

Researchers succeed in predicting the spread of microbes in spacecraft

October 30 2013

Research scientists from VTT Technical Research Centre of Finland participated in the EU's and Russia's joint BIOSMHARS project for developing means of controlling harmful microbes in manned spacecraft. The spread of microbes in closed spaces could be reliably predicted. By using the research results and calculation models, methods can also be developed for the management of the spread of microbes and bacteria in hospitals, public transport and office premises.

The BIOSMHARS project was implemented in 2011–2013 as the first stage in scientific co-operation between the EU and Russia in the control of harmful microbes in manned spacecraft. VTT's role in the project was central with regard to modelling, ventilation and contamination management, and in measurement verification. BIOSMHARS is part of the wider EU FP7 Space programme.

"On long space flights, some lasting up to hundreds of days, a human's immune system weakens and muscles atrophy. At the same time, some bacteria rapidly grow stronger and may mutate into antibiotic-resistant variants. The longer the space flight, the larger the crew's health risks and resultant problems. It is important to increase our understanding of how bio aerosols are created, how they spread in the indoor [air](#) and why they survive in exceptional conditions," says Principal Scientist Ilpo Kulmala who headed the programme on VTT's behalf. "We developed a calculation model that was successful in giving a reliable prediction of the transfer and spread of microbes in closed spaces."

Microbes accumulating on surfaces within closed spaces may deteriorate the material properties, and even destroy materials. "Over the longer term, our objective is to improve and develop methods for the effective management of the harmful effects of the spread of microbes, not just in spacecraft, but in hospitals, [public transport](#) and office premises," says Kulmala.

More effective management of infection risk

Participants in the BIOSMHARS project included experts in space technology, microbiology and modelling. The CFD (Computational Fluid Dynamics) calculation model for predicting the transfer and spread of microbes was validated in VTT's test laboratory and in a fully closed ecosystem in IBP's BIOS-3 test room in Krasnoyarsk, Russia.

"We concentrated on modelling microbes released from human skin and breathing. Once we are able to model the spread of [microbes](#), we can also develop effective means of controlling the infection risk. When someone sneezes, the microbe concentration is densest close to the body, but already mixed quite evenly in the air as little as one metre away. In terrestrial conditions, the drops and particles settle quickly," Kulmala says. "In weightlessness, the drops created during a sneeze remain in the air, with the risk that they enter the respiratory system. Microbes move with air flows, and also accumulate on electrically charged surfaces."

"People in developed countries spend a mere 90 per cent of their time indoors – in a spacecraft it is 100 per cent. The risk of diseases spreading through air can be reduced through sufficient ventilation, proper air distribution, and personal behaviour and hygiene," Kulmala explains.

In addition to researchers from VTT, the BIOSMHARS project that ended in the summer of 2013 also involved researchers from the

University of Eastern Finland and international research organisations.

Provided by VTT Technical Research Centre of Finland

Citation: Researchers succeed in predicting the spread of microbes in spacecraft (2013, October 30) retrieved 19 April 2024 from <https://phys.org/news/2013-10-microbes-spacecraft.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.