

4th Human Physiology Workshop

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Abstract to be send to humanphysiologie-ws@dlr.de



Microbial Monitoring in the EDEN ISS greenhouse, a mobile test facility in Antarctica

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Introduction:

The EDEN ISS greenhouse, integrated in a container, is a mobile test facility in Antarctica and is used to investigate new plant cultivation techniques for future space programs.

The EDEN ISS container was used from January 2018 to December 2018 for fresh food production for the overwintering crew at the Antarctic Neumayer III station.

Methods:

During the nine month operation time, samples from the different plants, from the nutrition solution of the planting system and from diverse surfaces within the three different compartments of the container were taken (greenhouse, service section, cold porch). Quantity as well as diversity of microorganisms were examined. For quantification, the microorganisms were extracted from the three different samples and the CFU were examined on R2A plates containing 50 mg/L cycloheximide and PDA plates containing 50 mg/L chloramphenicol. For identification of the isolated prokaryotic organisms, 16S rRNA gene sequencing was performed.

Results:

The microbial burden on the surfaces in the container and on the plant samples was generally lower than expected. In case of the plant samples, microbial quantities were in a range from 10² to 10⁴ colony forming units per gram plant material. Compared to purchased plants from a German grocery, the produce hosted much more microorganisms. The EDEN ISS plant samples showed mainly fungi and a few, most probably harmless bacteria. The bioburden in the nutrition solutions increased constantly over time but never reached critical values. The surface samples revealed high differences in the microbial burden between the greenhouse part of the container and the service section/ cold porch part. However, the numbers of pro- and eukaryotic organisms found in the planted greenhouse were still not critical. The microbial loaded surfaces showed strong temporal as well as spatial fluctuations. In case of the nutrition solution samples and the surface samples, the amount of bacteria exceeded the amount of eukaryotes many times over. The most abundant bacterial phyla were Firmicutes and Actinobacteria. These phyla include plant- and human-associated bacterial species.

Conclusions:

In general, there is a low risk of infection due to microbial contamination according to the results of this study.

IMPORTANT: Please indicate whether you hold a doctoral degree (PhD, MD), and whether you hold that title since more than 3 years:

I do not hold a doctoral degree; I just finished my Masters in Biochemistry.