

Determination of the Microbial Diversity of Spacecraft Assembly Facilities: first results of the project MiDiv

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The first step in the implementation of planetary protection guidelines encompasses a qualitative and quantitative inventory of the bioburden of spacecraft assembly facilities. In such an artificial environment mainly microorganisms are to be expected that are brought in by the humans themselves and that are able to withstand the controlled air circulation, the low relative humidity, the moderately high temperature and the low-nutrient conditions in the clean rooms of the assembly facilities. With informations about the composition of these microbial communities the development and/or optimization of adequate cleaning and sterilization procedures for spacecraft preparation before launch will be possible. The bioburden assessment in spacecraft assembly facilities requires a standardized procedure for sampling the air and surfaces in the facilities as well as of the spacecraft, a transfer of the biological samples under controlled conditions to the analyzing laboratory and a scientifically approved set of methods for analysis. In the MiDiv project we started to investigate the bioburden of spacecrafts using the satellites SMART -1 and ROSETTA as test objects. The analysis of the samples included so far cultivation on different media at different pH and temperatures with and without oxygen and with and without pasteurization, establishment of a culture collection of bacteria and partial 16S rRNA gene analysis. The results of these preliminary measurements, the numbers of colony forming units, differentiated according to the subgroups of aerobes, facultative anaerobes and anaerobes, and the phylogenetic classification, will be assessed with respect to the physiological potential of the identified microorganisms to withstand the different cleaning and sterilizing procedures used up to now for planetary protection measures. In the next step the survivability of selected microorganisms has to be tested under environmental conditions as they occur for example on Mars.