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SPACEFLIGHT ENVIRONMENT EFFECTS ON HUMAN SKIN MICROBIOME

Abstract

Understanding the effects of spaceflight environments on human health is becoming increasingly important with the growing potential for long-duration space travel. This study aims to investigate the influence of microgravity and hypergravity on the human skin microbiome, with a particular focus on the response of *Cutibacterium acnes* (*C. acnes*), a significant skin bacterium. To accomplish this, *C. acnes* samples that had previously been exposed and unexposed to radiation were subjected to various gravitational forces, including Moon 1/6g, Mars 1/3g, zero gravity, and hypergravity, during a parabolic flight experiment. The samples were grown to their mid-growth stage and maintained under optimal growth conditions throughout the flight, when possible. After completion, the samples were fixed to preserve the cellular processes and genetic material integrity. This study seeks to elucidate the potential changes in the microbiome structure, gene expression, and functional pathways of *C. acnes* in response to spaceflight through comprehensive RNA and DNA sequencing and analysis. The anticipated results of this study will be beneficial for future space missions in two ways: first, by revealing potential strategies for manipulating *C. acnes* activity to maintain astronaut skin health, and second, by identifying potential biomarkers for monitoring astronaut health during space travel. Moreover, this study may contribute to Earth-based applications by providing insights into the adaptation of *C. acnes* to extreme environments and aid in the development of strategies for treating skin conditions or enhancing microbial resilience in harsh environments.