



## **Mycosphere in soils: hyphal influence on bacterial dispersal and growth when colonizing pristine environments**

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Fungi and bacteria both play important roles in soil ecosystem functioning such as organic matter decomposition and nutrient turnover. Despite that they can coexist in nearly all ecosystems, co-occurrences at micrometer scale are difficult to detect due to the complexity of soils in which physical and chemical conditions are constantly changing in both space and time.

Current technologies such as micro-engineered model systems give us the opportunity to study fungal-bacterial interactions in natural field soil at microscale. We constructed a transparent chip (4 x 8 cm) based in silicone that mimics soil pore spaces. The chip was bonded to a glass piece in with an opening to the side to allow the microbial colonization. We buried these air-filled chips into natural soil from a deciduous tree patch. After two months, we collected the chips and analysed them under a microscope.

We found that the presence of hyphae influenced the water inflow into the chips. As hyphae created water film bridges, there was a significant increase in motile bacterial dispersal and growth in comparison with pore spaces without hyphae. However, bacterial cell abundance was highly variable in the different pores occupied by hyphae. More studies are needed to understand if this variation is due to different bacterial colonization strategies or complex fungal-bacterial interactions such as facilitation and competition.

Our study demonstrates that micro-engineered model systems are useful tools to get high-resolution information of fungi and bacteria co-occurrence and the ecological interactions between them. This study system could further help to identify the specific roles these microorganisms have in natural soil processes.