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GROWTH ON CARBOHYDRATES FROM CARBONACEOUS METEORITES ALTERS THE IMMUNOGENICITY OF ENVIRONMENT-DERIVED BACTERIAL PATHOGENS

Abstract

The last decade has witnessed a renewed interest in space exploration. Public and private institutions are investing considerable effort toward the direct exploration of the Moon and Mars, as well as more distant bodies in the solar system. Both automated and human-crewed spacecraft are being considered in these efforts. As inevitable fellow travelers on the bodies of astronauts, spaceships, or equipment, terrestrial microorganisms will undoubtedly come into contact with extraterrestrial environments, despite stringent decontamination. These microorganisms could eventually adapt and grow in their new habitats, where they might potentially recolonize and lead to the infection of the human space travelers. In this article, we demonstrate that clinically relevant bacterial species found in the environment are able to grow in minimal media with sugar compounds identified in extraterrestrial carbon sources. As a surrogate model, we used carbohydrates previously isolated from carbonaceous meteorites. The bacteria underwent an adaptation process that caused structural modifications in the cell envelope that sparked changes in pathogenic potential, both in vitro and in vivo. Understanding the adaptation of microorganisms exposed to extraterrestrial environments, with subsequent changes in their im- munogenicity and virulence, requires a comprehensive analysis of such scenarios to ensure the safety of major space expeditions in the decades to come.