

Project 9: Fungal cell polarization in response to external signals

Principal Investigator: Fleig, Ursula, PD Dr. phil.

Institut für Funktionelle Genomforschung der Mikroorganismen
Heinrich-Heine-Universität Düsseldorf
Universitätsstr. 1, Geb. 25.12.-u1
40225 Düsseldorf

Core mechanisms that regulate the polarity of a cell and its shape employ evolutionarily conserved components. Cell polarization in response to extrinsic clues is essential for a wide range of biological processes including cellular immune responses and directional cell migration. The ability to adapt the growth form to changing environmental conditions represents an important virulence associated trait for pathogenic fungi that helps the pathogen to spread and survive the host defense system. This reversible alteration of externally directed cell polarization is also found in the non-pathogenic model yeast *Schizosaccharomyces pombe*. External signals have been described that result in a switch of the *S. pombe* intrinsic vegetative growth mode. Such signals lead to a dramatic redirection of growth dictated by the position of the external signal. In this proposal we investigate how an extrinsic nutrient limitation signal leads to a dimorphic switch from the single-celled yeast form to the invasive filamentous growth form. This switch brings along a change in the growth pattern from bipolar cell end growth to monopolar growth, an alteration of the cell wall composition and cell-cell-separation defects, which facilitate a hyphal-like growth pattern.

We have recently identified members of the conserved Vip1-like 1/3 inositol polyphosphate kinase family as key determinants required for the alteration of externally specified fungal cell polarization. Vip1-like proteins generate a specific isoform of inositol pyrophosphates. Inositol pyrophosphates are highly energetic signaling molecules that are also involved in regulating nutrient and growth factor-mediated signaling in mammals. In this project we want to understand how external signals lead to a modification of the normal vegetative polarized growth of the fission yeast *S. pombe*. As these alterations are numerous we will focus on two phenotypes observed for cells that grow in a pseudohyphal manner namely increased cell-cell adhesion and defects in cytokinesis. The regulatory role of the *S. pombe* Vip1-orthologue Asp1 in these processes will be assessed. In addition, we will continue our analysis of the *C. albicans* Vip1-like protein CaVip1 with respect to its role in the morphogenesis of this fungal pathogen.