



## **Response of the extremely halophilic *Halococcus dombrowskii* strain H4 to UV radiation and space conditions in the EXPOSE -ADAPT project on the International Space Station**

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### **Abstract**

The international project ADAPT focuses on the response of different microorganisms to outer space conditions. In 2007, the European Space Agency (ESA) has installed the Columbus laboratory and the exposure facility EXPOSE-E on the International Space Station (ISS). One of the microorganisms that were exposed for 18 months on the ISS is *Halococcus dombrowskii* strain H4, an extremely halophilic archaeon which was isolated from about 250 million years old alpine salt deposits (1). Ground experiments with *Hcc. dombrowskii* included irradiation with different wavelengths and doses of UV, using a Hg low pressure lamp, a solar simulator SOL2 (both at the DLR, Cologne) and a Mars UV simulation lamp (2). Cells were embedded in halite crystals which were formed on quartz discs by evaporation of high salt buffers. Methods for analyzing the effects of exposure on *Hcc. dombrowskii* include the estimation of colony forming units (CFUs), staining for viability with the BacLight LIVE/DEAD kit (2), establishing long term liquid cultures and determination of the formation of cyclobutane pyrimidine dimers (CPDs) with specific antibodies (3).

Counting of viable (green) and dead (red) cells showed an apparent preservation of viability following exposure to about 21 kJ/m<sup>2</sup> in ground experiments, but the calculated D37 (dose of 37 % survival) for *Hcc. dombrowskii* was about 400 kJ/m<sup>2</sup> in salt crystals (2). CPDs were detected in about 6-8% of cells of *Hcc. dombrowskii* following exposure to a dose of 3000 kJ/m<sup>2</sup> (200-400 nm). Preliminary results with the samples of *Hcc. dombrowskii* from the ISS suggested preservation of cellular morphology and stainability with the fluorescent dyes of the LIVE/DEAD kit, as well as formation of CPDs in about 2-3 % of the cells. The determination of the survival of cells by measuring proliferation requires months of incubation; data can be expected in May or June 2010.

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