Understanding how fungi build their protective cell walls

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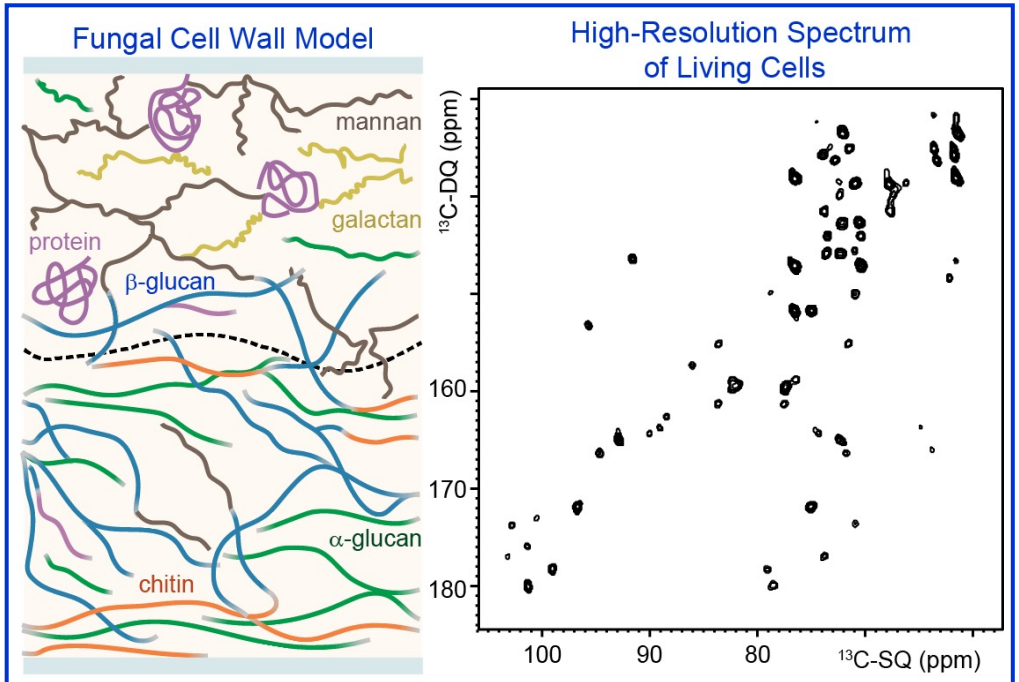
Life-threatening fungal infections and the insufficient efficacy of existing drugs call for the development of new antifungal agents. The polysaccharides in fungal cell walls are absent in humans, making them uniquely suitable as the target for future antifungal treatments.

An international user collaboration accessed a MagLab 18.8T magnet instrumented with unique MagLab probes, enabling solid-state Nuclear Magnetic Resonance (NMR) on the living cells of a major pathogenic fungus, *Aspergillus fumigatus,* to provide a molecular-level model of cell walls.

Four natural mutants of *Aspergillus fumigatus* were found to substantially reshuffle the polysaccharide composition to increase the rigidity and hydrophobicity of cell walls. This explains how fungi respond to biosynthesis deficiencies and re-build the cell wall for better protection and survival.

These findings have advanced our understanding of the supramolecular assembly of biopolymers in fungal cell walls. This approach provides a readily applicable method for evaluating the structural responses of fungal cell walls to genetic mutations and external stresses, such as novel antifungal compounds and other environmental stimuli.



Left panel: Structural model of fungal cell walls supported by extensive solid-state NMR data. The fungal cell wall is a complex network formed by five major types of polysaccharides and proteins. The dashed line separates the outer (above) and inner (below) domains of the cell wall that contain different polymers. **Right panel:** Representative 2D ^{13}C-^{13}C correlation NMR spectrum from intact cells of the *Aspergillus fumigatus* fungus. With the high resolution afforded by the MagLab's unique NMR probes, carbon connectivity of cell wall polysaccharides can be resolved.

Facility used: 800MHz with MagLab probes at NMR/FSU facility.

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