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Physiological Changes in *Phanerochaete chrysosporium* During the Onset of Ligninolytic Activity

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ABSTRACT

In the white-rot basidiomycete, *Phanerochaete chrysosporium*, ligninolytic activity appears with the transition from primary to secondary metabolism brought on by depletion of fixed nitrogen. To explore changes in cellular physiology during this transition two aspects of cell metabolism have been studied.

Firstly, proteins associated with the fungus were separated by two-dimensional polyacrylamide gel electrophoresis according to their isoelectric point and molecular weight. Ribosomal, cytoplasmic, and cell wall-associated proteins were separated and the protein patterns compared after growing the fungus under lignin degrading (nitrogen limited) and nonlignin-degrading (nitrogen excess) conditions. We find major differences in the protein populations of nonligninolytic and ligninolytic cultures; in the case of the cytoplasmic proteins there are approximately 20 novel proteins in the latter, but other protein species disappear. Attempts to identify some of the novel secondary phase proteins will be described. The patterns from some mutants of *P. chrysosporium* defective in ligninolytic activity or other aspects of secondary metabolism will also be discussed.

We have also studied the intracellular cyclic AMP levels during the onset of ligninolytic activity. These increased sixfold between days 3 and 5 and were maximal as the culture became ligninolytic. In control cultures (nitrogen excess), there was no ligninolytic activity and cAMP levels merely reflected growth.

To determine the effect of added nitrogen on cAMP levels 0.72*M* glutamate (final conc.) was added to ligninolytic cultures. The level of cAMP was halved between 4 and 8 h after glutamate addition, and ligninolytic activity was also

suppressed as expected. Some of the mutants of *P. chrysosporium* defective in ligninolytic activity showed decreased levels of intracellular cAMP.

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