

EDUCATION

STERIS UNIVERSITY



Biofilm's Threat To Patient Safety

One Integrated Approach to Healthcare

STERIS
Instrument Management Services *fms*

Credentialing

- STERIS Corporation is an approved provider of continuing nursing education by the California Board of Nursing (CERN) – provider # CEP 11681, and an approved Administrator Education Unit (AEU) provider by the Board of Ambulatory Surgery Certification (BASC) – provider # 1417.
- This program is approved by CERN, Certified Board for Sterile Processing and Distribution (CBSPD), International Association of Healthcare Center Service Material Management (IAHCSMM) for:
 - **1** contact hour(s) of continuing education credit;
 - **0** AEU(s) – BASC; and
 - **0.33** hour(s) of GI Specific content credit by the American Board of Certification for Gastroenterology Nurses (ABCGN).
- Participants must be present for the entire presentation/seminar to achieve successful completion and receive continuing education credit; partial credit will not be given.

Disclosures

- STERIS Corporation is providing the speakers and continuing education credits for this activity. Presenters are employees of STERIS Corporation and receive no direct compensation other than their normal salaries for participation in this activity.
- Commercial products referred to or seen during this presentation do not constitute a commercial support by the speakers.



Objectives

Upon completion of this program, you will be able to:

- Identify the stages of biofilm that may be impacted your core job functions.
- Discuss complications arising from the presence of biofilm.
- Describe cleaning and disinfection practices which will ensure patient safety through the elimination of biofilm.

Biofilm is Not New

- Fossil records
3.25 billion years old
- Medieval remedy for MRSA ~ 1900
- Concept of bacterial biofilm development ~ 1936

What is Biofilm?

A thin coating containing biologically active organisms that have the ability to grow in water, water solutions, or in vivo (organisms) that coat the surface of structures.

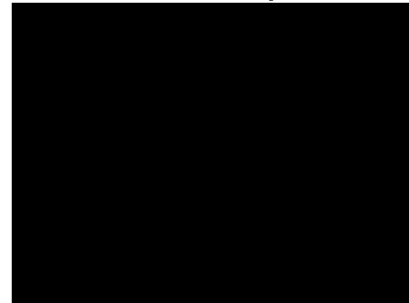
They contain viable and non viable micro-organisms (bacteria, archaea, protozoa, fungi & algae) that adhere to a surface and are trapped within a matrix of organic matter preventing antimicrobial and/or antifungal agents from reaching the soil.

AORN 2017

Influencers of Biofilm Formation

- Time of bacteria adherence to surface
- Number & types of cells in liquid
- Flow rate of liquid on or through a device
- Physical characteristics of device's surface
- Chemical characteristics of device's surface
- **You!**

Biofilm Development

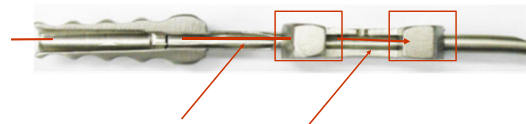


The Biofilm Threat

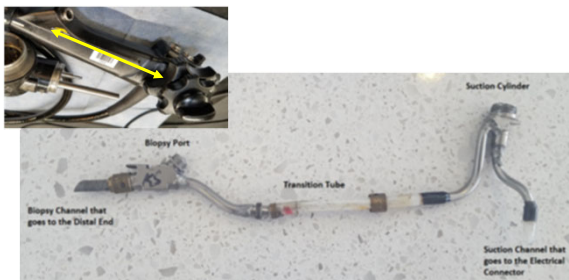
- Immune system keeps in check
- ↓ Immune system ↑ growth
- NIH - 80% of all human microbial infections are due to biofilm
- CDC – 70% of all human microbial infections are due to biofilm
- Endoscopes most susceptible medical device

The Biofilm Threat, continued

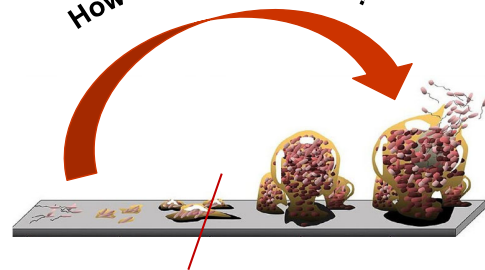
Wet and/or devices with lumens are problematic



The Biofilm Threat, continued



How long does it take ?



