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Mycogenic metal nanoparticles as under-explored resources for space exploration

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Space exploration is currently booming with a noticeable surge in the number of current and planned future missions. This has led to an expansion of research developments aiming to facilitate activities in this field. However, the exploration of mycogenic metal nanoparticles (MNPs), MNPs produced by fungi, has not been fully explored, especially under this context. Our current research addresses this knowledge gap and presents potential alternatives for the application of these MNPs to the space sector, since their current application in many industrial sectors are transferable for space exploration. Furthermore, mycogenic processes present several advantages over other microbial processes: easier manipulation, less steps since these do not require cell rupture, easier scale-up, use of cheaper substrates and therefore cheaper products.

In this research, we produced analyzed MNPs, using several different fungal strains isolated from Mars analogue sites (several high salinity locations from Cabo Verde), and grown in the presence of artificial Mars regoliths and exposed to microgravity (10^{-3} G). We then screened the MNPs' antimicrobial activity to infer on their potential to be used in the hull and infrastructure of spacecrafts and astronauts' suits.

Due to the combination of multiple extreme conditions, high salinity sites are seen as analogues for conditions on Mars (high exposure to UV, desiccation, low water availability, high salinity) and are a valuable source of new microbial strains of relevance for astrobiology (ranging from planetary protection to biotechnology). Isolating and growing fungal strains from these sites allows us to do a preliminary screening of their potential, while testing them under exposure to artificial Mars regoliths and microgravity allows us to further assess the viability of their eventual future use for *in situ* resource utilization (ISRU) outside our planet.

Here we show that filamentous fungi isolated from Mars analogue environments open the way towards potential alternative materials that will facilitate future space endeavors.

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