



Breaking Down Biofilms

A biofilm is a colony of microorganisms encapsulated in an extracellular polymeric substance (EPS) matrix that allows for adhesion to a wide variety of surfaces.¹ Microbes in biofilms can experience key survival benefits over planktonic (free-floating) microbes.² How do biofilms impact patient care?

What organisms are commonly associated with biofilm formation?

Numerous species can produce biofilms. However, the most frequently observed biofilm-producing microbes include *Staphylococcus aureus*, *Staphylococcus epidermidis*, *Streptococcus viridans*, *Enterococcus faecalis*, *Escherichia coli*, *Klebsiella pneumoniae*, *Proteus mirabilis*, *Pseudomonas aeruginosa*, and *Candida* spp.^{2,3} Different foci of infection may feature different common causative organisms relating to local flora (e.g., *Staphylococcus* spp. colonizing an IV catheter; *P. mirabilis* colonizing a nephrostomy tube).

How can biofilms impact treatment?

Biofilm formation can enhance microbe survivability through many complex mechanisms including immune evasion and increased antimicrobial resistance. Hypothesized mechanisms of resistance in biofilms include EPS matrix limiting antimicrobial penetration of antimicrobials and the inoculum effect where a high density of microbes exist relative to low concentration of antimicrobials.¹ For example, one *in vitro* study demonstrated that the concentrations of some antibiotics needed to eradicate bacteria in biofilms were up to 1000-fold higher than [minimum inhibitory concentrations](#) (MIC)s of the same bacteria when not in a biofilm.³ Through the inoculum effect, the *in vivo* MIC is effectively much higher than the *in vitro* MIC.

Because of the above issues, antibiotics therapy alone may not be sufficient for management of infections associated with biofilms, especially with infections involving implanted prosthetic material. In these cases, removal of biofilm is often necessary for clinical success. For example, guidelines for catheter related bloodstream infections and prosthetic joint infections indicate that surgical management may be necessary for patients with persistent infection.^{5,6}

Key Takeaway: Infections involving biofilms are challenging to treat with antibiotic therapy alone and highlight the importance of concomitant source control, when clinically indicated.

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