Biofilm Associations Thrombotic 38% ~ Infections 25%

Isolated From

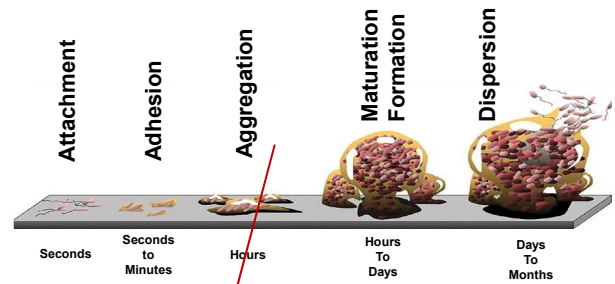
- Artificial voice prostheses
- Central venous catheters
- Intrauterine devices
- Artificial joints
- Prosthetic heart valves
- Urinary catheters
- Endoscopes

Microorganisms

- *Candida albicans*
- *Enterococcus*
- *Klebsiella pneumoniae*
- *Pseudomonas aeruginosa*
- *Staphylococcus aureus*

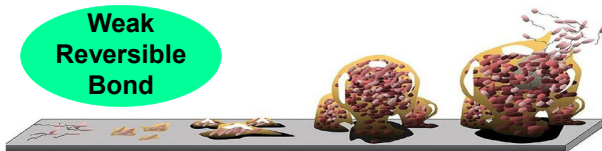
CDC

Stages & Timeline of Biofilm Development



Influence of Time

Weak
Reversible
Bond



Strong Non-reversible Bond

Within Seconds ~ Attachment Reversible Attachment of Bacteria



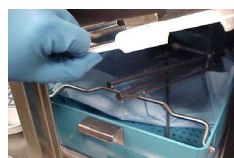
AORN

Care of Instruments
RP IV: Instruments should be kept free of gross soil during surgical procedures.



RP V: Cleaning and decontamination should occur as soon as possible after instruments and equipment are used.

Within Seconds to Minutes ~ Adhesion



AORN: Care of Instruments

RP V.f - Instruments should be treated with an instrument cleaner according to the instrument or device manufacturer's recommendation before transport. This facilitates the efficiency and effectiveness of cleaning. It reduces the potential for corrosion, rusting, and pitting by debris, and limits the potential for lumens to become obstructed by organic material.

Handicaps

- Culture
- Average cost of OR time is \$60/minute
- Room turn time metric
- Tray reconciliation

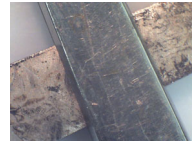
**Within Hours ~ Aggregation
~ Growth and Division of Bacteria**



AORN: Care of Instruments

RP VI - Contaminated instruments must be contained during transport and should be transported in a timely manner to a location designated for decontamination.

**Within Hours to Days ~
Maturation Exopolymer & Biofilm Production**



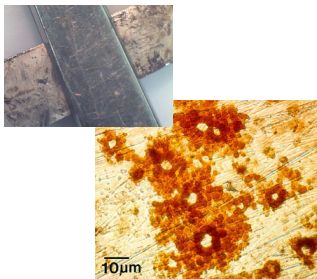
Scratches



Rust

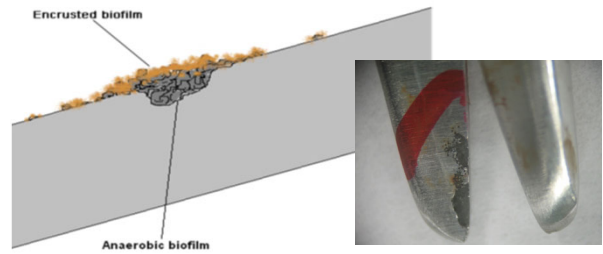
RP VI.e - Removal of organic material from instruments becomes more difficult after the debris has dried. Blood and body fluids that have dried on the instruments are hard to remove, can cause continuing surface erosion damage (i.e., pitting) overtime, and can inhibit sterilization.

