Oscar Juarez, J Comput Sci Syst Biol 2014, 7:5
http://dx.doi.org/10.4172/0974-7230.S1.009

OMICS Group Conferences
Accelerating Scientific Discovery

2nd International Summit on
Integrative Biology
August 04-05, 2014 Hilton-Chicago/Northbrook, Chicago, USA

Mechanism, metabolic role and evolution of the sodium-pumping NADH dehydrogenase

Oscar Juarez
Rensselaer Polytechnic Institute, USA

The sodium-pumping NADH dehydrogenase (Na^+-NQR) is the first complex in the respiratory chain of different types of pathogenic bacteria. This enzyme fulfils two essential roles, incorporating the redox equivalents form NADH into the respiratory chain and creating a gradient of sodium that is used to sustain many different homeostatic and metabolic roles. In this work, some of the most important aspects of the mechanism of Na^+-NQR and the roles of this enzyme in pathogenic bacteria and in other types of bacteria will be reviewed. Our studies have clarified the pathway of electron transfer within the enzyme and the thermodynamic properties of the cofactors and the regulatory mechanism for electron transfer, which has been important to understand how the enzyme utilizes the energy released by the redox reaction to pump sodium. We are now studying the pathway and mechanisms used for sodium transport. Our data demonstrates that the enzyme contains up to three catalytic binding sites for sodium that presents positive cooperativity. Moreover we have shown that different redox steps within the enzyme, triggers conformational changes that allow the capture of sodium and its release to the external side of the membrane. Currently, we have analyzed the phylogenetic history of this enzyme. Our data demonstrate that Na^+-NQR appeared through the duplication of the operon that encodes the homologous complex RNF, in the common ancestor of Chlorobi and Bacteroidetes. Moreover, the current distribution of this enzyme is the result of up to four horizontal gene transfer events.

Biography

Oscar Juarez completed his PhD (2001-2006) at the School of Medicine, National University of Mexico. In 2007, he joined the Department of Biology at the Rensselaer Polytechnic Institute, as Postdoctoral Researcher. In 2011, he was appointed as Research Assistant Professor in the same department. During his scientific career he has published 18 manuscripts and three book chapters. His contributions have been particularly important to understand the mechanism of the main ion pump of *Vibrio cholera*. His areas of expertise and interests cover different topics, such as enzyme kinetics, metabolic modeling, protein engineering, pathogen physiology and drug discovery.

oscarxjuarez@gmail.com