

Insights into the cellular responses to hypoxia in filamentous fungi.

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Abstract

Most eukaryotes require molecular oxygen for growth. In general, oxygen is the terminal electron acceptor of the respiratory chain and represents an important substrate for the biosynthesis of cellular compounds. However, in their natural environment, such as soil, and also during the infection, filamentous fungi are confronted with low levels of atmospheric oxygen. Transcriptome and proteome studies on the hypoxic response of filamentous fungi revealed significant alteration of the gene expression and protein synthesis upon hypoxia. These analyses discovered not only common but also species-specific responses to hypoxia with regard to NAD(+) regeneration systems and other metabolic pathways. A surprising outcome was that the induction of oxidative and nitrosative stress defenses during oxygen limitation represents a general trait of adaptation to hypoxia in many fungi. The interplay of these different stress responses is poorly understood, but recent studies have shown that adaptation to hypoxia contributes to virulence of pathogenic fungi. In this review, results on metabolic changes of filamentous fungi during adaptation to hypoxia are summarized and discussed.

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