Plastic Problem or Solution: Screening for Polyethlyene Terephtalate Degrading Bacteria in Arkansas

Hoang, Jason (School: Arkansas School for Mathematics, Sciences and the Arts)

Researchers in Japan have identified a species of bacteria, Ideonella sakaiensis, which is capable of degrading Polyethylene Terephthalate (PET), a common ingredient in many plastics. The purpose of this research was to screen for bacteria potentially capable of degrading PET using unique primers designed for polymerase chain reaction (PCR) from the published Ideonella sakaiensis genome. Basic Local Alignment Search Tool (BLAST) searches were used to assure that the primers would be unique to this bacterium. Genomic DNA from soil samples and negative controls, soil not routinely exposed to plastics and lab-cultured bacteria, were isolated for PCR using the DNeasy PowerSoil Kit (Qiagen). Dilutions of DNA and varied annealing temperatures were also used to generate more distinct bands. The amplified DNA was visualized using gel electrophoresis and data of band presence (at the expected 529bp) and strength was recorded. None of the negative controls revealed the band at the expected size, even though they did amplify with positive control bacterial primers. Based on the results, the hypothesis that there are PET degrading bacteria present in contaminated soils in Arkansas was supported. The presence of these bands was statistically significant compared to the absence of bands in the negative control (two-sample t-test p-value of 0.0332). Due to plastic contamination, bacteria naturally found in the soil may be adapting and using PET as a carbon source; although this may be good for degrading unwanted waste, such bacteria may begin to also degrade wanted plastics. Future research should include generating clearer bands and sequencing the samples.

Awards Won: