Description for the general public

The high concentration of small, water-soluble compounds such as salts or sugars increases the osmotic pressure of the environment. This is a limiting factor for development of many microorganisms, because in the hypertonic environment there is a high risk of uncontrolled flow of water across cell membranes. However, there are organisms that can efficiently adapt to these conditions. The best example is yeast *S. cerevisiae*, which is also extremely important for human, because of its applications in food industry. These yeasts can develop and perform a fermentation in the environment with high sugar concentrations. It is possible thanks to highly specialized mechanism of stress response, called HOG pathway (high osmolality glycerol). The most important result of this mechanism is production and accumulation of intracellular glycerol, which balance the high osmotic pressures on both sides of cell membrane. However it is not a universal solution. Non-conventional yeast *Yarrowia lipolytica* produces erythritol instead of glycerol in response to the high osmotic pressure. While the pathway of erythritol biosynthesis in yeast is already fairly well described, the regulation of this process is mostly unknown. Better understanding of regulation mechanism is important since erythritol is synthetized by a significant group of microorganisms, including genus *Pichia, Zygopichia, Candida, Torula, Trigonopsis* and *Moniliella*. Characterization of response to the osmotic shock at *Y. lipolytica* may become a good model also for other non-conventional yeasts, which have a high application potential.

The purpose of the project is to identify the main proteins involved in the regulation of glycerol metabolism to erythritol in *Y. lipolytica*, in response to the osmotic stress. A series of genetic manipulation will be performed in order to determinate the similarities and differences to HOG pathway occurring in *S. cerevisiae*.