Tracking Microplastics through a Food Chain to Determine the Effectiveness of Plastic Biodegradation in Mealworms

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By 2050, there could be more plastic in the ocean than fish (Parker, 2018a). This inspired me to research the mealworm as a possible solution to the global plastic problem. My goal was to determine if mealworms (Tenebrio molitor) can biodegrade plastics, and if those plastics would transfer along a food chain. This study may be one of few to examine this. I fed polystyrene to mealworms, and fed the mealworms to crayfish (Orconectes sanbarnii). Crayfish organs and excrement went through a chemical digestion process that I designed. I found microplastics in the crayfish gastrointestinal (GI) tract but found significantly more in the excrement. This indicates that mealworms might not metabolize all the plastic they consume. Crayfish health was not affected by plastic ingestion. Unexpectedly, plastic microfibers from unknown sources appeared in all samples. In an individual mealworm, I found an average of 117 microplastics. In an individual crayfish, the GI tract had an average of 56 microplastics. Microplastics transferring up the food chain may indicate low biodegradation abilities of mealworms. However, my data may suggest that mealworms adjust to the plastic diet and therefore metabolize more of it over time. There was considerable variability throughout my project. Larger sample sizes and more precise measurement techniques may be needed to conclude how much plastic mealworms metabolize. My study demonstrates how difficult microplastics are to track and how problematic they may become in the environment.

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