Evaluating the Efficacy of the PETase and Leaf Compost Cutinase Enzymes in Breaking Down Polyethylene Terephthalate Plastic in a Cell-Free System

**Andover High School, Andover, MA, US**

Vismay Ravikumar, Evelyn Wheel, Hannah Lehmann, Megan Zhang, Aarit Chauhan, Miley Arora, Sanjith Kalpat, Teacher: Lindsey L’Ecuyer, Mentor: Nathan Crook and Tianyu Li (NCSU)

Plastic water bottles currently are made primarily from PET (polyethylene terephthalate), a plastic that does not degrade on its own and is polluting our oceans. The enzyme PETase can break down PET into its monomer, mono ethylene terephthalate, and then further into ethylene glycol(EG) and terephthalic acid(TPA) by the enzyme MHETase. Leaf Compost Cutinase(LCC) is an alternative enzyme that hydrolyzes PET into its monomeric parts, functioning at temperatures from 60 to 70 degrees Celsius. Using an engineered plasmid containing the DNA sequences for either PETase or LLC in a cell-free system, our project is a proof of concept analyzing the efficacy of these enzymes on PET substrate in powder and film form.