Characterizing the Influence of Temperature on Microplastic Uptake and Depuration in Eastern Oysters, *Crassostrea virginica*

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Background

- Microplastics (MPs) are a contaminant of emerging concern.[1]
- Microplastic particles, including tire wear particles, fragments, and fibers, can be easily consumed by filter feeders like the Eastern oyster (*Crassostrea virginica*) (Figure 1).
- Previous research has found that plastic exposure may adversely affect oyster immune function and reproduction.[3,4]
- Despite the concurrent rise of global temperatures, little is known about how temperature impacts microplastic uptake and depuration in oysters.
- Increased temperatures may decrease pollution tolerance.[2]

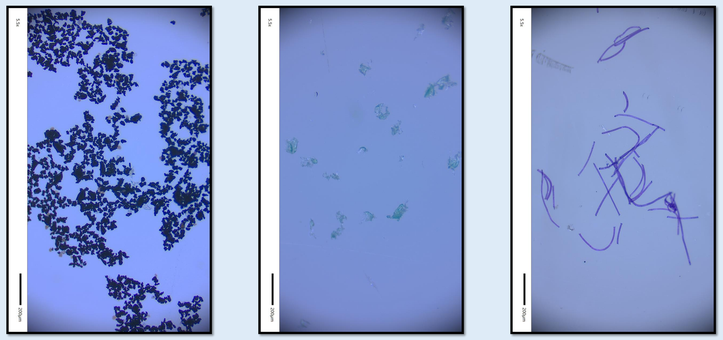

Figure 1. From left to right: Tire wear particles, MP fragments, and MP fibers.

Methods

- Oysters will be randomly assigned to one of three temperature groups: 20°C, 24°C, or 28°C
- Oysters in each temperature group will then be randomly assigned to microplastic uptake periods of 0, 24, 48, or 96 hrs.
- Some oysters assigned to the 96 hr depuration period will be randomly assigned to one of three depuration periods (Figure 2).
- Oysters will be sacrificed and microplastic counts will be compared among groups.
- The toxicokinetics of uptake and depuration will be modeled.

Objectives

1. Quantify the effect of temperature on microplastic uptake and depuration in the Eastern oyster.
2. Model microplastic uptake and depuration in Eastern oysters exposed to different temperatures.

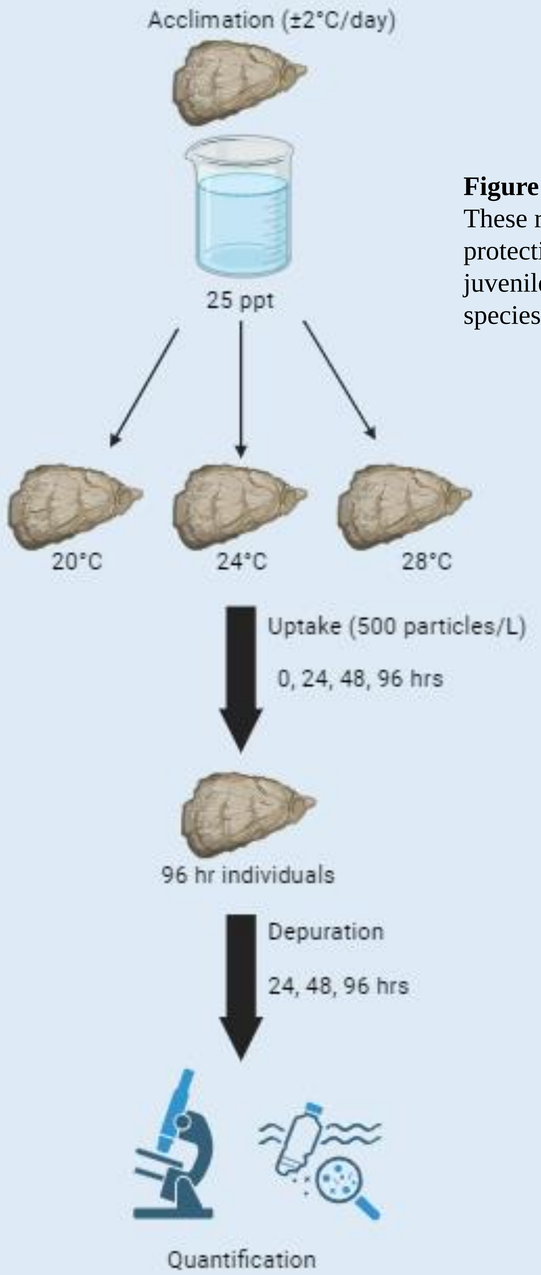

Figure 2. Diagram of proposed experimental design.

Significance

- Oysters provide vital ecosystem services such as nursery habitat, erosion control, and natural filtration systems (Figure 3).
- Consumption of oysters may be a vector for microplastic bioaccumulation and human microplastic exposure.
- This experiment will help elucidate the potential impact of increasing ocean temperatures on microplastic uptake in oysters.

Figure 3. An oyster reef. These reefs provide shorelines protection from erosion and juvenile habitat for many fish species. Image from VIMS.

Works Cited

1. Hale, R. C., Seeley, M. E., La Guardia, M. J., Mai, L., & Zeng, E. Y. (2020). A Global Perspective on Microplastics. *Journal of Geophysical Research: Oceans*, *125*(1), e2018JC014719. https://doi.org/10.1029/2018JC014719
2. Lannig, G., Flores, J. F., & Sokolova, I. M. (2006). Temperature-dependent stress response in oysters, Crassostrea virginica: Pollution reduces temperature tolerance in oysters. *Aquatic Toxicology*, *79*(3), 278–287. https://doi.org/10.1016/j.aquatox.2006.06.017
3. Scanes, E., Parker, L. M., Seymour, J. R., Siboni, N., King, W. L., Danckert, N. P., Wegner, K. M., Dove, M. C., O'Connor, W. A., & Ross, P. M. (2021). Climate change alters the haemolymph microbiome of oysters. *Marine Pollution Bulletin*, *164*, 111991. https://doi.org/10.1016/j.marpolbul.2021.111991
4. Sussarellu, R., Suquet, M., Thomas, Y., Lambert, C., Fabioux, C., Pernet, M. E. J., Le Goïc, N., Quillien, V., Mingant, C., Epelboin, Y., Corporeau, C., Guyomarch, J., Robbens, J., Paul-Pont, I., Soudant, P., & Huvet, A. (2016). Oyster reproduction is affected by exposure to polystyrene microplastics. *Proceedings of the National Academy of Sciences*, *113*(9), 2430–2435. https://doi.org/10.1073/pnas.1519019113