist L, Boström A, Lingström P, Hugoson A, Rolandsson M, Birkhed D. Effect of nicotine-containing snus on plaque pH in vivo. Submitted for publication.

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Abstract

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Background and aims: This thesis describes oral health and the use of tobacco with the emphasis on dental caries and Swedish snuff (snus). There appears to be a general opinion in Sweden that snus protects against caries, but there are no scientific studies that support these speculations. More research is therefore needed and the aims of the present investigations were accordingly: 1) to describe the use of tobacco and changes over time (1983-2003) in randomly selected individuals between 15 and 70 years of age, in relation to socioeconomic conditions and dental care habits, 2) to study the relationship between various intraoral caries-associated variables and the effect of smoking and of using snus on dental caries, 3) to study caries-related factors and the pH fall in dental plaque in a group of Swedish snus users and 4) to investigate pH changes in plaque in vivo when using different snus products, both with and without nicotine, and to analyse their carbohydrate content.

Methods: Three previous epidemiological cross-sectional studies carried out in 1983, 1993 and 2003 were the platform for Studies I & II (n=2015 and 1591 respectively). The participants were between 15 and 70 years of age. Study III was a clinical study with middle-aged adults (26-62 years old), who had been using snus for ≥ 10 years (n=102) and a control group (n=101) consisting of non-tobacco users. Study IV, in which plaque pH was measured in situ, comprised 10 snus users.

Results: Study I showed that there was a statistically significant reduction from 34% tobacco users in 1983 to 28% in 2003. The decrease was most obvious among smokers, while the number of snus users increased somewhat. More tobacco users than non-users did not visit a dentist regularly. In 1983 and 1993 (Study II), there were no significant differences in mean DFS between smokers and non-users, but there was a statistically significantly higher mean DFS in comparison with snus users. Study III, which was carried out in 2009-2011, showed that the salivary secretion rate was higher ($p < 0.001$) in snus users than in non-users (2.50 vs. 2.16 ml/min). Regarding gingival inflammation, non-users showed a mean of 14.4 ± 13.9 and snus users 20.4 ± 18.2 ($p < 0.009$). No statistically significant differences between these two groups were found regarding plaque index, primary and secondary enamel and dentine caries, DFS and salivary counts of mutans streptococci and lactobacilli. The pH fall after a sucrose rinse was more pronounced among the controls than in the snus users (NS). Snus users had fewer snacks between meals compared with non-users ($p < 0.001$). The intraoral pH measurements in Study IV showed that all four nicotine-containing products increased the plaque pH, in contrast to three of the six nicotine-free products, which lowered the pH. The carbohydrate analyses showed only traces of glucose, fructose and sucrose (0.5-1%) and starch ($\approx 1.5\%$) in the various nicotine-containing snus products. Some of the nicotine-free products, on the other hand, contained up to 6.5% low-molecular-weight carbohydrates and 26.0% starch.

Conclusions: 1) During the 20-year period (1983-2003), there was a reduction in the number of smokers and an increase in the number of snus users. Tobacco users had less frequent dental visits and poorer oral hygiene habits than non-tobacco users. 2) The results of the cross-sectional epidemiological studies, performed in 1993 and 2003, indicate that daily smoking and the use of Swedish snus do not appear to increase the risk of dental caries. 3) The clinical study carried out in 2009-2011 showed only minor or no differences in caries and related factors between daily snus users and non-users. 4) All the tested nicotine-containing snus products increased the plaque pH, in contrast to three of the six nicotine-free products, which lowered the pH.

Key Words: carbohydrates, dental care habits, dental caries, nicotine-containing snus, nicotine-free snus, plaque pH, salivary factors, smokeless tobacco, smoking, snuff, socioeconomic factors, tobacco.

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