Microplastic invasion may be taking over our ecosystems.

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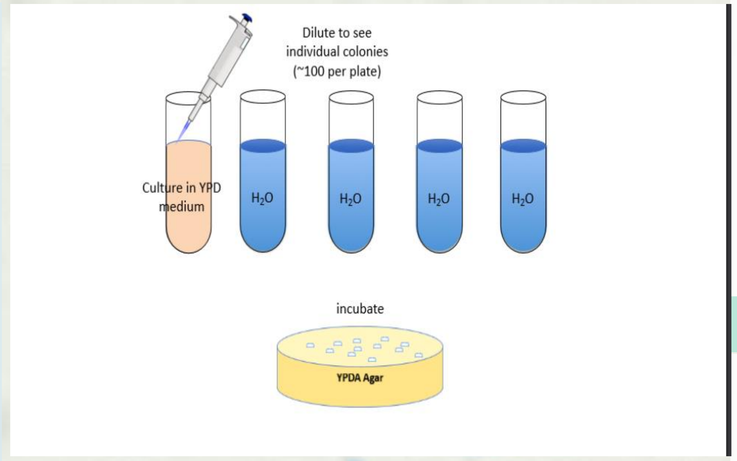
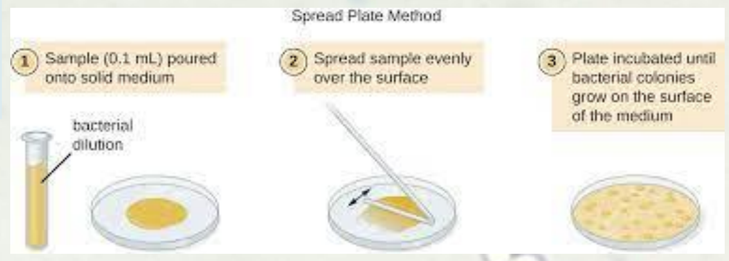
Introduction

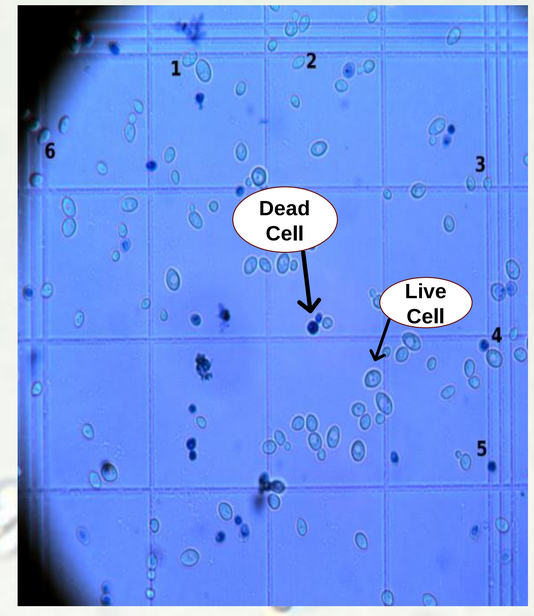
One of the most prominent classes of non-natural products made by humans which have pervaded the earth's environment are plastics. Microplastics (MPs) are <5mm in size and are commonly found in terrestrial and marine environments. MPs exposed to the natural environment experience UV aging, causing brittleness that can lead to the formation and release of even smaller particles. This UV-aging process allows for easier migration, adsorption, and accumulation of plastic pollutants further affecting the biosphere. Our study examined whether the growth and the viability of *Saccharomyces cerevisiae,* a model organism commonly known as baker's yeast , would be altered by exposure to MP and UV-aged MPs.

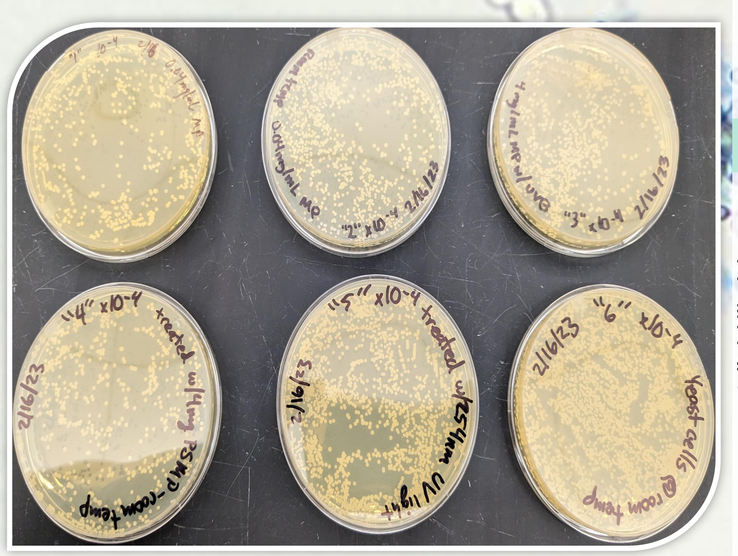
Methods

- Prepare 6 test tubes containing 10 mL of YPD media with two different concentrations of MPs with and without UV treatment and yeast cells.
- Measure yeast viability with methylene blue assay every 2hr for 6hr of incubation at 30 degrees C.
- Dilute yeast cells by serial dilution and plate dilutions onto YPDA plates. Incubate plates for 24-48 hours
- Count number of colonies on 'countable' plate containing 30-300 colonies.
- To quantify the effect of MP and UV-aged MP on cell division and viability of *S. cerevisiae* we calculated Colony Forming Units/mL (CFUs) by dividing the number of colonies by the amount plated multiplied by the dilution factor.









