The Effect of Carboxymethyl Cellulose on the Filtration Capabilities of Zebra Mussels

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Dreissena polymorpha, commonly known as the Zebra Mussel, is a highly invasive species of bivalve. D. polymorpha has been responsible for the alteration of natural American waterways and the extinction of dozens of native species in addition to millions of dollars of damage annually. D. polymorpha possesses a powerful siphoning and filter feeding system, allowing a single mussel to filter up to 2L of water per day. Carboxymethyl cellulose (CMC) is a common food additive due to its thickening capabilities and coagulating nature. This chemical has GRAS (Generally Recognized As Safe) certification by the FDA and is naturally biodegradable, making it the choice chemical for this experiment. During this experiment, 12 sets of 12 mussels were exposed to different CMCs at different concentrations for 30 minutes before being resubmerged in lakewater. After the effects had been measured, the same mussels were exposed to their respective CMC solution for 2 days as it slowly dissolved into the surrounding water, much like how CMC would act if deposited onto a bed of mussels in a lake. The mussels exhibited behavioral changes during the 30 minutes of exposure but returned to normal after being resubmerged in lakewater. 2 day exposure yielded significant behavioral changes persisting during the entire trial. CMC did not effectively kill any mussels during either of these two tests. Using the two CMC solutions that yielded the largest behavioral changes, a chronic exposure test was conducted. Over the 6 repetitions, each lasting 6 days, the number of mussels actively siphoning decreased to around 16% and over half of the mussels were observed to be deceased at the end of the 6 days.

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