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The survivability of cyanobacteria on lunar rocks, their relevance for future space travel and possible causes for the changes in their cells

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Cyanobacteria are ubiquitous in the world. They have successfully colonised both land and sea and were the first to oxygenate the atmosphere in what is known as the Great Oxidation Event (GOE) (1). Cyanobacteria are also the only prokaryotes capable of photosynthesis and are considered a pre-evolutionary stage of today's chloroplasts (2). This is predicted on the endosymbiont theory, which postulates that cyanobacteria have been taken up by other organisms and thus become today's chloroplasts. In recent developments the interest in prokaryotes has increased with regards to space travel since they can be a reliable producer of materials with only minimal resources (3).
Based on the growing interest in prokaryotes we investigated growth behavior of cyanobacteria on moon rocks. Therefore, cyanobacteria were first isolated from the environment around the Heinrich-Heine University (HHU). For this purpose, cultures were taken from different terrestrial surfaces or aquatic habitats and selected for cyanobacteria with antibiotics.
Selected cultures were incubated on the lunar rock simulant EAC-1A. Under the conditions used in this study, cyanobacteria grow on the simulant. Especially the strain *Anabaena PCC 7120* (henceforth called *Anabaena sp.*) grew in medium without nitrogen as well as in medium without nitrogen and iron. These results indicate a benefit of the regolith of *Anabaena sp.* as the control without regolith grew little or not at all. Incubation with the regolith also altered the so-called heterocysts. These showed increased chlorophyll at different time points. Repeats of this experiment under same conditions showed the same results. Possible candidates of minerals in the regolith were tested to find out which one is responsible for the changes of the heterocysts.
Goals of further experiments are investigations if those cells are capable of photosynthesis and nitrogen fixation at the same time.
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References:
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