



# Reducing The Spread of Aquatic Invasive Species Through The Optimization of Coating Additives

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## Background

### Aquatic Biofouling

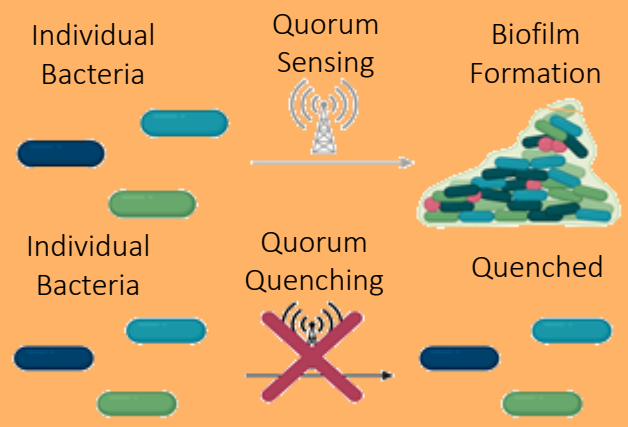


Biofouling Problems:

- Increased drag
- Biocorrosion
- Increase spread of aquatic invasive species (AIS)
- Current control methods are toxic

## Quorum Sensing (QS), Quorum Quenching (QQ) and Biofilms

- Microbes form a biofilm by communicating with each other, called Quorum Sensing. This process can be halted via Quorum Quenching



## Biofouling is Increased by Bacterial Biofilms

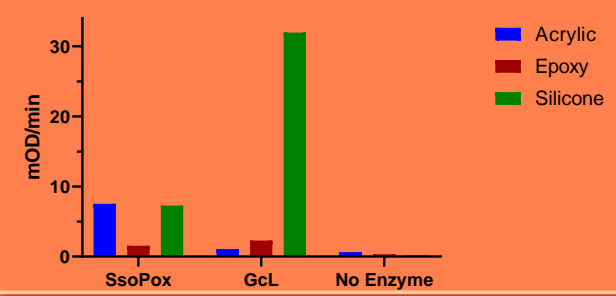
1. Bacteria attach to a surface and begin to grow
2. Bacterial biofilms allow for easier attachment of macroorganisms
3. Macroorganism community increases



## Quorum Quenching is Active in Different Coatings

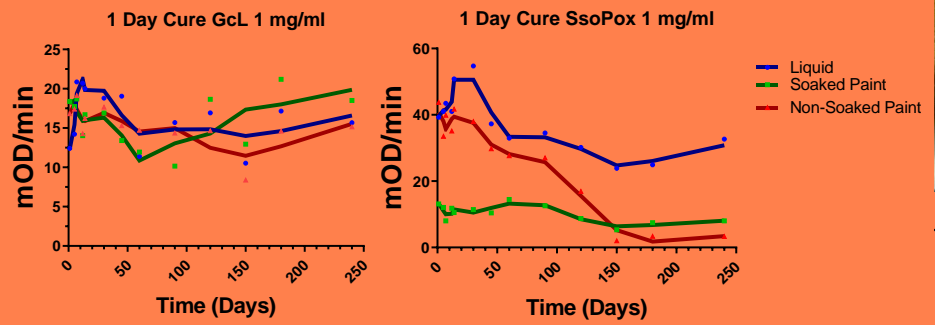
- Quorum Quenching Enzymes SsoPox and GcL still possess QQ activity when added to different coatings.
- Activity varies from each coating.

Enzyme Activity In Different Coatings (1mg/ml)



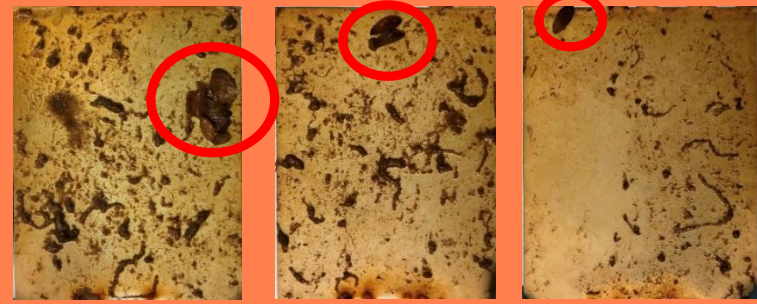
## Experiments

### Enzyme Additives Remain Active For Many months in Acrylic Paint



- QQ enzymes have activity for several months after being added to acrylic paint.
- GcL shows relatively consistent activity, while SsoPox does lose activity over time.

## Paint Additives Reduce Zebra Mussel Attachment



Inactive Proteins      Copper      QQ Protein

- Various additives were mixed into acrylic paint and applied to plastic coupons.
- These coupons were placed in Lake Minnetonka for several months to examine the number and size of Zebra Mussels attached to the coupon

## Conclusion

With the successful addition of QQ enzymes into various aquatic coatings, we hope to provide an alternative for the prevention of biofouling and spread of aquatic invasive species. While also being a more eco-friendly solution compared to what is currently being used.

\*Conflict of Interests: Mikael Elias is the co-founder and equity holder of Gene&GreenTK, a company that holds the license to the patent WO2014167140 A1. These interests have been reviewed and managed by the University of Minnesota in accordance with its Conflict of Interest policies. The remaining authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

