

IAF HUMAN SPACEFLIGHT SYMPOSIUM (B3)
Utilization & Exploitation of Human Spaceflight Systems (3)Author: Dr. DMITRY OZEROV
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Institute for Biomedical Problems, Russian Federation, post@imbp.ruEXPRESS METHOD TO ESTABLISH THE TRACE CONTAMINANTS EXPOSURE LIMITS IN THE
AIR OF LONG-TERM ORBITAL STATIONS**Abstract**

Many years of ISS air monitoring have shown the longer station is used the more new chemical contaminants are found in the air. It leads to the need of establishing limits for these trace contaminants. The classic approach to establish the air contaminants exposure limits will require many years of experimental research on animals. It complicates the operational control and toxicological assessment of air contaminants onboard the station during long-term flights. One way to address this issue is to develop an express method to establish the air contaminants exposure limits, which will allow us to calculate and promptly introduce hygienic standards without long-term toxicological experiments with animals. There were conducted mathematical and statistical studies of more than 21 000 concentrations of air contaminants, which were measured in the ISS air for the period from 2001 to 2017. It has been found the lognormal distribution of trace contaminants in the air of the station. A series of rectilinear regression equations were obtained based on the correlation-regression analysis. These equations are reflecting the close relationship between the maximum permissible concentrations established for air contaminants of working area, ambient air and the air of manned spacecrafts. The correlation coefficients for these equations were not less than 0,7. To improve the accuracy of the calculation method, in addition to general equations, there were developed a number of equations that take into account the hazard classes and toxicological end points of chemicals. The experimental substantiation of the calculation method was carried out in chronic (120 days) experiments on laboratory animals. The experiments were made in strict accordance with bioethical requirements of the World Society for the Protection of Animals (WSPA) and directive on the protection of animals used for scientific purposes (2010/63/EU - European Parliament). Threshold concentrations have been setup based on the results of biochemical, functional and pathomorphological studies characterizing the general toxic, hepa- neuro- and hephrotoxic effects of chemicals. The obtained equations of rectilinear regression allow to calculate and establish the trace contaminants exposure limits in the air of long-term orbital stations. The trace contaminants exposure limits are used for setting up medical and technical requirements for prospective air cleaning systems for long-term orbital stations and Lunar/Martian bases.