BioISI - Biosystems & Integrative Sciences Institute

Masters 4 – Molecular Biology FCUL
Masters 5 – Biochemistry for Health NOVA

Oxaloacetate decarboxylase complex from Vibrio cholerae

Place of work/: FCUL

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Abstract

Life relies on the constant exchange of different forms of energy, i.e., on energy transduction. All living organisms need energy to fuel life processes. External energy sources, light or chemical compounds, are converted to biologically usable forms of energy, such as adenosine triphosphate (ATP) or electrochemical gradients (Δμ̃).

The majority of the organism seem to rely on a proton motive force but some microorganisms depend on sodium gradient to survive. Many human and animal pathogens rely on the use of Na+ as a coupling ion instead of or in addition to the H+. This capability to use a sodium motive force might have an important role in energy metabolism and pathogenicity of some pathogens, such as Vibrio cholerae, a Gram-negative pathogen responsible for 3 to 5 million cases of cholera annually and 100,000 to 120,000 of deaths.

Oxaloacetate decarboxylase (OAD) was the first enzyme of the Na+-transport decarboxylases family demonstrated to act as a Na+ primary pump. OAD couples the Gibbs energy change of the decarboxylation reaction to the transport of Na+ across the membrane.

The main goal of this project is to explore the structure and function of the transmembrane complexes OAD-1 and OAD-2 present in V. cholerae. In this project, the MSc student will learn microbiology, molecular biology, biochemistry and biophysics methodologies. Specifically, the student will perform, among other techniques, cell growths, protein expression, purification and biochemical and biophysical characterizations.