

The first European congress on microbial biofilms: EUROBIOFILMS 2009, Rome, Italy, September 2–5, 2009

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The Congress Center of the Santa Lucia Foundation Research Hospital in Rome, Italy, was the venue from September 2–5, 2009 of the First European Congress on Microbial Biofilms – EUROBIOFILMS 2009, providing the participants with a valuable forum for a fruitful scientific exchange in the field of microbial biofilms (Fig. 1).

The original proposal to organize such a conference dates back to the Executive Board meeting of the newly established Study Group on Biofilms (ESGB) of the European Society for Clinical Microbiology and Infectious Diseases (ESCMID), held in Copenhagen on April 2005. On that occasion, as Member-elect, Gianfranco Donelli highlighted the program of the First Workshop on Microbial Biofilms that he was organizing at the Italian National Institute of Health in Rome, June 2005, and proposed to hold a European congress on biofilms under the ESCMID umbrella in the future.

During these years, in addition to the above-mentioned workshop (attended by 223 participants, mostly from Italy), three international conferences on biofilms, known as Biofilm I, II and III, were held in Germany (Osnabrück, 2004; Leipzig, 2006; Munich, 2008). However, each of these scientific events was attended mostly by participants from the organizing country.

Thus, the idea to organize a large conference in Europe as a counterpart to the four Biofilm Conferences previously spon-

sored by the American Society for Microbiology represented a difficult, but exciting challenge. In fact, the recognition of a Congress as European should not be based only on its occurrence in a European country, but requires the involvement as much as possible of scientists from the different European countries, including the members of the Organizing and Scientific Committees as well as the invited speakers. Further, the most important European Organizations in the field of microbiology, ESCMID and Federation of European Microbiological Societies (FEMS) *in primis*, should be actively involved.

The final agreement for the organization in Italy of this European Congress was reached on the occasion of the Biofilm International Symposium organized by the ESGB held in Palma de Mallorca in November 2007.

During the year 2008, meetings with Niels Høiby, Søren Molin and Craig Williams in Barcelona, Ute Romling and Michael Wilson in Sweden and again with Niels Høiby in Rome allowed Gianfranco Donelli to appoint a number of highly qualified scientists as members of the International Advisory Board and to plan the scientific program of ‘EUROBIOFILMS 2009’.

Further, both ESCMID and FEMS agreed to be actively involved in promoting the event, also providing support to facilitate attendance to the Congress by young scientists as well as partially covering the expenses for invited lecturers.



Fig. 1. The 500-seat congress hall of the Santa Lucia Foundation during EUROBIOFILMS 2009.

Within the symposium on biomaterial-related infections, Henny C. van der Mei discussed the possible role of biofilm-based infections in the failure of orthopedic implants.

Further, host–pathogen interactions were addressed by several lecturers from different points of view. According to Michael Givskov, the *P. aeruginosa* quorum-sensing system is responsible for the activation of a number of virulence factors, which in turn attract phagocytic white blood cells (PMN's), indicating the crucial role of cross-communications between bacteria and the immune system. Again, the *P. aeruginosa* model was used by Gerd Döring to illustrate the role of a novel oxygen sensor in the post-translational regulation of alginate export. Finally, Mark Shirtliff updated participants on the prospect of vaccine development against chronic *S. aureus* biofilm infections.

A session on fungal biofilms was opened with a lecture by Mahmoud Ghannoum, who took participants on a fascinating journey from basic science to translational research through the illustration of the currently available methods to study biofilm development in clinically relevant *Candida* spp. The possible strategies to inhibit *Candida albicans* biofilm formation by antifungal agents such as echinocandins or recently identified natural compounds were addressed by Christine Imbert. The main features of *C. albicans* and *S. aureus* dual-species biofilm were highlighted by Brian Peters, while Francesco Giuliani reported on a new photosensitizer, which, when excited with red light (600–700 nm) of moderate intensity, exhibits a powerful *in vitro* activity against sessile *C. albicans*, thus supporting the possible use of photodynamic therapy against candidiasis.

State-of-the-art research on the biofilm matrix was presented by four invited lecturers. Hans-Curt Flemming described the extracellular polymeric substance (EPS) as a functional network whose tridimensional structure with pores and channels determines mass transport and access to nutrients. Meanwhile, Thomas Neu illustrated the analytical techniques available today for the characterization of EPS including (1) polymer matrix isolation and chemical analysis; (2) imaging by electron or light microscopy; and (3) laser scanning microscopy for the analysis of fully hydrated matrix samples. Matt Parsek described the role of the newly identified putative adhesin CdrA, acting as an EPS matrix cross-linker in *P. aeruginosa*, while Said Jabbouri reported on the qualitative and quantitative variations of the EPS in staphylococcal biofilms depending on the strains and culture conditions.

