Effect of simulated microgravity in the fungus *Aspergillus niger*

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Fungi are able to colonize indoor-closed habitats such as space stations, in a variety of solid and liquid substrates – e.g. walls, windows, life-support systems, etc. Their growth is usually associated with material degradation and spore formation, which can pose a threat to both astronauts' health and spacecraft safety, in particular when in long-duration missions [1-3]. This makes monitoring fungal populations a challenge for medical and operation requirements in current and future space missions. *Aspergillus niger* is one of the predominant fungus detected aboard the Russian Space Station (Mir) as well as the International Space Station (ISS), but it is also known as the model organism for modern biotechnology, producing compounds of interest ranging from citric acid to antibiotics and polymers, among many others [4]. Understanding how the space environment affects fungal growth is not only important to maintain health and safety in spacecraft habitats, but also to assess future opportunities for biotechnology in space.

To study how microgravity affects the growth of *A. niger*, an approach was set to characterize the fungus internal structure under simulated microgravity. For that, *A. niger* was grown as a colony for 3-5 days in minimum medium at 30°C, in both Earth gravity (1 g) and simulated microgravity (SMG) using a Clinostat [4]. Three different mutant strains were included, to address the effect of melanin and polarized (tip) growth in adapting to the simulated microgravity environment. Colony microstructure was analyzed by newly established scanning electron microscopy (SEM) techniques; changes in colony growth were determined by colony area; sporulation yield was identified by determining the amount of spores produced per colony.

Results reveal that simulated microgravity induces changes in colony thickness, colony area and sporulation yield, also suggesting that melanin plays a role in adapting to the low gravity environment. This work marks an important step in the establishment of new electron microscopy methodologies that can be used to study large-dimension samples of filamentous fungi, exposed to different experimental conditions, on Earth or in Space.

References

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