

# A Sensitive Method for Examining Whole Cell Biochemical Composition In Filamentous Fungi Using Synchrotron Ftir Spectromicroscopy

K. Jilkin<sup>1</sup>, K.M. Gough<sup>1</sup>, R. Julian<sup>2</sup>, S.G.W. Kaminsky<sup>3</sup>

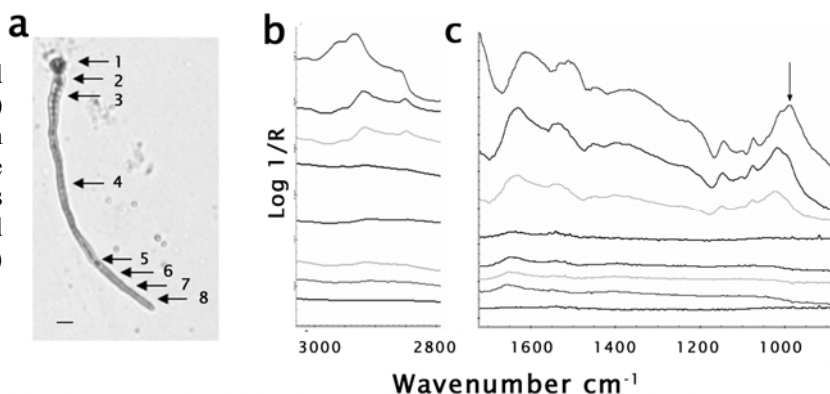
<sup>1</sup>Department of Chemistry, University of Manitoba, Winnipeg MB, Canada R3T 2N2

<sup>2</sup>Synchrotron Radiation Centre (SRC,) U. Wisconsin at Madison, Stoughton, WI, U.S.A., 53589

<sup>3</sup>Department of Biology, University of Saskatchewan, Saskatoon SK, Canada S7N 5E2

Cell function is related to cell composition. Filamentous fungi (molds and mildews) have two main life cycle stages: vegetative hyphae for substrate colonization and nutrient acquisition, and asexual spores for survival and dispersal. Hyphal composition changes over a few tens of microns during growth and maturation; spores are different from hyphae. Most biochemical analyses are restricted to studying either a few components at high spatial resolution (*e.g.* histochemistry) or many compounds at low spatial resolution (*e.g.* GC-MS). Synchrotron FTIR spectromicroscopy can be used to study fungal cell biology by fingerprinting varieties of carbohydrates, proteins, and lipids at about 6 $\mu$ m spatial resolution. FTIR can distinguish fungal species and changes during hyphal growth (Figure 1).

**Figure 1:** Spectra recorded from the germinating spore (a) reveal that high sugar and protein reserves are conserved within the spore, while only minute amounts of protein and sugar are conveyed down the growing tip (spectra (b) and (c)).



IR spectral analysis reveals that even fungi grown under optimal *vs* mildly stressed conditions exhibit dramatic biochemical changes without obvious morphological effects. Here we compare hypha and spore composition of three fungi, *Aspergillus nidulans*, *Neurospora* and *Rhizopus*. There are clear biochemical changes when hyphae commit to spore development, during spore maturation and following germination, many of which are consistent with results from molecular genetics, but have not been shown before at high spatial resolution.<sup>1</sup>

## References:

[1] K. Jilkin, KM Gough, R. Julian and SGW Kaminskyj, *Submitted, July 7, 2007*