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USING SINGLE-CELLED EUCARYOTES AS A MODEL ORGANISM IN SPACE RADIATION BIOLOGY

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An issue of crew members'health care is raised while planning long-term expeditionary space missions. It was determined that astronauts encounter an increased risk of developing bacterial infections, respiratory diseases, dermatoses and allergic reactions, gastrointestinal disorders, as well as reactivation of certain viruses during the flight to the ISS. This is in part the fact that the human microbiota changes by the influence of stress factors (microgravity, space radiation, hypodynamy, isolation and etc.), which, in turn, leads to a decrease in the reactivity of the immune system, changes in a brain and development of diseases. It is important to note that a source of infection most commonly is an astronaut himself, because his body contains a large number of microorganisms which can spread in the environment, get into the air, and deposit on a surface of a spacecraft. In addition, bacterial and yeast probiotics can be used to maintain a human microbiota. In that regard, there is a need to study the interaction of the ISS microbial community and its crew members in order to prevent biomedical and other complications during the flight, as well as to study the stability of probiotic properties in conditions of an altered microbiota.

The purpose of the study is to explore the influence of stressful conditions and the space ionizing radiation on the viability and evolution of microorganisms. In this work well-characterized yeasts of the genus Saccharomyces cerevisiae, which are part of the spacecraft microbiota, were used as a model organism. There are results of the analysis of the sensitivity of a laboratory yeast strain to the mutagenic action of nitrogen ions in this research. It is shown that accelerated nitrogen ions have a higher biological effect compared to rarely ionizing gamma rays. It concerns both lethal and mutagenic effects. A tester system that allows to cull mutations selectively of a frameshift effect was used to test mutations. A determining of the sequence of nucleotides showed that the mutations were mainly due to the loss of one nucleotide (75%). The remaining mutations were multiple. Next steps were to study the behavior of another strain of Saccharomyces boulardii, which has probiotic properties.

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