

Effects of cosmic rays on the Earth's surface applied to space radiation biology

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Our research demonstrated, that secondary cosmic rays, and variations of the geomagnetic field on the Earth's surface could be essential in determining the situation on the board of a spacecraft and the state of different biological objects. The biological systems on the Earth's surface are shielded by the atmosphere against the general damaging effects of geocosmical agents. However, the exposure of biosystems to secondary cosmic rays during the great solar particle events at high latitude could be comparable with the exposure to cosmic rays on the board of a space station during a quiet period. Hence, the genetic effects in cell systems, induced by their exposure to secondary cosmic rays during great solar events near the Earth's surface, could be same as it in space. Our experiments on cell cultures carried out during the great solar particle events in October, 1989 at high latitude have demonstrated extraordinary phenomena, associated with destructions of cellular nuclei, DNA and chromosomes which were found in cell cultures. The observed effects coincided with an increase of solar high energetic particles in the near Earth's space and an increase of the neutron count rate near the Earth's surface. Similar phenomena were also found during experiments on the board of spacecraft in the near Earth orbit. There is reason to believe that consequences of a super events in SCR for genetic matter of biological objects during space exploration should be at least not less pronounced than at the near Earth's surface. The effects of geocosmical agents on the growth of the microflora have been analyzed by technology of system reconstruction and by compared analysis dynamics of skin cover pathogenic microflora growth and variations of geocosmical agents near Earth's surface. It was found that the growth of the pathogenic and nonpathogenic microflora are determined by different groups of geocosmical agents. Moreover, the neutron count and the solar wind plasma density have a main significance for the modulation of pathogenic microflora growth. The results of research manifests that the pathogenic microflora is more sensitive to variations of geocosmical agents, especially, secondary radiation, than the nonpathogenic microflora. Our research shows that the growth of

pathogenic microorganism inside of spacecraft and on the cosmonaut organism should be modulated by global geocosmical agents associated with solar activity, intensity of secondary particles inside of the spacecraft and fluctuations of the interplanetary media. Our new research reveals that water inside of an organism could be the main of the target for the action of cosmic rays. From the point view of the special environment on the board of spacecrafts, it will be interesting to study the modulations of the water properties under conditions of low gravicity, low strength of the geomagnetic field, and high intensity of cosmic rays. Thus, our research demonstrates that experiments carried out on the Earth's surface can be applied to space research as they supply the knowledge about mechanisms of biosystem modulations by geocosmical agents, and give a basis for searching methods of protection of human organism in the space environment.

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