The Oral Ecosystem with Microbial Biofilms
Research theme at the Faculty of Odontology, Malmö University

**NEED FOR RESEARCH**

Research within the 'Oral health' profile

**Clinical research**

In situ models

Research within the 'Oral health' profile

In vitro models

Oral health care

Implementation

Evaluation

**OVERALL HYPOTHESIS**

Saliva covers oral surfaces and interacts with bacteria

Minor salivary gland secretions in children and adults are investigated with respect to flow and content. Saliva is collected using Sialotape, placed at different mucosal locations. The flow is measured using the Peristom 8000 (Puriflow®) and content is investigated using different biochemical analytical methods. Changes in salivary composition in relation to age have been observed.

**Bacteria degrade salivary mucins**

Mucins are large glycoproteins that form a protective network on all oral surfaces while at the same time providing initial attachment sites for oral bacteria. Through cooperation bacteria can break down both the carbohydrate- and protein part of the mucins.

**Mutans Prediction in Skåne**

MalPI is a clinical study comprising 995 5-7 year-old children. The overall aim is to increase our knowledge of the genetic contribution to dental caries, with focus on variation in host immune response in terms of ILA, salivary IgA and mutans streptococci.

**Biofilms on implants**

Osteo-integration is necessary for healing and retention of titanium implants and biological modified titanium surfaces for oral use are now available. In this project, microbial biofilms growing on these surfaces are studied. Other types of surfaces studied are, for example, periodontal catherers.

**Biofilm bacteria are often acid tolerant**

Bacteria growing in a biofilm express different properties than bacteria growing in solution. Biofilm bacteria are more stress tolerant, for example more resilient to antibiotics and more acid tolerant. Picture A shows a plaque sample, where most of the bacteria are acid tolerant (green), whereas the sample in Picture B contains mostly non-acid tolerant bacteria (red).

**Which bacteria can be found in dentine caries?**

Hypothesis: Different bacterial consortia can survive and generate the same net disease promoting factors in the dentine carious process. The consortia will differ at various depths in the lesion and between different lesions. Project: Mapping of the dentine caries microflora at various depths in the dentine caries lesion.

**Interactions between salivary proteins and bacteria lead to changes in protein expression (phenotypic changes) in the bacteria. An example is that mucins induce an up-regulation of degradative enzymes within bacteria that interact with them. The bacteria use these enzymes to degrade the mucins and then use the degradative enzymes to degrade bacteria that express mucins, as this is not an intracellular process**.

**Bacteria develop stress resilient phenotypes**

By interfering in this process, new “anti-microbial” strategies, which prevent oral disease, can be developed.

**Changes in bacterial physiology can be identified**

**Proteomics (protein expression)**

By visualizing bacterial proteins with protein dyes, new or specific proteins can be cut out and identified using mass-spectrometry.

**mRNA-FISH (gene expression)**

Markers for specific active genes in bacteria can be visualized using this technique. In this way changes in bacterial physiology can be identified.

**Protein expression directly on the bacteria**

After the identification of protein of interest, we develop antibodies and are able to visualize the proteins directly on the bacteria using microscopy.

**Biofilms interact with oral epithelial cells**

We have developed a model in which oral epithelial cells, growing on a surface, are exposed to bacteria. Preliminary results suggest that living bacteria attach to the cell surface and are internalised without breaking down the epithelial cells.

**Overall hypothesis**

When salivary proteins and bacteria interact, the bacteria develop stress resistant phenotypes. By intervening in this process, new “anti-microbial” strategies, which prevent oral disease, can be developed.