Fungal Hyphal Extension

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Abstract

This subproject is one of many research subprojects utilizing the resources provided by a Center grant funded by NIH/NCRR. The subproject and investigator (PI) may have received primary funding from another NIH source, and thus could be represented in other CRISP entries. The institution listed is for the Center, which is not necessarily the institution for the investigator. Cellular expansion is an absolute necessity during the growth and development of plants and fungi. Expansion relies upon the accumulation of inorganic ions, the resulting water influx creates the hydrostatic pressure (turgor) that causes the cell to expand. Cellular expansion is normally asymmetric. Rather than expanding in all directions, there are localized regions of expansion that result in the well-defined final shape of the cell. The extreme example of anisomorphic cell expansion is tip growth. Here, the machinery of expansion is highly concentrated in a small region such that the cell exhibits tubular growth. How does the cell maintain the turgor that drives expansion? How is expansion controlled spatially? Both aspects of tip growth rely on transport at the plasma membrane. During my most recent visit to the BioCurrents Center (Feb/Mar 2006), I used ion-selective microelectrodes to determine the role ion uptake plays during turgor recovery after hyperosmotic treatment. We had shown that a MAP kinase cascade, homologous to the HOG pathway in yeast, activated ion transport after hyperosmotic treatment, the cause of rapid recovery of the normal high hydrostatic pressure (turgor) . We proposed to examine a novel signal transduction pathway, identified by osmosensitivity of the cut mutant which encodes a defective phosphatase and plays a separate role in osmoresponses. We demonstrated hyperosmotic-induced changes in the ion fluxes in the cut mutant . The magnitude of the ion uptake was less in wildtype, yet the turgor recovery was very similar. This could be explained by rapid glycerol production in the cut mutant that was not observed in the wildtype strain. Thus, the putative phosphatase appears to control the relative contributions of ion uptake and glycerol production in the short-term (that is, within 40 minutes, the time required for turgor recovery, prior to significant gene expression), and thus plays a supporting role compared to the osmoresponse MAP kinase cascade.

Funding Agency

Agency	National Institute of Health (NIH)
Institute	National Center for Research Resources (NCRR)
Type	Biotechnology Resource Grants (P41)
Project #	5P41RR001395-24
Application #	7357332
Study Section	Special Emphasis Panel (ZRG1-BPC-H (40))
Project Start	2005-12-01
Project End	2006-11-30
Budget Start	2005-12-01
Budget End	2006-11-30
Support Year	24
Fiscal Year	2006
Total Cost	$24,505
Indirect Cost	

Institution

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