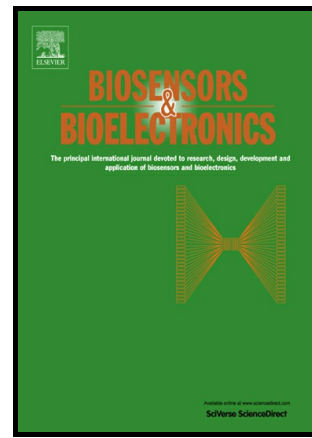


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Advanced biosensors for monitoring astronauts' health during long-duration space missions

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Abstract

Long-duration space missions pose important health concerns for astronauts, especially regarding the adverse effects of microgravity and exposure to high-energy cosmic rays. The long-term maintenance of crew health and performance mainly relies on prevention, early diagnoses, condition management, and medical interventions in situ. In-flight biosensor diagnostic devices and medical procedures must use few resources and operate in a microgravity environment, which complicates the collection and management of biological samples. Moreover, the biosensors must be certified for in-flight operation according to strict design and safety regulations.

Herein, we report on the state of the art and recent advances in biosensing diagnostic instrumentation for monitoring astronauts' health during long-duration space missions, including portable and wearable biosensors. We discuss perspectives on new-format biosensors in autonomous space clinics. We also describe our own work in developing biosensing devices for non-invasively diagnosing space-related diseases, and how they are used in long-duration missions. Finally, we discuss the benefits of space exploration for Earth-based medicine.

Keywords

Space medicine; Point-of-care testing; Biosensors; Spaceflight; International Space Station; Diagnostics.

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