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THE COSPAR PLANETARY PROTECTION GUIDELINES AND THE DETECTION OF MICROBIOLOGICAL CONTAMINATION ON SPACE HARDWARE

Abstract

In view of the ongoing and planned in situ life detection and sample return missions to planets and other solar system bodies the demand to control spacecraft-carried microbial contamination becomes obvious. COSPAR (Committee of Space Research) has defined planetary protection guidelines for different types of missions and target bodies. The COSPAR bioburden limits for the different planetary protection categories are based on bioburden defined in this context as the number of aerobic microorganisms that can be measured with a specific assay on one nutrient medium at one growth temperature. Microbiological investigations have shown that under these culture conditions not only spore-forming bacterial species are selected and cultivated, but also other thermotolerant species. The detection of extremotolerant bacteria and the presence of viable but yet to be cultivated bacteria from various spacecraft assembly facilities suggest the need to evaluate other potential microbial communities. Recently, also archaea, a group of microorganisms separate from bacteria, could be detected in spacecraft assembly facilties. Therefore, new rapid methods that provide more accurate estimates of total viable bioburden and that do not require the cultivation of microorganisms have to be developed and standardized for future space missions. The physiological potential of the microbial community on spacecraft and in cleanrooms has to be investigated in detail to be able to focus future bioassays on the detection of organisms that might contaminate e.g. the Mars environment or complicate planned life-detection measurements.