

Osmoregulatory MAP kinase signal transduction pathway

Haruo Saito

(The University of Tokyo, Institute of Medical Science, Professor)

【Outline of survey】

The budding yeast *Saccharomyces cerevisiae* survive widely fluctuating osmotic conditions in their natural habitat. To cope with an increased external osmolarity, yeast synthesize, and intracellularly retain, the compatible osmolyte glycerol. They also readjust the pattern of gene expression and protein synthesis, and regulate cell cycle progression. These events are governed by the High Osmolarity Glycerol (HOG) signaling pathway, whose core element is the Hog1 MAP kinase (MAPK) cascade. We have elucidated the overall configuration of the HOG signal pathway from cell surface osmosensors to activation of the Hog1 MAPK. However, the mechanisms of detecting the extracellular changes in osmolarity (osmosensing) by yeast has been unclear. Recently, we identified a pair of highly glycosylated, mucin-like transmembrane proteins, Msb2 and Hkr1, as putative osmosensors in yeast. In this project, we intend to elucidate the molecular mechanism by which these glycoproteins detect and convert an external osmotic change to an intracellular signal.

【Expected results】

Most osmosensors known to-date detect osmotic changes indirectly through their effects on the plasma or internal membrane. In contrast, the newly discovered mucin-like membrane-glycoproteins Hkr1 and Msb2 appear to monitor the environmental osmotic changes directly, perhaps via alterations in their polymer gel structures induced by osmotic changes. Thus, our studies on the yeast osmosensors may reveal a totally new mechanism of osmosensing are also relevant to higher eukaryotic cells.

【References by the principal investigator】

- Tatebayashi K, Yamamoto K, Tanaka K, Tomida T, Maruoka T, Kasukawa E, & Saito H. (2006). Adaptor functions of Cdc42, Ste50, and Sho1 in the yeast osmoregulatory HOG MAPK pathway. **EMBO J.**, 25: 3033-3044.

【Term of project】 FY2007– 2011

【Budget allocation】 21,800,000 yen
(2007 direct cost)

【Homepage address】

<http://www.ims.u-tokyo.ac.jp/MolCellSignal>