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## Molecular adaptation of a metagenome-derived mercuric reductase from Kebrit Deep brine environment in the Red Sea to high salinity

Eman Bellah Aly Ramadan

The American University in Cairo, Egypt

Red Sea Kebrit brine (1490m) possesses unique environmental conditions, characterized by high salinity 4 M, temperature 23.4 °C, elevated concentration of heavy metals, no oxygen and high hydrostatic pressure. In order to highlight the structural-functional relationship of enzymes adaptation to such extreme environmental conditions, DNA isolated from the microbial community of Kebrit brine is subjected to 454-pyrosequencing and a metagenomic dataset is established and looked for enzymes involved in mercury detoxifications. An operon containing the genes essential for mercury detoxification was identified in our 454-pyrosequencing metagenomic dataset. A total of 28 *merA* orthologs were identified in Kebrit brine metagenomics library, choosing two *merA* genes: One representing the consensus sequence (K35-NH) and the other (K09-H) have amino acid substitutions replacing non-polar with acidic amino acids. Kinetic parameters were measured at the NaCl concentration that gave maximum activity for the respective enzyme. K09-H maximal activation is observed at 2 Molar NaCl and retains 65% of its activity at 3 Molar. K35-NH showed maximum activity at 0 Molar NaCl which is equivalent to 52% activity of K09-H at 4 M. Both and K35-NH retained 90% of their activity after 10 minutes incubation at 65 oC. Comparing the kinetics of both enzyme suggested that the amino acids difference between the two orthologs are acquired evolutionary structural adaptation to confer site-specific level of halophilicity to survive in such extreme environment as Kebrit Deep. This halophilic feature if used properly is a potential for many industrial and bioremediation applications in detoxification of mercury.

### Biography

Eman Bellah Aly Ramadan has completed her Bachelor of Medicine, Bachelor of Surgery (MBBC) in 1997 and MSc degree in Pediatrics from Ain Shams University, Faculty of Medicine in 2002. She has received MSc in Biotechnology from American University in Cairo, Egypt in 2011. She is currently a PhD candidate of American University in Cairo, Egypt.

emanbellah@aucegypt.edu

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