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Observing Pathogenic Affinity of Candida and Rhodotorula under Simulated Moon and Martian Atmospheres

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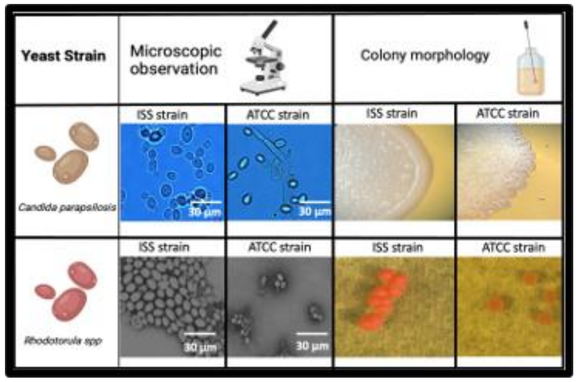
Abstract & Aims

This study aims to test the virulence-related phenotypes of *Candida parapsilosis* and *Rhodotorula mucilaginosa*, isolated from the International Space Station. These species of yeast are common commensals of the human skin microflora and can be opportunistic fungal pathogens responsible for superficial infections as well as systemic infections in humans.

Figure 1: Preliminary Understanding & Initial Findings

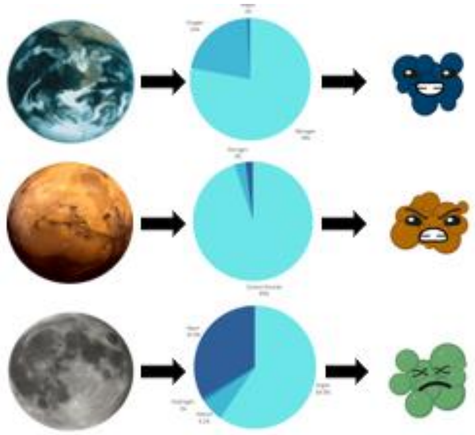


What defines "*pathogenic affinity*" and how is it measured?

- *adapt to environmental stress*
- *increased virulence*
- *resistance to antifungals*
- *increased filamentation*
- *increased fungal biofilm formation under microgravitational conditions*

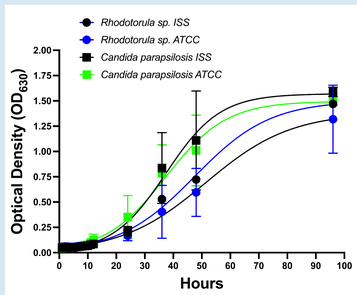
Test Principle

Does Atmospheric Composition Affect Pathogenic Affinity?



Simulated Atmosphere Growth

Figure 2: Growth Comparison, Control & CO_2 atmospheres



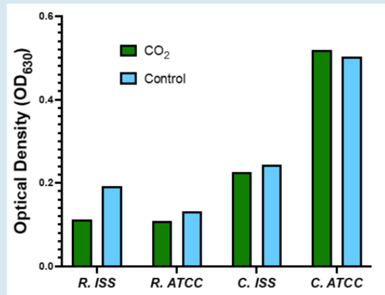


Figure 2 confirms preliminary findings indicating that the ISS strains experience minimal increased growth though not statistically significant, compared to earth controls. For control, optical density was measured every hour for 12 hours, followed by 24-, 36-, 48-, and 96-hour time points. Growing the strains in an induced, anaerobic environment resulted in no statistical differences in growth.

Affinity for Filamentation

Figure 3: Rhodotorula colonies on YPD + FCS

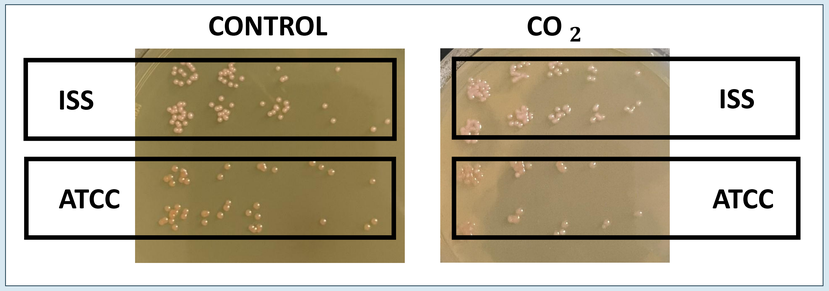


Figure 3 shows that Rhodotorula ISS strains demonstrate increased filamentation. Further, strains incubated in CO $_2$ have denser capsule aggregation

