Inducing dispersion from *Pseudomonas aeruginosa* biofilms via heat shocks

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Virtual Research Open House, College of Engineering
November 5, 2020
INFECTION OF MEDICAL DEVICES IS A SERIOUS PROBLEM

- Increased hospitalization
- Additional surgical procedures
- Replacement of medical devices
- Cumulative cost of over $5 billion

O'Toole et al., Biofouling (2015) 31: 665-675
What is the cause of robust infections?

Microbial Biofilm Lifecycle

- Planktonic
- Attachment
- Growth
- Maturity
- Dispersion
• Thermal treatment of biofilms at mild temperatures is a promising strategy for elimination of infections.

• The long goal of our research is to develop a therapeutic technique that would use remote and localized heat shocks to mitigate biofilm infections on implanted devices.
Combining heat shocks and antibiotics enhance biofilm elimination. But how?
1- Feed (Nutrient media 3gm/L)  
2- Peristaltic pump  
3- Flow cell (1” X 1” X 6”)  
4- Biofilm on a heating element  
5- Sampling valve  
6- Effluent  
7- Power supply  
8- LabVIEW (temperature control software)
Biofilm was exposed to a constant flow of media to establish a baseline population.
RESULTS

Once the population baseline was established after 40 min, heat shock was applied at 70°C for 5 min.
Heat can not only eradicate biofilms directly; it can have them dispersed and vulnerable to antibiotics.

Combining thermal shocks and antibiotics enhances biofilm elimination.
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Funding Support  
• American Heart Association, 18IPA34170108  
• Center of Biocatalysis and Bioprocessing  
• University of Iowa Department of Chemical and Biochemical Engineering
Biofilm Lifecycle

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Individual microbes → Biofilm Development

Heat → Antibiotics