Substrate Material Effects On Biofilm Formation

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Biofilms are responsible for persistent implant infections

- **3.6 million implants**
- **4%** of implants: biofilm infection
- **$5 billion**

https://www.youtube.com/watch?v=0DSA_8t4-UA


https://www.a2ztaxcorp.com/hospitals-get-tax-notices-for-medical-implants/attachment/1513080308/


Current prevention strategies face implementation and efficacy limitations

**Drug eluting surface**

**Antimicrobial/antiadhesion coatings**


Thermal treatment of biofilms can be an effective alternative

- Heated media immersion
- Alternating Magnetic Field (AMF)
- Thermoelectric device (TEC)
- Electro resistive devices

Each heat treatment method requires biofilm culture on different substrate materials.

- Frosted glass microscope slides
- Iron Oxide Coating
- Stainless steel
- Polystyrene (PS)
- Glass coverslips
- Aluminum foil tape
Aim: Determine the effect of the substrate material on biofilm population density

Pseudomonas Aeruginosa PA01 stock

Inoculum ≈10⁹ CFU/ml

24 h
37°C

4-well dish: 18.75 cm²/well
5 ml TSB/well

160 rpm

96 h
37°C

Shaker Table

Enumeration

Frosted Glass Slides

Fe₃O₄- toluene/ (PS) resin coating

Stainless steel coupons
Aim: Determine the effect of the substrate material on biofilm population density

Pseudomonas Aeruginosa PA01 stock

Inoculum $\approx 10^9$ CFU/ml

Fulcon tubes on TEC 5.7 cm$^2$ 5 ml TSB

Shaker Table

Enumeration

Aluminum foil tape

Glass coverslips

(PS)
Changing the substrate material does not affect the biofilm population density.

Biofilm culture in 4-well dishes:
- Frosted glass slides
- Iron Oxide Coating
- Stainless steel coupons

Biofilm culture in fulcon tube on TEC:
- Glass coverslips
- (PS) coating
- Aluminum foil tape
To sum up...

- Biofilms infections on medical implants: a great concern
- Failure of current prevention/treatment methods
- Alternative: heat treatment
- Need for different substrate material
- Changing the substrate material does not affect the biofilm population density

Future goal...

- Method for delivering the heat shock
- Temperature of the heat shock
- Time duration of the heat shock
- Substrate material
Thank you!