Preface

The aim of this book is to give an overview of important medical biofilm infections, the pathogenesis of these infections, and the current concepts of how biofilm infections can be prevented, diagnosed, and treated. The current definition of bacterial biofilms is *A coherent cluster of bacterial cells (one or several species) imbedded in a matrix – which are more tolerant to: most antimicrobials and the host defence, than planktonic bacterial cells*. The clinical feature of biofilms infections is the increased tolerance to the defense mechanism of the body and to antibiotics and disincentives. The consequence of these features is chronic infections which are defined as infections which persists in spite of the body's innate and adapted immune response and in spite of antibiotic therapy and – in contrast to the normal colonization of the body's surfaces (skin, mucosa) – induce an immune response and gives rise to pathology in the neighboring tissues and therefore clinical signs of disease. A schematic view of the features of medical biofilms is given in the Table 1. With respect to diagnosing biofilms, adequate biopsies, pus, swabs or removed foreign bodies is used for culture, Gram-stain and FISH stain for microscopy, and to release the biofilm material on, e.g., foreign bodies, sonication is recommended. Adequate culture technique for at least one week may be necessary, and in case of no growth, PCR amplification of 16S rRNA genes should be performed to detect and identify non-culturable but viable bacteria.

The chapters of this book are written by well-known international experts in medical biofilms and the result is scientifically frontline information, which hopefully can be used both in the clinical and basic science work. Since several aspects of biofilms are not fully understood, certain opinions might deviate slightly between the chapters, for the benefit of the doubt.

The focus of the book is on the medical biofilms. It is the hope of the editors that inspirations from the chapters of the book may lead to further research in other areas of clinical biofilms which at the present time are not so well studied. To this purpose we have included chapters on technical methods to study biofilms.

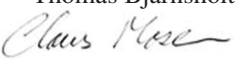
Biofilm infections were introduced into human medicine by professor J.W. Costerson (at that time at the University of Calgary) about 30 years ago, but during the first decades it remained a research area for a few dedicated scientist and their results did not have much influence in human medicine. This has changed

Table 1 Some general features of biofilm infections in humans compared to acute planktonic infections and superficial colonozation/normal flora on skin and mucosal membranes. The bold fonts indicate biofilm specific features. (N. Høiby 18-11-2009)

Features of biofilm infections	Necessary condition for biofilm infections	Sufficient condition for biofilm infecions	Also found in acute planktonic infections	Also found in colonization/ normal flora on skin and mucosal membranes
Aggregates of bacteria embedded in a self-produced polymer matrix	Yes	Yes	No	No/Yes
Tolerant to clinical relevant PK/PD dosing of antibiotics in spite of susceptibility of planktonic cells	Yes	Yes	No	No/Yes
Tolerant to both innate and adaptive immune reponse	Yes	Yes	No	No/Yes – unknown (s-IgA)
Inflammation	Yes	No	Yes	No
Biofilm-specific antigens	No and Yes – seldom – e.g. Pseudomonas aeruginosa alginate	No and Yes – seldom – e.g. Pseudomonas aeruginosa alginate	No	No
Antibody response	Yes – after some weeks	No	Yes – after some weeks	No
Chronic infections	Yes	Yes	No	No
Foreign body associated infections	No	Yes	No but yes the first day of infection	No
Located on surfaces	No	No	Yes	Yes
Localized infetion	Yes	No	Yes	Yes
Focus for spreading or local exacerbation	Yes	No	Yes	Yes

dramatically during the last decade probably due to the organization of regular scientific biofilm meetings in USA, Europe, and Japan which included both basic scientists and clinicians. Cystic fibrosis *P. aeruginosa* lung infection, foreign body infections, chronic osteomyelitis, and dental infections were soon recognized as important biofilm infections and have ever since been in frontline of the interests of clinicians. It is our hope that this book will further promote both basic and clinical relevant biofilm research in these and other areas to the benefit of patients suffering from chronic biofilm infections.

Copenhagen, Denmark Thomas Bjarnsholt



Copenhagen, Denmark Claus Moser

Copenhagen, Denmark Peter Østrup Jensen

Copenhagen, Denmark Niels Høiby

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