Life Sciences as Related to Space (F)
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WHAT CAN WE LEARN FROM MICROORGANISMS FROM EXTREME ENVIRONMENTS ON EARTH FOR SPACE EXPLORATION?

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The search for past or present life in our solar system is a major driver for space exploration. So far, Earth is the only known planet which harbors life. Our understanding of habitability is based on our knowledge about the physical and chemical limits of life on Earth and directs the search for extraterrestrial life in space missions. Habitable environments exist on our neigbour planet Mars and in the subsurface oceans of the icy moons in the outer solar system, such as Europa and Enceladus. To learn more about the limits of life on Earth we studying extreme environments on Earth and performing experiments in microbiological labs, in space simulation facilties and in space experiments using space as a tool for astrobiology.

In our ongoing research activities with a focus on Mars, microorganisms were isolated from extreme Mars-analogue environments on Earth. Their resistance against environmental parameters as they exist on Mars such as low water activity, anaerobic atmosphere, low pressure, short-wavelength UV radiation, ionising radiation, oxidising compounds were tested in the lab and in planetary and space simulation facilities. The isolation and investigation of different microbial strains showed that (i) desiccation tolerance is quite common, (ii) desiccation and radiation tolerance is not correlated, (iii) in some cases, desiccation results in enhanced radiation tolerance, (iv) high concentrations of oxidizing compounds are influencing the cell viability and morphology, (v) perchlorates have an influence on desiccation tolerance, but not on radiation tolerance. We could show that microorganisms from extreme environments on Earth can survive Mars-relevant stress factors. If they can also survive a simultaneous exposure to all of them will be tested in a space experiment on the International Space Station.