Efficacy of Antimicrobial Polylactic Acid Plastic Food Storage Films

Knipper, Libby (School: Beckman Catholic High School)

An estimated 1 in 6 Americans is exposed to foodborne illness annually. Previous research observed increased numbers of microbial contaminants present in plastic food packaging for fresh produce and eggs as compared to paper. In 2018 14,530 US Tons of plastic packaging were generated with 10,090 US tons ending up in landfills and only 1980 tons recycled. This situation was exacerbated in 2020 as the Coronavirus pandemic impacted food storage methods and materials in an attempt to reduce possible transmission of disease agents through single-use and takeout containers. An increase of natural polymer-based film materials in the food packaging industry has occurred in recent years to help reduce petroleum-based plastic accumulation. The focus of this research was to develop and evaluate biodegradable and compostable polylactic acid food packaging films while incorporating antimicrobial agents. Food compatible films were created and compared using propolis, elderberry, garlic, turmeric, and rosemary additives. Fresh food products were wrapped in each biofilm to observe food quality in addition to the number and type of microorganisms present during food storage. Bacterial and fungal samples were added to each biofilm in Petri dishes to observe microbial inhibition. Bacterial colonies were counted at pin tip and pinhead sizes. Fungal masses were observed and assessed with ImageJ. It was hypothesized that films incorporating additives would have less microbial growth than untreated biofilm and petroleum-based plastic film. Significantly less microbial occurrence was observed in PLA and treated PLA films compared to petroleum-based films.

Awards Won:

Fourth Award of $500