

GLYCEROL HOMEOSTASIS, A NEWBORN CONCEPT ON YEAST PHYSIOLOGY

Cândida Lucas

CBMA – Centro de Biologia Molecular e Ambiental- Departamento de Biologia da
Universidade do Minho, Braga, PORTUGAL

Glycerol is classically regarded as the osmolite that in yeasts counteracts osmotic/salt stress effects. The pathways for production and consumption of glycerol correspond to a crossroad between glycolysis/gluconeogenesis, fermentation/ respiration and lipid synthesis, interfering in redox balance, and pH_{int} and P_i pools regulation. In turn, the regulation of glycerol pathways respond to carbon source demands, growth phase and stress. Glycerol intracellular amounts depend on metabolism, but also on transport and retention processes. The constitutive Fps1 channel ensures retention and release of glycerol upon osmotic up- or down-shock. The active transporter Stl1p, a glycerol/ H^+ symporter, is tightly and complexly regulated and modulates glycerol internal levels in response to numerous *stimuli*. These include glucose repression, induction by growth on non-fermentable carbon sources, extremely high in the case of cells growing on glycerol. Also, Stl1p is highly and transiently expressed during diauxic shift and entry into stationary phase, as well as in response to high temperature stress and osmotic shock under particular conditions. Further expression patterns are suggested by global studies. The role of glycerol has long been accepted as connected to the hydric equilibrium of the cells. The presence of glycerol active transporters in numerous yeasts, constitutively expressed in the more osmo/halotolerant than *S. cerevisiae*, agrees with this. Yet, the modulation of glycerol internal levels transcends the osmolite function, as it appears simultaneously cause and consequence of the regulation of other vital processes to the cell. This can be inferred from the coordinated control of glycerol transport/metabolism by several of the main signalling pathways, and from glycerol possibility being needed for signalling itself. All taken, yeast cells need to maintain/modulate glycerol intracellular homeostasis at all times appears as a new and promising concept and has to be considered when the improvement of yeast biotechnology processes is at stake.