Acclimatization of *Bacillus* Bacteria for the Biological Degradation of Microplastics

Denzel Jesus Carrillo Ortiz
Universidad Autonoma de Nuevo Leon, Garza, Mexico

Dr. Juan Francisco Villarreal Chiu
Universidad Autonoma de Nuevo Leon, Garza, Mexico

Dra. Melissa Marlene Rodriguez Delgado
Universidad Autonoma de Nuevo Leon, Garza, Mexico

Abstract:
Plastic is one of the most widely produced and used synthetic materials worldwide. Due to its extensive use and inadequate disposal, plastic waste can persist in the environment and undergo degradation processes that promote the release of small particles known as microplastics. Among the strategies developed to address this environmental problem, the use of microorganisms has gained interest due to their potential to biodegrade polymeric materials. The genus Bacillus is particularly relevant, as several species have demonstrated the ability to degrade plastics. In this study, an indigenous bacterial consortium composed of Bacillus strains isolated from different areas of the metropolitan region of Nuevo León, Mexico, was acclimatized to favor adaptation to microplastics as a potential carbon source in a minimal medium. Subsequently, the biodegradation of microplastics extracted from commercial facial exfoliating products was evaluated, including cellulose-based and synthetic polymer particles. Mass loss reached 22.47% for cellulose microparticles and 3.39% for acrylic polymer microparticles. Optical microscopy, scanning electron microscopy, and Fourier-transform infrared spectroscopy were used for material characterization. Morphological modifications and changes in characteristic signals were observed. These results suggest that the acclimatized bacterial consortium promoted the biodegradation of the evaluated microplastics, with greater mass loss observed in the cellulose microparticles.

Keywords:
Acclimatization, Biodegradation, Consortium, Microorganisms, Microplastics.