DOI: 10.46991/JISEES.2025.SI1.144

# Role of Ion Gradients and Redox Potential During Anaerobic and Aerobic Conditions in *E. Coli* and *S. Cerevisae*

Karen Trchounian[*]

[1] Research Institute of Biology, Yerevan State University, Yerevan, Armenia
[2] Department of Biochemistry, Microbiology and Biotechnology, Faculty of Biology, Yerevan State University, Yerevan, Armenia
[3] Microbial Biotechnologies and Biofuel Innovation Center, Yerevan State University

## ABSTRACT

It is well known that during anaerobic conditions redox potential shifts to low negative values compared to aerobic conditions. This affects also the rate of ion fluxes, ATPase activity, end products formation. In *E. coli* during fermentative conditions $H^+$ and $K^+$ ions are mainly involved in regulation of ATPase activity, ion fluxes and further maintaining bioenergetic balance in the cell. While in *S. cerevisae* yeasts besides $H^+$ and $K^+$ ions further $Na^+$ ions also contribute to overall balancing the cell energetics depending on oxygen availability. The shift from anaerobic to aerobic conditions changes the redox potential to positive values and further the ions involved in regulation of ion balance in the cell. During fermentation at pH 7.5 it is well established that in *E. coli* $F_OF_1$, Trk, Hyd and other secondary transport systems interact together for maintaining cell homeostasis and conserving energy. Similar strategy is identified in *S. cerevisae* during oxygen limited conditions. It can be proposed a unique strategy of interaction between ATPase and secondary transport systems for energy conservation in yeasts and *E. coli* for elucidating the redox potential dependent ion evolution from anaerobic forms of life towards shifting to aerobic ones.

**Keywords:** *S. cerevisae*, *E. coli*, ATPase activity, $F_OF_1$, Trk, $H^+$ and $K^+$ ions

## References:

1. Trchounian, A.; Trchounian, K. Fermentation revisited: how do microorganisms survive under energy-limited conditions?. *Trends Biochem. Sci.* **2019,** *44*, 391–400. DPI:10.1016/j.tibs.2018.12.009

## [*]Corresponding Author:

Karen Trchounian, Director, Research Institute of Biology, Yerevan State University, 1 Alex Manoogian str., Yerevan, 0025, Armenia.
Email: k.trchounian@ysu.am