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Medical Care for Humans in Space (4)

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MODULATION OF NASOPHARYNGEAL AND PERIODONTAL MICROBIOTA IN HUMANS
EXPOSED TO EXTREME AND ABNORMAL ENVIRONMENTAL CONDITIONS: NEW
DEVELOPEMENTS

Abstract

Extreme and unusual environmental conditions such as space flight, diving or long-term isolation may induce different kind of dysbiosis, which could provoke the appearance or quantitative growth of opportunistic microflora, particularly in the nasopharyngeal and periodontal mucosa, and give rise to infection-inflammatory processes. Using of antiseptic and antibacterial agents is not advisable in a changed or closed environment as it may be the reason for a dysbiotic shift in the host, alter drug sensitivity, form aggression factors in microflora and, therefore, provoke infection. One of the methods of mucous microbiota modulation is implantation of nonpathogenic microorganisms which will extrude opportunistic pathogens without impinging the symbiotic microbiota. The aim of the study was to evaluate the effectiveness of two bacterial preparations: nasal and oropharyngeal sprays. Nasal preparation was formulated on the basis of *Corynebacterium pseudodiphtheriticum* strain number 090104, which was isolated in 1955 in Moscow from healthy person. Several authors describe a competitive relationship between *Corynebacterium spp.* and *Staphylococcus aureus* on the nasal mucosa which may suggest potential probiotic properties of corynebacteria. The preparation was a nasal spray of *C. pseudodiphtheriticum* 090104 suspension in saline with a bacterial concentration of 108 CFU/ml. Oropharyngeal preparation was formulated on the basis of oral probiotic *Streptococcus salivarius* strain K12, which was never used in humans exposed to extreme and abnormal environmental conditions. The preparation was an oropharyngeal spray of *Str. salivarius* K12 suspension in saline with a bacterial concentration of 108 CFU/ml. Effectiveness of preparations was assessed in a several experiments with simulation of some spaceflight factors (dry immersion, isolation, hyperbaric conditions). Various schemes of application of preparations were applied. The study protocols were approved by the Institute of Biomedical Problems RAS Biomedical Ethics Committee; each volunteer provided a written Informed Consent before participation in the study. In all cases of nasal spray application the strong inhibiting effect against nasal *S. aureus* was detected. Administration of the oropharyngeal spray prevented increasing of pharyngeal pathogenic bacteria and provoked decreasing of periodontal pathogenic microbiota. Application of both preparations stimulated growth of protective microbiota of pharyngeal and nasal mucosa. Based on the results of the reported study, we can speculate on the effectiveness of the proposed approach for modulation of nasopharyngeal and periodontal microbiota in humans exposed to extreme and abnormal environmental conditions. Further studies of this bacterial therapy method are under development.