



Biofilms: A Continual Hazard

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Biofilms are found throughout the nature on living and non-living surfaces; including household and industrial pipes, medical devices, plant and animal tissue. Biofilms play an important role in the progression and prognosis of a large no of disease states like chronic otitis media, urinary tract infection, keratitis, infective endocarditis etc. Biofilms are three dimensional communities of bacteria that attach to each other and to the surface which consists of both the cells and excreted extracellular polymeric substances (EPS). Bacteria living within biofilms are more protected from immune cells, tolerant of antibiotics and more resistance to environmental stress. The formation of biofilms is divided into different stages: 1) initial reversible attachment 2) irreversible attachment 3) maturation I-aggregation into microcolonies 4) maturation II- three-dimensional biofilm formation and 5) dispersal. Biofilms can be found more or less anywhere and may affect human health both positive and negative way. The positive effect includes the biofilms of commensal bacteria like *Staphylococcus epidermidis*, which can hinder the colonization of potentially pathogenic bacteria. However, biofilms are more frequently associated with numerous pathogenic human diseases and plant infections. The example of biofilms which form within and on the tissue are; burn wounds, keratitis, chronic otitis media (COM), dental biofilms, infective endocarditis, urinary tract infection, cystic fibrosis (CF) etc. The majority of infections in patients with burns are caused by major bacteria like *P. aeruginosa*, *S. aureus*, *Streptococcus sp.*, and *Acinetobacter*. These bacteria are associated with biofilm formation and are resistant to the antibiotic and other disinfecting agents. Keratitis is primarily caused by three genera of bacteria, all known biofilm formers: *Staphylococcus*, *Streptococcus*, and *Pseudomonas*. In chronic otitis media, the infection is most commonly caused by the biofilm-forming bacteria like *P. aeruginosa*, *S. aureus*, and *E. coli*. Infective endocarditis is caused by the Streptococci, Staphylococci, or Enterococci genera and each bacteria of these genera are

known for biofilm formers. Most of the urinary tract infections (UTIs) are caused by uropathogenic *E. coli* strains. Less frequently *Proteus mirabilis*, *K. pneumoniae*, *P. aeruginosa*, *Enterococcus sp.*, *Enterobacter sp.*, group B *Streptococcus*, and *Staphylococcus saprophyticus* also cause UTIs. Bacteria utilize an array of strategies to colonize the urinary tract, like adhesin-displaying pili to intervene attachment to epithelial cells. *P. aeruginosa* mainly concerning CF lung pathogens and patients that successfully avoid *P. aeruginosa* infections be likely to have a significantly increased life expectancy. The other class of biofilms is that form on medical implants and devices. Biofilms formed on the surface of implants make the component of bacteria more resistant to sterilization and antibiotic treatment *in vivo*. The most common bacteria involved in orthopedic infections are *Staphylococcus sp.*, *Enterococcus sp.*, *Klebsiella sp.*, *Pseudomonas sp.*, and *Acinetobacter Sp.* Catheter-associated urinary tract infections (CAUTIs) are the most common nosocomial infections. Due to the widespread distribution of biofilms in diseases and their resilience to numerous antimicrobial treatments, biofilm research is receiving more attention. The nature of interactions between bacteria and host is complex and bacteria play an important role in human life from beneficial to pathogenic. Certainly, years of research has already revealed new targets for antibiofilm therapy, a continued research is needed to develop optimal disinfection procedures to prevent biofilm formation like, triggering the dispersal of the biofilm or looking into ways of preventing the early formation, by re-engineering the surfaces they are prone to develop upon such as urinary catheters and implants.

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