Effects of Microplastics and Pharmaceuticals on Zebrafish Fitness

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Introduction

- A problem which has found its way into the Earth's waterways is microplastics and pharmaceuticals.
- A study conducted by PennEnvironemtal Research & Policy Center talks about the dangers of microplastics and says that by 2050 there could be more microplastics in our oceans than there are fish (Savitz et al. 2021).
- In addition, water treatment plants do a poor job of removing pharmaceuticals from water and these pharmaceuticals are being found in Earth's waterways.
- The purpose of the experiment was to see how microplastics and pharmaceuticals effect the fitness of fish

Background Information

- Both microplastics and antibiotics are two classes of emerging contaminants and it's proposed that they have a negative impact to the aquatic ecosystem (Li et al. 2018).
- A study looking at how microplastics effect aquatic life, found that three out of the four fish species, excluding the crucian carp, had ingested microplastic particles in the exposure experiment (Roch et al. 2020).
- A study looking at pharmaceuticals found fish treated with 3µg/mL fluoxetine for 3 hours had a significant decrease in broadside display within 10 cm of the mirror (P=0.015) and a significant decline in 90° turns (P=0.003) during the trial period compared to control conditions (Lynn et al. 2007).
- Although, both pharmaceuticals alone were harmful to the fish in low ppm range, the mixture of both antibiotic and microplastics were found to be more harmful than just antibiotics alone (Prata et al. 2018).

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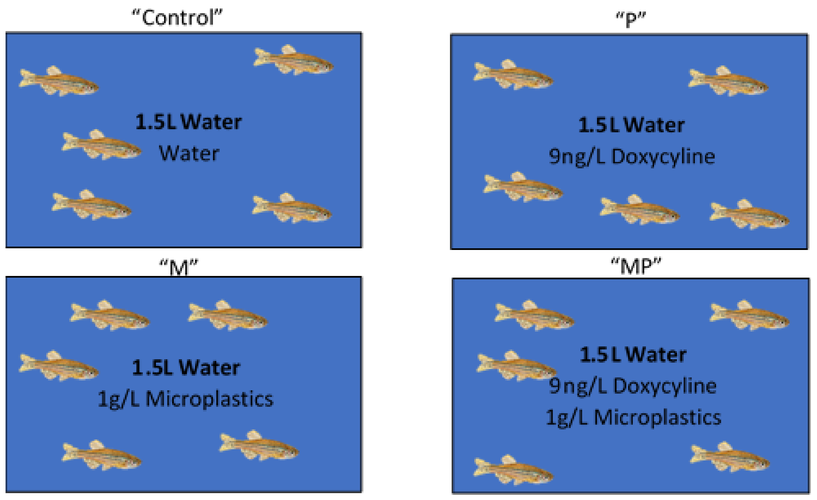
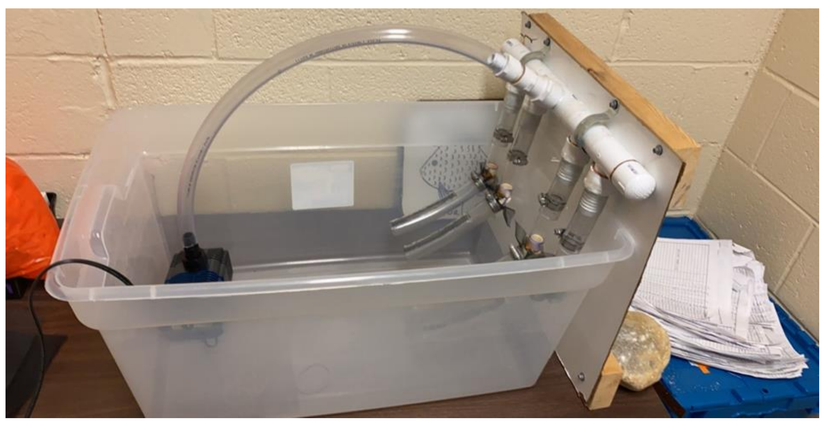
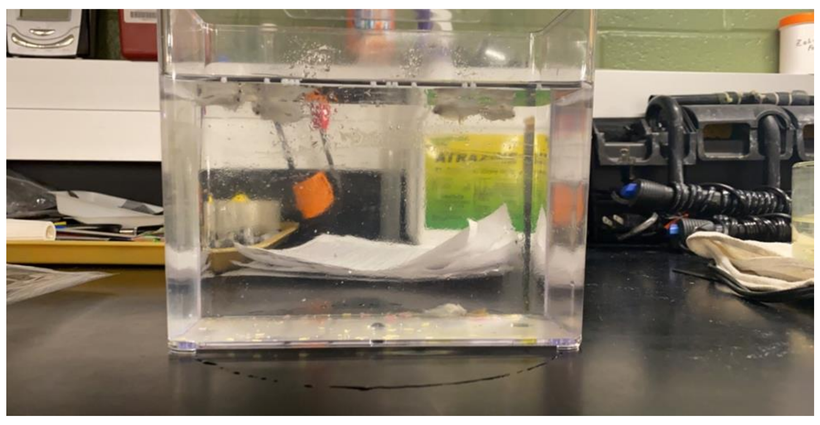
Methods