A session was also dedicated to the biofilm-based infections associated with the implantation of medical devices. David Stickler described the crystalline bacterial biofilms growing on the surface of antimicrobial urinary catheters; Roger Bayston addressed the poorly investigated issue of device-related infections in neurosurgery and the encouraging results obtained recently with an antimicrobial bioma-

terial active against the causative bacteria and with the capacity to prevent biofilm formation. Emilio Guaglianone reported on multispecies biofilms developing in the lumen of biliary stents, as a critical step in the process of stent clogging.

In a symposium dedicated to quorum sensing and cell signalling in biofilms, Moshe Herzbergh analyzed the effect of *E. coli* K12 surface density on the uptake of the quorum-sensing signal AI-2, while Marco Oggioni reported that sialic acid (*N*-acetylneuraminic acid) is essential for *Streptococcus pneumoniae* attachment to plastic at concentrations similar to those of free sialic acid in saliva.

Biofilms in gastrointestinal and urogenital tracts were also reviewed extensively. The environmental and genetic factors influencing biofilm formation by the probiotic strain *Lactobacillus rhamnosus* GG were discussed by Sigrid De Keersmaecker, while the genetic basis of biofilm formation of *Helicobacter pylori* was described by Baraa Alhaj-Hussein. Alexander Swidsinski introduced the crucial role of microbial biofilms in bacterial vaginosis, while Jennifer Patterson reported on the identification of a biofilm-associated protein (Bap)-like protein, a homologue of the staphylococcal Bap, in a bacterial vaginosis isolate of *Gardnerella vaginalis*. Sandra Mazzoli reported on her long-term hospital experience with biofilms in chronic bacterial prostatitis, of etiology mainly involving *E. coli*, other *Enterobacteriaceae*, enterococci, staphylococci and *Pseudomonas* spp., the proven ability of these species to form biofilms possibly explaining the high resistance to antibiotics and the difficulties in microbiological diagnosis.

Susceptibility and antibiotic resistance of biofilm-growing bacteria were the issues of a specific oral session in which Oana Ciofu illustrated biofilm-related and traditional antibiotic-resistance mechanisms, while Stefania Stefani reviewed the available data on the efficacy of tigecycline in biofilm-based infections.

The oral cavity biofilm issue was introduced by a keynote lecture by David Spratt, who underlined how the currently available molecular biology techniques, such as PCR cloning, qPCR and DGGE, allow us to determine the richness and diversity of oral communities, to profile them and to track population dynamics in health and disease. In a session on the same topic, Gunnar Dahlén described the dental plaque as a biofilm characterized by 'starving' and 'dormant' bacteria, with a high degree of cell communication allowing the microbial community to gain access to nutrients. However, according to Rudolf Gmur, the question remains as to how far the results of *in vitro* experimental models on oral biofilms actually reflect *in vivo* aspects in periodontal disease pathogenesis. In this context, the recent development of multispecies *in vitro* 'subgingival' biofilm models may provide an interesting new way to investigate, perhaps more realistically, the elusive host–parasite

interactions occurring in periodontal disease. Bente Nyvad described dental caries as a consequence of changes in the natural balance of the resident microbial communities caused by altered local environmental conditions. In fact, intraoral stresses such as sucrose consumption may cause environmental changes in the biofilm (low pH), which may subsequently stimulate a shift in the composition of the biofilm bacteria in favor of more acidogenic and aciduric species.

A number of recently developed biofilm control strategies were also addressed. Andrew McBain reported evidence in favor of the effectiveness of bacterial replacement therapies and on the recently launched dental probiotics. Iolanda Francolini reviewed recently devised strategies to prevent and/or control biofilm growth on central venous catheters, with a particular focus on those based on: (1) antimicrobial polyurethanes able to coordinate metal ions (Ag^+ , Zn^{2+} , etc); (2) the biofilm matrix-degrading enzyme, dispersin B, to enhance antibiotic penetration through the biofilm; and (3) a magnetic nanoparticles-based targeting system to fight *in situ* catheter-related infections.

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A novel *in vitro* system for the evaluation of the anti-biofilm efficacy of contact lens care solutions was also illustrated by Claudia Randler. Jean Marc Berjeaud demonstrated that the antimicrobial peptides gramicidin A and magainin I, grafted on the surfaces of materials used in the food industry or for medical device manufacture, display a very promising antibiofilm efficacy.

The keynote lectures of the last day of the congress were presented by Paul Williams on quorum sensing and biofilm development on biotic and abiotic surfaces and by Jeffrey Kaplan on biofilm matrix-degrading enzymes as useful research tools and potential antibiofilm therapeutics.

The Congress was closed by a speech by the ESCMID President Javier Garau, who stressed the increasing interest in microbial biofilms and also the need to focus more attention and provide support to the future activities of the ESCMID Study Group for Biofilms. Finally, Professor Garau congratulated the EUROBIOPILMS 2009 Chairman, Professor Gianfranco Donelli, and the entire International Organising Committee for the high scientific level of the congress and the large and well-qualified attendance.

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