Subsurface martian soil as favorite place of terrestrial radioresistant bacteria origin.. A. K. Pavlov[1], V. N. Shelegedin[2], M. A. Vdovina[3], A.A.Pavlov[4]
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Here we propose that the radioresistance (tolerance to ionizing radiation) observed in several terrestrial bacteria has a martian origin. Multiple inconsistencies with the current view of radioresistance as an accidental side effect of tolerance to desiccation are discussed. Experiments carried out 25 years ago were reproduced to demonstrate that "ordinary" bacteria can develop high radioresistance ability after multiple cycles of exposure to high radiation dosages followed by cycles of recovery of the bacterial population. We argue that "natural" cycles of this kind could have taken place only in martian shallow subsurface layer, and we hypothesize that Mars microorganisms could have developed radioresistance in just several million years' time [1].

Our laboratory modeling has demonstrated that terrestrial nonextremophile microorganisms can reproduce even under extremely low atmospheric pressure (0.01–0.1 mbar). Necessary conditions for metabolism and reproduction are the sublimation of ground ice through a thin upper layer of soil leading to liquid water films production and short episodes of warm temperatures in the vapor diffusion layer [2]. We also consider the ability of terrestrial bacteria to withstand such harmful factors of martian subsurface environments as oxidants (perchlorates and H_2O_2) and ability to use possible specific energy sources and nutrients for microorganisms in subsurface layers such as products of atmospheric photochemical processes, radiolysis of water ice by cosmic rays, radionuclides decay, accretion of interplanetary and interstellar dust particles and comet impacts. Finally, we analyze transfer to Earth of hypothetical martian subsurface microorganisms by way of martian meteorites. Our hypothesis implies multiple and frequent exchanges of biota between Mars and Earth.

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