Abstract

IST2 is known as a gene encoding in the model yeast *Saccharomyces cerevisiae* a membrane protein, that is studied thanks to a unique way of biogenesis and trafficking that apparently does not use classical secretory pathway. Although the gene was named more than ten years ago according to the phenotype of cells with its deletion (Increased Sodium Tolerance), the role of this protein in cell tolerance to toxic sodium has not been elucidated. Our searches in databases revealed that similar proteins are encoded in the genomes of other species of yeast, but none of them has been studied so far.

In this work, four new strains lacking *IST2* have been constructed in the genetic backgrounds differing by the presence of genes encoding transport systems for accumulation of potassium (Trk1, Trk2), for export of surplus potassium cations (Tok1, Ena1-5, Nha1) and for export of toxic cations lithium and sodium (Ena1-5, Nha1). Plasmid carrying the gene coding *IST2* sequence has also been conctructed. The effect of *IST2* deletion in different genetic backgrounds was studied by phenotypic tests on solid and liquid media. It was found that *IST2* probably does not play a role in osmotolerance in general (absence of the phenotype of *IST2* deletion on high concentrations of KCl), but its presence affects ability of the cells to cope with high concentrations of toxic sodium and lithium salts. Furthermore, in cells lacking high-affinity potassium importers, that in environments with the limit potassium concentration grow very poorly, *IST2* deletion improves their growth on media wit low KCl amounts. On the other hand, if in addition to genes encoding potassium importers also genes for exporters are deleted, then *IST2* deletion has a negative effect on cell growth in potassium-limitited conditions. The results of phenotypic tests further suggested a genetic interaction between *IST2* and *ENA1-5* or *NHA1* and showed that Ist2 protein is involved in maintaining of homeostasis of alkali metal cations in *Saccharomyces cerevisiae* cells and that its absence leads in most cases to lower concentration of sodium inside the cells. On the other hand, estimation of physiological parameters related to cation homeostasis, such as membrane potential or intracellular pH, did not show significant changes in *IST2* presence or absence.

Keywords: *IST2, Saccharomyces cervisiae*, cation homeostasis, tolerance to salts.