EPSC Abstracts,
Vol. 2, EPSC2007-A-00482, 2007
European Planetary Science Congress 2007

Radiation resistance of methanogenic archaea from Siberian permafrost-affected soils

Daria Morozova (1), Ralf Moeller (2,3), Petra Rettberg (3) and Dirk Wagner (1)

(1)Alfred Wegener Institute for Polar and Marine Research, Research Department Potsdam, Telegrafenberg A 43, 14473 Potsdam, Germany, (2)German Collection of Microorganisms and Cell Cultures GmbH (DSMZ), Braunschweig, Germany, (3)German Aerospace Center (DLR), Institute of Aerospace Medicine, Radiation Biology Division, Cologne, Germany

(Daria.Morozova@awi.de/ phone +49 (0) 331 288 2159/2200).

Methanogenic archaea from the Siberian permafrost-affected soils and from non-permafrost habitats were exposed to solar UV- and ionizing radiation in order to assess their limits of survival. Metabolic activity and viability of methanogenic archaea in environmental samples remained unaffected by exposure to monochromatic and polychromatic UV radiation caused by the shielding of the soil layers. Pure methanogenic cultures isolated from the permafrost's active layer exhibit an increase in radioresistance to UV (20-fold) and ionizing radiation (32-fold) compared to the non-permafrost isolates. The F_{37} (UV radiation) and D_{37} (X-rays) values of the permafrost strain *Methanosarcina* sp. SMA-21 were 700 J m^{-2} and 6-12 kGy, respectively. This resistance is comparable to values for *Deinococcus radiodurans* (F_{37} 640 Jm^{-2}, D_{37} 6-7 kGy). Due to the increased radiation-resistance of permafrost isolates, their long-term survival, and their anaerobic lithoautotrophic metabolism, methanogenic archaea from permafrost can be considered as suitable candidates in the search for microbial life in the Martian subsurface. The ESA mission *Mars Express* confirmed the existence of water on Mars, which is a fundamental requirement for life, as well as CH_4 in the Martian atmosphere, which could only originate from active volcanism or from biological sources; both these results suggest that microbial life could still exist on Mars, for example in the form of subsurface lithoautotrophic ecosystems, which also exist in permafrost regions on Earth.