Results and Analysis

Colony Forming units (CFU) of Yeast upon Exposure to 0.04mg/mL microplastics with and without UV treatment

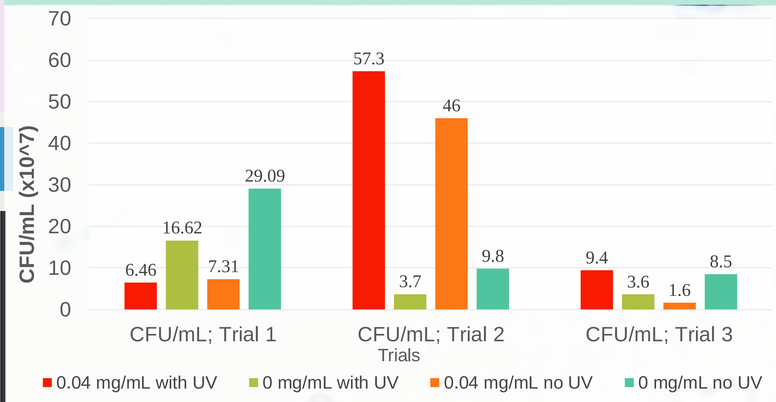


Figure 1. *S. cerevisiae* exposed to 0.04 mg/mL MPs showed reduced cell growth in trial 1 & 3 only, also trial 1, the UV-aged MPs reduced growth compared the controls. UV-treatment didn't inhibit cell growth in all trials compared to controls.

Colony Forming units (CFU) of Yeast upon Exposure to 4mg/mL microplastics with and without UV treatment

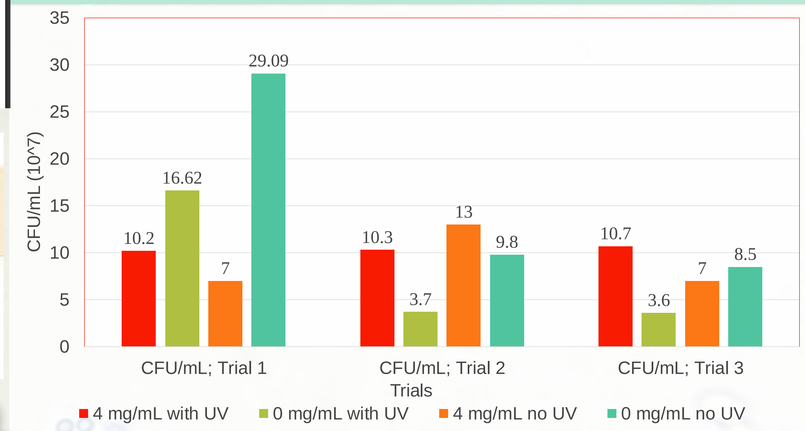


Figure 2. *S. cerevisiae* exposed to 4 mg/mL MPs & UV-MPs showed reduced cell growth in trial 1, but no notable reduction in trial 2 & 3 when compared to it's control. In all trials, UV-treatment showed insignificant inhibition on cell growth compared to control.

Trial 1 Cell Viability of 4mg/mL Microplastics With and Without UV Treatment

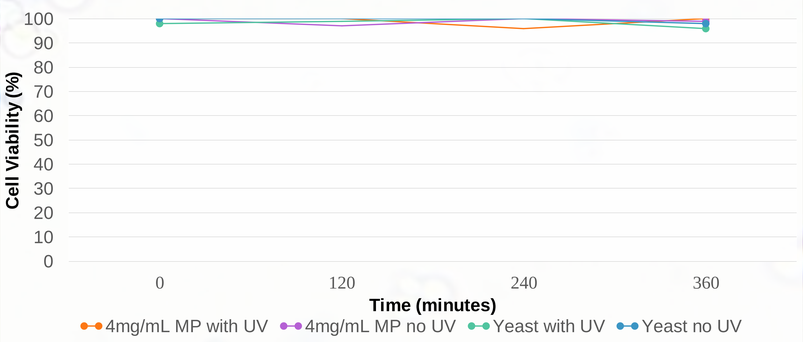


Figure 3. *S. cerevisiae* exposed to 4 mg/ml microplastics with and without UV treatment shows no decrease in cell viability.

Our results show that both low and high concentrations of MPS inhibited yeast cell division for trial 1 (Figures 1 & 2). For trials 2 and 3 MP seemed to increase yeast cell growth . Cell viability was not affected by MPs and UV-aged MP across all three trials.

Conclusion

Findings suggest that microplastics exposure negatively impact eukaryotic cell division. A correlative study tested the effects of PS-MP on micro-algae, yeast, and bacteria proportional to its increasing concentrations and size. They analyzed that the inhibition on cell division was attributed by the cell surface's absorbance and blockage with PS-MP at transporters which reduced uptake of CO_2 and light (fundamental for photosynthetic organisms). Uv exposure had little to no effect on cell proliferation. Moving forward we would like to

- Treat *S. cerevisiae* with microplastics for a longer span of time
- Expose microplastics to UV treatment for an extended period.
- Use various kinds of microplastics

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Acknowledgements

This research was done at the Lake Washington Institute of Technology. We would like to express our appreciation to Dr. Kimberly McClure for her help and instruction.

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