Goldschmidt 2024 Abstract
https://doi.org/10.46427/gold2024.23918

Mycogenic silver nanoparticles from strains exposed to hypergravity

MARTA FILIPA SIMÕES[1,2], CRISTIANE ANGÉLICA OTTONI[3,4], GABRIEL MARQUES DE BARROS[5], ALLEN MATT DREWS[2,6], CHRIS KOON HO WONG[7], CRISTINA VARESE[8] AND ANDRÉ ANTUNES[1,2]

[1]Macau Center for Space Exploration and Science, China National Space Administration (CNSA)

[2]State Key Laboratory of Lunar and Planetary Sciences (SKLPlanets), Macau University of Science and Technology (MUST)

[3]São Paulo State University (UNESP)

[4]School of Agriculture (ISA), University of Lisbon

[5]Marine Peptides and Proteins Laboratory (LABPEPMAR), São Paulo State University Júlio de Mesquita Filho - UNESP-CLP (coastal campus)

[6]Division of Space Technology, Department of Computer, Science, Electrical and Space Engineering, Luleå University of Technology

[7]Faculty of Health Sciences, University of Macau

[8]University of Torino

Presenting Author: msimoes@must.edu.mo

Despite being understudied, fungi have a significant impact on life on Earth, with a reach that can even extend beyond our planet. Since the inception of space exploration, fungi have been identified as contaminants, hitchhikers, or integral parts of mission crews and payloads [1,2]. It is known that certain strains and species can pose health risks, while others can contribute to infrastructure degradation. However, other species could prove extremely beneficial for *in situ* production processes, especially for extended space missions where payload reduction is crucial.

Through the HyperGES program, offered by the United Nations Office for Outer Space Affairs (UNOOSA) in partnership with the European Space Agency (ESA), we conducted hypergravity experiments with selected fungal strains under the project entitled “HyperSpacEx – Medical and Biotechnological Potential of Fungi in Hypergravity for Space Exploration”. Hypergravity was simulated using the Large Diameter Centrifuge (LDC) at the European Space Research and Technology Center (ESTEC) in Noordwijk, the Netherlands.

The use of such simulators is highly advantageous, as simulated testing provides a more accessible alternative for astrobiology and space biotechnology research, although certain space parameters are challenging to replicate in a standard microbiology lab. In terms of gravity simulation tests, most fungal assays have been restricted to microgravity conditions, and all of these involved a limited number of species [3].

To cover this current gap, we selected 17 different fungal species and exposed them to hypergravity (10 and 15G), a common condition in space exploration. Furthermore, we analysed the production of silver nanoparticles under such conditions. When compared to the mycogenic synthesis under normal gravity, no significant differences were observed. The strains that demonstrated higher production at normal gravity maintained the same level of production in the exposed samples. The apparent lack of effects on nanoparticles production under such conditions highlights that these strains are suitable candidates for space application in such settings. Nevertheless, hypergravity is a relatively unexplored parameter that could potentially offer different settings for mycological processes and the production of bioproducts and warrants further investigation.

References:

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