Microscopic Image

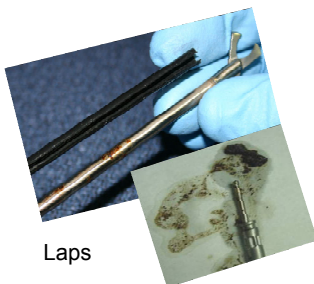


- Box-lock areas
- Fractures
- Pitted areas
- Rusted areas
- Interlocking areas

**Within Hours to Days ~
Maturation Exopolymer & Biofilm Production**



Days to Months ~ Dispersion



Kerrisons



Laps

Days to Months ~ Dispersion, continued



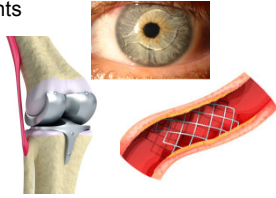
Case Carts



Casters

Colonization > Tenacious Infection Increased Prevalence of Artificial Technology

- Aging population
- Scientific & engineered enhancements
- Implants, joints
- Intra ocular lenses
- Catheters
- Artificial mechanical valves



Bacterial Resistance

- 1000 times more resistant to antibiotics
- Standard antimicrobial therapy useless
- Infections slow to grow but persist
- Implants colonized by microorganisms
- Implant removal often necessary

What Problems Do Biofilm Cause?

- Otitis media, gingivitis, tonsillitis
- Urinary tract infections
- Endocarditis, infected heart valves and septicemia
- Mucosal and systemic infections
- Immuno-compromised are most susceptible

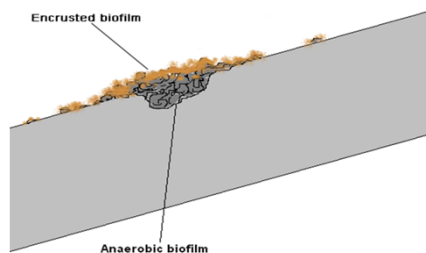


Wound Issues

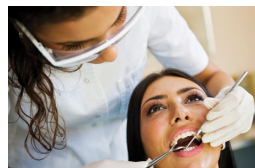
- Diabetic
- Decubitus
- Feeding Tubes



Anaerobic and Aerobic Biofilm



How are these alike?



This should remind you of this.

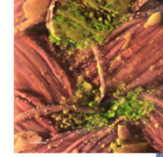


Endemic Contaminated Incoming Water, continued



Laundry Quandary

- ANSI/AAMI ST 65
- AORN 2017
- Launder 140° F
- *Acinetobacter*
-  Home Laundry



Miscellaneous

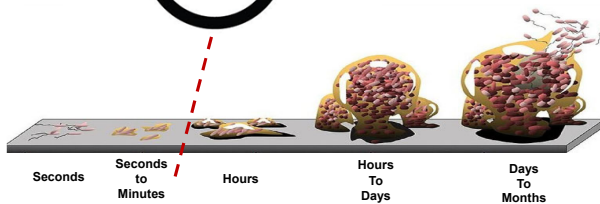
- Clean & maintain scrub brushes
- Connection/irrigation tubes should be dry
- Lotion and soap containers should not be refilled



Action Plan

- Perform assessment
 - Water quality
 - Determine flow dynamics
 - Correlate practice to IFUs
- Update protocols
- Verify competencies
- Follow protocols
- Perform maintenance

Communication and Cooperation



References

- American National Standards Institute/Association of the Advancement of Medical Instrumentation. (2013). ANSI/AAMI ST65: 2008/(R) 2013 Processing of reusable surgical textiles for use in health care facilities.
- Association of periOperative Registered Nurses. (2017). Guidelines for perioperative practice. Denver, CO: Author.
- Association for the Advancement of Medical Instrumentation. (2013). ANSI/AAMI ST79:2010 & A4 comprehensive guide to steam sterilization and sterility assurance in health care facilities. Arlington, VA: Author.
- STERIS University. (2015). Now Playing: Biofilms - The Good, the Bad, and the Ugly. Mentor, OH: Author.

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