
Biofilms in Medicine
By
Claudia Dreszer
Susanne Sperling
Mauro Tavian

Content of the Presentation

- What is a biofilm
- Biofilms in medical devices
- Involved microorganisms
- Biofilm associated infections
- Plaque
- Endocarditis
- Urinary tract infecton

What is a Biofilm?

- A community of microorganisms attached to a surface
- Most enviromental biofilms contain multiple species
- Pathogens in biofilms can cause human and animal infections

Where do biofilms in medical devices occur?

- Contact lenses
- Central venous catheters
- Endotracheal tubes
- Intrauterine devices
- Mechanical heart valves
- Pacemakers
- Dialysis catheters
- Urinary catheters
- Voice protheses

Microorganisms commonly found on medical devices

- *Staphylococcus*
- *Streptococcus*
- *Enterococcus*
- *E. coli*
- *Klebsiella*
- *Pseudomonas*

Bacteria may originate from the skin of the patient, or a healthcare worker and tap water

To dentists and doctors, biofilms are more than an eyesore. They are expensive, destructive and sometimes deadly…

Cartoons: T. Thiessen

Chronic infections with biofilm association

- Plaque
- Infectious Bacterial Endocarditis
- Urinary tract infections
- Cystic Fibrosis
- Staphylococcus Osteomyelitis
- Middle Ear Infection
- Chronic Prostatitis
- Infectious Kidney Stones

Plaque

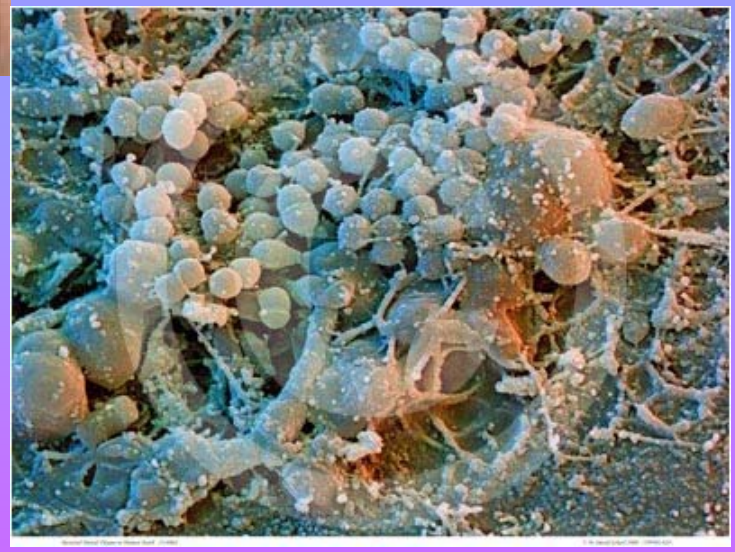
- Dental plaque is probably the most common biofilm found in humans
- Dental plaque is a general term for the diverse microbial community (predominantly bacteria) found on the tooth surface, embedded in a matrix of polymers of bacterial and salivary origin.

Effects of Plaque

The predominant bacteria found on tooth surface are Streptococcus, Actinomyces, Nesseira, Anaerobic rods.

These bacteria are able to ferment carbohydrates to organic acids which dissolve the mineral part of the teeth. The organic part of the teeth is destroyed directly.

Disgusting teeth



Microscopic picture of Plaque

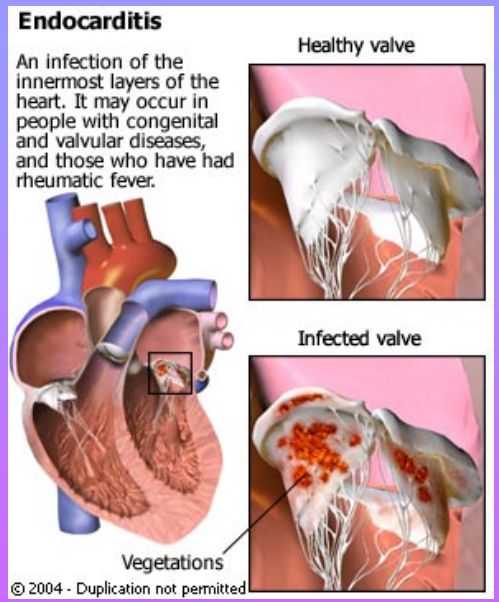
Infectious Bacterial Endocarditis

- Endocarditis occurs when bacteria enter the bloodstream and attach to a damaged portion of the inner lining of the heart or abnormal heart valves. Not all bacteria entering the bloodstream are capable of causing endocarditis. Only those bacteria that are able to stick to the surface lining the heart and abnormal valves tend to cause endocarditis.
- Endocarditis most often occurs in people with preexisting heart disease.

Endocarditis

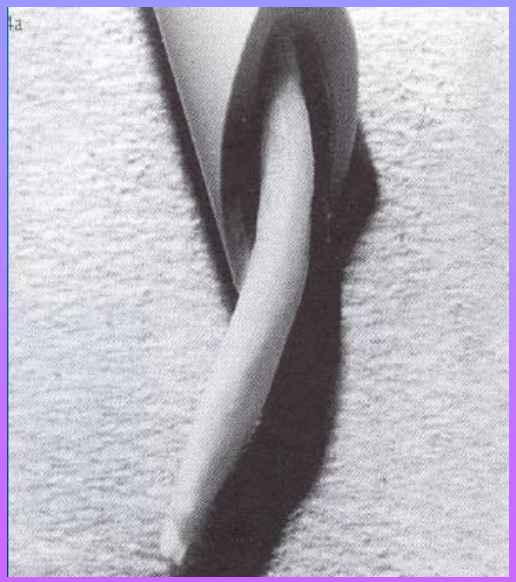
- Pathogens causing Endocarditis: *Streptococcus sanguis*, *Streptococcus mutans* ,*Staphylococcus aureus*

Infected heart



Catheter-Associated urinary tract infection

- All patients receiving long-term catheterization (>28 days) become infected
- Biofilms forming on the surface of indwelling devices act as a source of acute infection



Gross deposit of biofilm overlayed with inflammatory cells and erythrocytes

Catheter-Associated urinary tract infection

- Because of the indwelling catheter there is allways bacteria in the urine.
- The catheter provides a direct pathway for the bacteria to enter the bladder.
- If the catheter becomes blocked by biofilms urinary tract infection can be caused.

Conclusion

- These are only a few examples of biofilms in medicine and the infections they cause.
- Microbial biofilms definetely show a public health problem.
- Unfortunately microorganisms in biofilms are difficult or impossible to treat.