**Introduction**

Reducing plastics pollution is a great challenge that deserves to be met with ingenuity and technology. By using biodegradable polymers for packaging, plastics left in the environment will degrade back into their monomer units and into carbon units and will not accumulate and pollute the environment or be ingested by animals. The main reason biodegradable polymers are not used is their cost which ranges from twice to twenty times of oil based polymers used in packaging. Let us analyze the costs of a biodegradable polymer, polylactic acid (PLA), and how it is manufactured.

**Cost**

By figures of 2010¹; 450,000 metric tons per year of polylactic acid is dwarfed by the 200 million metric tons oil-based plastics¹. Polylactic acid roughly costs $0.8 per kilogram of lactic acid, as the selling price of PLA should decrease by roughly half of its present price to compete with fossil-fuel-based plastic¹.

**Manufacturing**

The manufacturing of polylactic acid can be done by chemical synthesis or biosynthesis², where a series of microorganisms process different feedstocks and produce lactic acid in a fermenter³ which is then separated using several techniques. A good amount of research has been carried out using naturally occurring organisms that produce high yields of lactic acid³,⁴ but improvements should be studied in order to reduce costs and processing times and increase yield and to manufacture the chosen isomer to be then polymerized.

**IDEA**

The idea is to reduce costs by using genetically modified organisms to produce monomers, lactic acid for example, an enzymes that polymerize them in an automated facility with the goal of reducing costs so packaging manufacturers have an economic incentive to adopt and adapt their equipment to process biodegradable polymers. An automated facility to produce biologically derived products is not new. The pharmaceutical industry use genetically modified organisms to produce different types of proteins and the cost of their research is offset by the cost of medications. For simpler molecules such as monomers, it is possible to benefit from the expertise these companies developed to design DNA sequences that will express the desired monomer in an automated facility or biorefinery⁵,⁶. Such a facility could produce a large amount of data and screening sequences that produce the desired monomer unit and enzymes for polymerization catalysis should take a shorter amount of time.
References


