The Effect of Replacing Surfactants With Fossil Fuel Free Alternatives on the Toxicity of Ceriodaphnia dubia

Shields, Emma (School: Jackson Senior High School)

Imagine aquatic life like fish, crawdads, and tadpoles dead on the side of the creek bed. What we dispose of into our waterways matters. Filling the water with surfactants from products like detergents is harming the animals that live in the waters. Right now fossil fuel petroleum is being used as the surfactants in original types of detergents. The addition of this fossil fuel is creating a toxicity issue for living organisms. This experiment was designed to try and provide a possible solution to this problem. Alternative surfactants that are considered to be fossil-fuel-free are being added to the detergents in hopes of decreasing the amount of damage humans are doing to the aquatic ecosystems. In my experiment, I decided to test the original detergents containing 100% petroleum-based fossil fuels against the fossil-fuel-free detergents that contain plant-based surfactants. This test was run to determine if the alternative detergent was safer for Ceriodaphnia dubia to live in. Through my research, I have found that the fossil-fuel-free detergents had a small effect on the mortality rate of the water fleas compared to the original detergents. I calculated the average LC50 for the original detergents and the eco-friendly detergents and found a 0.45mg/L LC50 difference between the two categories of detergents. This means that, overall, the fossil-fuel-free detergents decreased the mortality rate of the Ceriodaphnia dubia by 3.85%. When running a hypothesis test I determined my null hypothesis was not statistically significant because my p-value, .4452, was greater than .05. Even though I got this result, I still believe that this should be studied further because the water in ecosystems is becoming more polluted over time.

Awards Won: