

# PRESS RELEASE

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## ENSURING THE SPACECRAFT INDOORS SAFETY OF FUTURE HUMAN SPACE MISSIONS

**LIST has been recently selected by the European Space Agency (ESA) to develop novel nontoxic and antimicrobial surface treatments for spacecraft indoors.**

On 4 March 2019, LIST's materials department officially launched its 18 months research project "ESA NBactspace", aiming to ensure the spacecraft indoors safety, with a view to future human Space missions. As pioneer within the scientific community, LIST will develop novel nontoxic coatings with antimicrobial broad spectrum activity for spacecraft indoors.

### **Towards heavy-metal free antimicrobial coatings**

The surface treatments used on spacecraft indoors recently proved to have a long-term toxicity risk due to their composition based on heavy metal particles, such as silver and copper. In parallel, a growing number of pathogens strains is showing an antibiotic resistance. At the dawn of human Space missions, involving more and more people for an increasingly time, it is of high importance to guarantee the astronauts safety against microbial, algal and parasite proliferations, but also against nanoparticles toxicity.

With proven experience and expertise in surface treatment, microbiology and cytotoxicity, LIST's materials department mission is to develop novel and viable heavy metal-free antimicrobial coatings, offering the same efficiency in Space environment as the current ones. To do so, silver and copper of the antimicrobial solutions will be replaced by nontoxic biosourced materials, such as active molecules extracted from plants or lignin-based materials and antimicrobial peptides found in bacteria. The objective is to have either no particle released in the environment, or release of low concentration of nontoxic biodegradable or biocompatible particles. This challenging research will generate unprecedented approaches in terms of processing of space-friendly and durable antimicrobial coatings.

### **An all-in-one antimicrobial mechanism**

Different mechanisms can be used in surface treatments to protect a material from pathogens. Each has its benefit: avoiding the pathogen binding on the surface, an immediate destruction of the pathogen in contact, or the diffusion of active elements along the material surface. The ambition of LIST is to build a new and efficient combination of all these mechanisms, while using biosourced or/and novel biocompatible synthetic materials.

### **From confined conditions to real-life applications**

The confined environment of a spacecraft involves a high level of requirements in the development of the surface treatments, due to e.g. the accumulation of nanoparticles or the fast proliferation of pathogens within those particular conditions. However, the current

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The Luxembourg Institute of Science and Technology (LIST) is a mission-driven Research and Technology Organization (RTO) that develops advanced technologies and delivers innovative products and services to industry and society. As a major engine of the diversification and growth of Luxembourg's economy through innovation, LIST supports the deployment of a number of solutions to a wide range of sectors, including energy, IT, telecommunications, environment, agriculture, and advanced manufacturing at national and European level. Thanks to its location in an exceptional collaborative environment, namely the Belval Innovation Campus, LIST accelerates time to market by maximizing synergies with different actors, including the university, the national funding agency and industrial clusters.

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state-of-art of antimicrobial tests in Space conditions is very limited, and the studies focused on heavy metal-free solutions are almost non-existent.

Through its approach as well as its methods, LIST will greatly contribute to a better knowledge and definition of the standards to follow in confined environments. Moreover, this applied research might have an important socio-economic impact, besides developing a sustainable and viable alternative to heavy metal-based surface coatings. Indeed, the resulting technology is envisaged to be transferable to other environments, such as e.g. the hospital setting, and medical implants or devices.

## **About the European Space Agency**

The European Space Agency (ESA) is Europe's gateway to space. Its mission is to shape the development of Europe's space capability and ensure that investment in space continues to deliver benefits to the citizens of Europe and the world.

ESA is an international organization with 22 Member States. By coordinating the financial and intellectual resources of its members, it can undertake programmes and activities far beyond the scope of any single European country.

Find out more on its website: <https://www.esa.int/spaceflight>

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