

Applied Microbiology 2018: Isolation, molecular characterization and extracellular enzymatic activity of culturable halophilic bacteria from hypersaline natural habitats- Samyah D Jastaniah- King Abdulaziz University

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Isolation, molecular characterisation, and extracellular enzymatic behavior of cultivable halophilic bacteria from natural environments of hypersaline. 19: Biodiversitas 1828-1834. Saline habitats are unusual extreme environments, like the Dead Sea, because of their extreme salinity. Most saline environments are caused by seawater evaporation and have an almost neutral to slightly alkaline pH (such as the Red Sea (pH8.3) and the Arab Gulf (pH8.3)). Ten halophilic (two Gram-negative) bacterial strains belonging to the Halomonadaceae family and (eight Gram-positive) belonging to the Bacillaceae family were isolated from the Red Sea, the Arabian Gulf and the Dead Sea by subjecting the isolates to a high salinity medium, followed by identification using 16S rRNA gene sequencing. Four of the isolates were designated on the basis of their high salinity tolerance; SBR1 showed 97% homology to *Halomonas aquamarina*, SBR2 showed 97% homology to *Sediminibacillus* sp., (Red Sea), SBA9 showed 94% homology to *Halobacillus* sp., (Arabian Gulf) and SBD17 gave 98% homologation to *Halobacillus dabanensis* (Dead Sea). The isolates were also characterized by their physiological parameters, SBR1 showed optimum growth at 30°C, pH8.5 and 1.5M NaCl, SBR2 at 30°C, pH6.0 and 1M NaCl. Optimum conditions for SBA9 were 35°C, pH6.5 and 1M NaCl and for SBD17, 37°C, pH7.0 and 1M NaCl.

Introduction: Microorganisms which live in extreme environments are called extremophiles. So-called psychrophiles and thermophiles grow best at low and high temperatures. Alkaliphiles and acidophiles are adapted to alkaline and acid conditions, barophiles grow best at high pressure, radioresistant organisms can live in high radiation environments, whilst halophiles are salt-tolerant organisms. Extremophiles have a number of strategies that enable them to live in harsh environments such as their ability to produce extreme hydrolytic enzymes that are becoming increasingly attractive to modern biotechnology, industry, and medicine. For example, thermophiles produce polymer degrading enzymes and DNA polymerases; these are stable and active at high temperatures. Psychrophilic proteases and lipases are active at lower temperatures, while acidophilic and alkaliphilic enzymes may be useful in the development of detergents. Halophilous or halophilic microorganisms thrive in hyper-saline concentrations and include eukarya, bacteria, and archaea members. The pink-red color of hypersaline environments worldwide is due to halophilic microorganisms, and the most frequently found halophiles belong either to the archaea or to certain bacterial genera, such as *Haloquadratum*, *Halobacterium*, *Halomonas*, and

Salinibacter, as well as the green algae, *Dunaliella salina*. Because of their salt requirements, halophiles may be divided into three main groups; extreme halophiles prefer to grow at 5 M NaCl, moderate halophiles at 3 M NaCl, and slight halophiles at 1 M NaCl. Our full realization of microbial diversity has been impeded by the difficulty of studying microorganisms in natural environments through cultivation and other traditional methods. One milliliter of seawater can contain 106 of unidentified microorganisms, making the use of modern molecular methods important to determine the large variety and structure of microbial populations. These techniques and methods can be used on both culturable and non-cultural micro-organisms isolated from a variety of environments including seawater and soil. A number of molecular techniques were developed to characterize and identify the phylogenetic and functional diversity of microorganisms, the most commonly used being the analysis of 16S rRNA genes for prokaryotes, selectively amplified by the Polymerase Chain Reaction (PCR) from the entire genomic DNA extracted from the environmental sample, with or without the need to cultivate micromicroorganisms. The aim of this study was to isolate bacteria from the Red Sea, – Isolation and characterization of halophilic bacteria in Saudi Arabia and the Dead Sea in Jordan in 1829 (also known as the Persian Gulf), and the Jordanian Dead Sea, and then identify any isolated halophilic bacteria using 16S rRNA gene sequencing. The study also involved physiological characterization of bacterial halophilic isolates.

Results and Discussion: Fifty-eight halophilic bacterial strains were isolated under aerobic conditions from seventeen samples taken from various high-saline environments varying between water, sediment and mud, i.e. the Red Sea and the Arab Gulf Kingdom of Saudi Arabia, which are salt and alkaline environments (pH 8.39-pH 8.35) and the Jordan Dead Sea, which is a hyper-saline and acidic environment (pH 6.03) make environment. Twenty-four bacterial isolates from the Red Sea samples were collected during the early summer of May. At the same time, the samples from the Arabian Gulf obtained nine bacterial isolates. At the end of the summer September, twenty-five bacterial isolates were obtained from Dead Sea samples. For the specific isolation of halophilic bacteria, a range of media containing a range of NaCl was used. Saline nutrient medium (1M NaCl) yielded ten strains of halophilic bacteria. In this study, it was decided to fully characterize only four of the ten strains, since these were most suited to grow at high concentrations of NaCl.