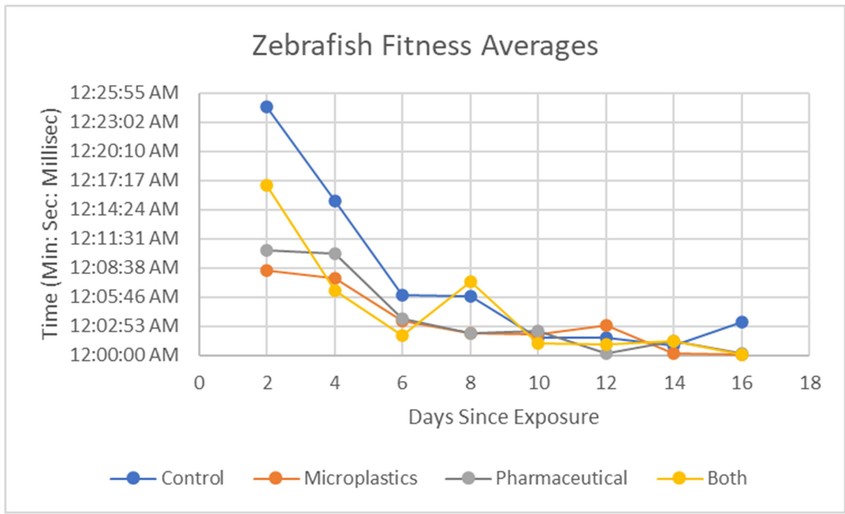
- All fish had a 2-day acclimation period
- Fish were fed every day (~100mg/L fish food)
- Changed water twice a week
- Tested by using apparatus depicted below
- 4 fish were tested at a time and timer stopped when fish hit net
- Changed experiment after 4th day, started noting size of fish and only used fist 2 tubes

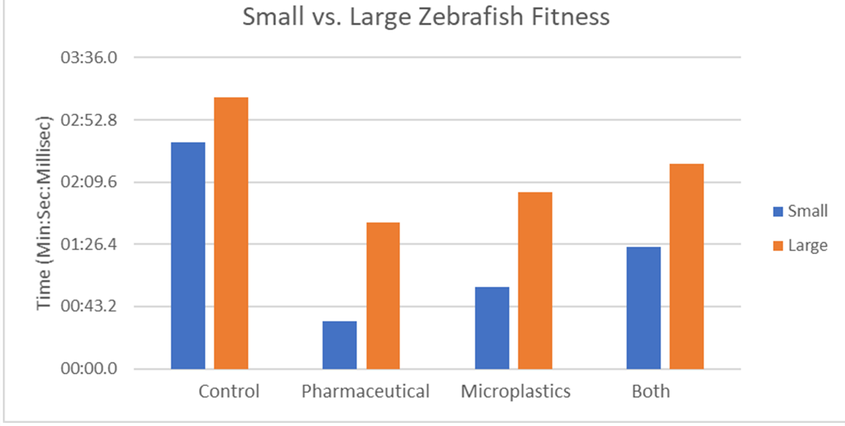






Results





Conclusion

- Although no statistical difference was found, a clear trend during the first six days can be observed from the scatter plot
- In addition, the p-value between large and small fish was 0.07, meaning larger fish were able to swim longer than smaller fish
- One theory is the microplastics absorbed the pharmaceutical, which is why "Both" in the scatterplot was above the microplastics and pharmaceutical alone.
- Additional research must take place to see how microplastics and pharmaceuticals are effecting fish fitness