



### The objective of ESGB

...is to promote and disseminate studies and knowledge about methods and results of biofilm studies with relevance for infections in humans. The ultimate goal is to improve diagnostics and the results of prophylaxis and therapy of biofilm infections in humans.

### Biofilms

In general, bacteria have two life forms during growth and proliferation. In one form, the bacteria exist as single, independent cells (planktonic) whereas in the other form, bacteria are organized into sessile aggregates. The latter form is commonly referred to as the biofilm growth phenotype.

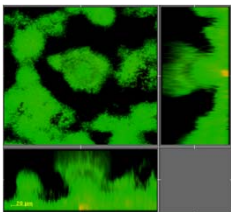


Scanning electron microscopy images of in vitro *Pseudomonas aeruginosa* biofilms

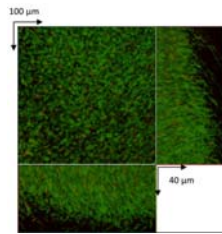
**The important hallmarks of chronic biofilm-based infections are extreme resistance to antibiotics and many other conventional antimicrobial agents, and an extreme capacity for evading the host defences.**

### Biofilm structures

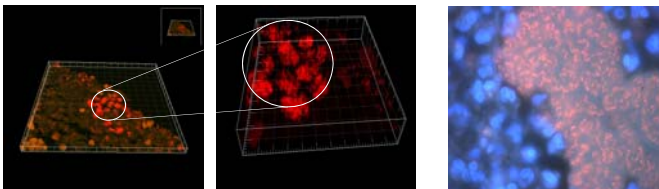
Biofilms constitute a protected mode of growth that allows survival in the hostile environment. The biofilm consists of microcolonies encapsulated by exopolysaccharide (EPS) produced by the bacteria or the host.



In vitro *Pseudomonas aeruginosa* biofilm (Bjarnsholt, T)



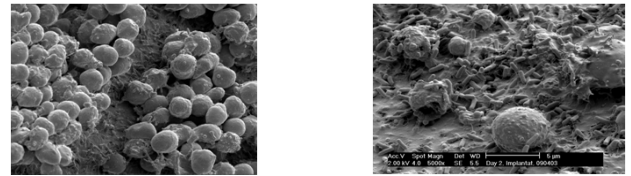
In vitro *Propionibacterium acnes* biofilm (Coenye, T)



In vivo *Pseudomonas aeruginosa* biofilm (red by PNA FISH), surrounded by PMNs (blue by DAPI). Left: chronic wound, Bjarnsholt et al; Wound Repair and Regeneration, 2008) right: chronic infected cystic fibrosis lung (Bjarnsholt et al; Pediatr Pulmonol. 2009 Jun;44(6):547-58.

### Biofilms and inflammation

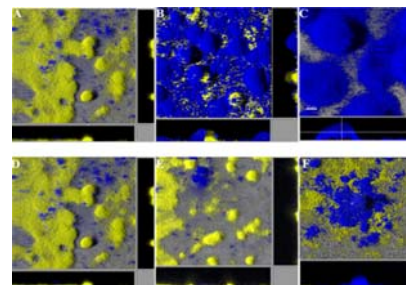
Bacteria in biofilms are protected against the inflammatory host response. Detrimental they seem to generate an ongoing cellular response, often dominated by Polymorphonuclear leukocytes (PMNs).



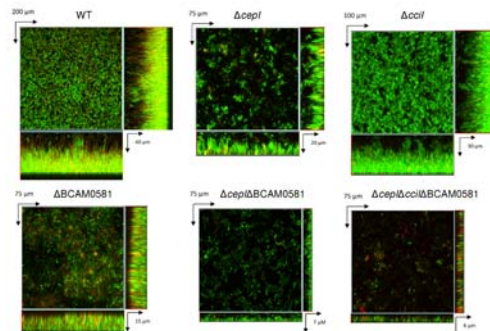
Scanning electron microscopy images of ex vivo interactions between the *Pseudomonas aeruginosa* biofilm and the host defences. Left picture, day 1, phagocytosing polymorphonuclear leukocytes (PMNs). Right picture day 2, where the bacteria succeeded in forming a protective biofilm that killed the PMNs. (Van Gennip et al., Infect Immun. 2012)

### Biofilms and treatment

Biofilm bacteria are generally more tolerant to antibiotic treatment than their planktonic bacteria counterpart. Antibiotic doses which kill suspended cells, for example, need to be increased as much as 1,000 x to kill biofilm cells in vitro. Biofilms evade antimicrobial challenges by multiple mechanisms.



CLM images of biofilm growth competition experiments between wild-type *P. aeruginosa* PAO1 (yellow) and its mutS deficient mutant derivative, PAOMS, (blue) in the absence or presence of ciprofloxacin. Macia et al AAC 2011; 55: 5230



"Representative confocal images of 24-h-old biofilms formed by various *Burkholderia cenocepacia* QS mutants" (Coenye, T)