Figure 4: Candida colonies on YPD + FCS

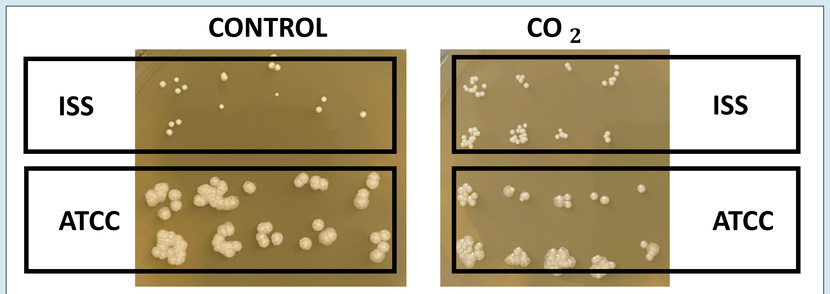


Figure 4 shows that Candida ISS strains demonstrate decreased filamentation. Similar to Rhodotorula, strains incubated in CO $_2$ have denser capsule aggregation

Response to Antifungals

Figure 5: Minimum Inhibitory Concentration (MIC) Caspofungin

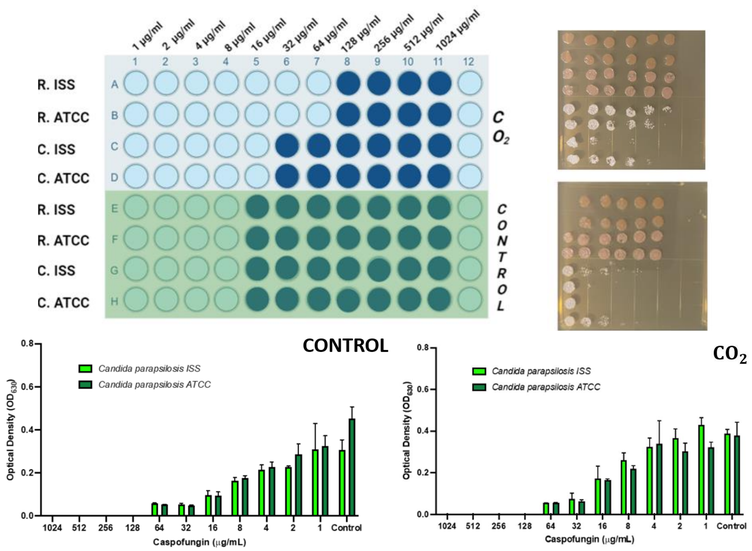


Figure 5 shows strains incubated in CO $_2$ demonstrate increased resistance to Caspofungin. There is no statistically significant difference in resistance between ISS and ATCC strains. The MIC for the control strains is 16 µg/mL, the MIC for the CO2 strains ranges from 32-128 µg/mL

Figure 6: Minimum Inhibitory Concentration (MIC) Amphotericin

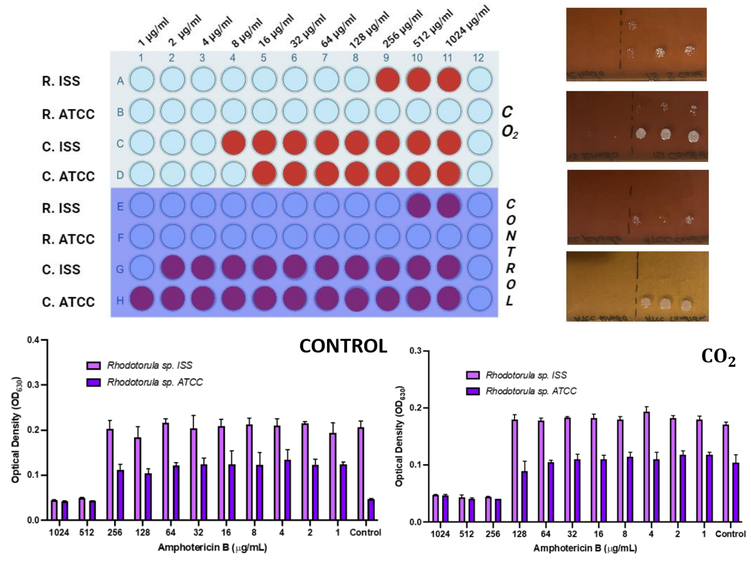


Figure 6 shows that colonies grown in a carbon-dioxide rich atmosphere have a slightly reduced resistance to Amphotericin B. The observed ISS strains demonstrate increased resistance compared to ATCC strains per atmosphere. The MIC for the control strains is 512 µg/mL, the MIC for the CO2 strains 256 µg/mL.