Molecular basis of inflammation caused by biomaterials

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The contact between an artificial implant and tissue initiates an array of so called foreign body reactions. The reactions are ranging from those taking place directly on the surface *i.e.* protein adsorption and complex surface associated reactions such as complement activation and coagulation to cell involvement and wound healing around the site of implantation. The different elements of the foreign body reaction are intimately linked to each other and this thesis will provide an integrated view of the inflammatory response to biomaterials.

This thesis is based on the findings of both *in vitro* and *in vivo* studies. The *in vitro* experiments were aimed at developing a screening method for novel biomaterials which included the study of general protein adsorption and early surface induced cascade reactions involving the complement system and the coagulation system. For this purpose, a quartz crystal microbalance with dissipation monitoring (QCM-D) instrumentation was used. QCM-D was found to be a very useful method for screening purposes. Important parameters could be measured with high precision and the sensor surfaces were easy to coat which made the technique very versatile.

An important part of this work was to see if the biological response from the *in vitro* studies could bring new ideas for the interpretation of foreign response reactions found in the *in vivo* situation. A polymer system containing a range of poly(alkyl methacrylates) with different surface molecular mobility was used. This system was then analyzed in both the developed *in vitro* QCM-D system and in well defined animal models. Interesting conclusions could be drawn especially when regarding the effect of the blood plasma clot quality had on the cell association to the implanted surface. Also, histological findings such as fibrotic capsule formation could be related to the initial events on the surface.

ISBN: 91-628-6664-8

Göteborg 2005