The Biodegradation of Styrofoam through the Use of Superworm Gastrointestinal Flora

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Styrofoam poses a huge global threat due to its toxicity. Unfortunately, it is accumulating in the environment because it takes thousands of years to decompose. The purpose of this experiment was find a novel solution to this problem by determining if superworms (Zophobas morio), a kind of beetle larvae, were able to eat and decompose styrofoam with the aid of gastrointestinal plastic-biodegrading bacteria. To test this, 300 superworms were fed 10.19 grams of styrofoam for 14 days. Superworms were observed to consume 2.67 grams of styrofoam, indicating that they ate approximately 26.2 ± 5% of total styrofoam mass. To isolate styrofoam-biodegrading bacteria, a solution made from 100 of these superworms' digestive tracts was spread over petri dishes containing styrofoam as a sole carbon source. Of the multitude of bacteria that grew on these isolation plates, a few showed substantial growth in the presence of styrofoam compared to controls (as measured with colony forming unit counts and optical density readings), likely indicating that they were able to utilize it as a carbon source. 16s rDNA sequencing identified one of these bacteria to be Acinetobacter bereziniae, a novel styrofoam-biodegrading bacteria. This experiment demonstrates that superworms likely provide one of the best ways of completely degrading styrofoam, because they consumed it at a faster rate than any other process known to completely decompose styrofoam. Future research is needed to confirm and quantify superworms' degradation of styrofoam at a metabolic level.

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