From Shrimps to a Barbie: Shrimp Shell Bioplastics - A New Solution to the World's Growing Plastic Problem

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Plastic pollution is a major world problem; the burning of fossil fuels from petroleum-based plastics is a major contributor to global warming. Plastic kills thousands of marine species every year, depletes oceans and the toxins in plastics plus manufacturing byproducts are leaching out into our soil. Yet people still do not care. They will only care if the problem affects them, so 80 samples of fish were examined for micro plastics that could leach out toxic chemicals and potentially enter our food chain, causing endocrine disorders. An average of 4.62% of the body mass of each fish was plastic. A solution to save the environment and us was to create bioplastics. In my previous trial, plastics made from corn, potato and tapioca starch with different amounts of glycerine were created to determine the one most suitable for commercial use (flexible, strong, durable, transparent, fastest decomposition). The cornstarch bioplastic was found to be the most suitable, but was soluble in water and took away a food source. Subsequently, the new aim was to determine whether a plastic, suitable for commercial use, could be made out of waste. Chitosan (from shrimp shells) and fibroin (from silk) were synthesized to produce a plastic. It elongated more than conventional plastics and had a tensile strength of 13.9mPa (professionally tested). This is comparable to commercial grade LDPE plastics. It was transparent, insoluble in water, exhibited antimicrobial properties and decomposed 1.5 million times faster than conventional plastics, making it a suitable substitute for plastic bags, packaging, medical equipment such as sutures and many other applications. The plastic also released nitrogen during the decomposition process, acting as a fertilizer for soil and stimulating plant growth.

Awards Won:

Fourth Award of $500

Arizona State University: Arizona State University Intel ISEF Scholarship