

Distributions of euryhaline halophilic microorganisms at non-hypersaline environments

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The euryhaline halophilic microorganisms grow in a wide salinity range from lower than 3% NaCl (seawater equivalent) to upper than 15% NaCl or to even at saturation level (about 30% NaCl). Euryhaline halophiles maintain intracellular osmotic balance by controlling the concentration of compatible solutes. These compatible solutes not only stabilize the proteins from denaturation caused by high salt concentration but also serve as protection against stresses such as heating, freezing and drying. Indeed, many reports have shown that a number of euryhaline halophiles could tolerate other environmental parameters such as low and high temperatures, desiccation, high pressure and high concentrations of heavy metals. Although multiple adaptabilities of euryhaline halophiles have been reported, very few studies have shown that euryhaline halophiles may also adapt well to non-hypersaline extreme environments. We obtained a lot of euryhaline halophiles from a wide range of extreme habitats such as deep-sea sediments, waters, hydrothermal vent fluids and seeps.

Some euryhaline halophiles were also isolated from the terrestrial samples. The availability of water (water activity) in terrestrial samples is varied, from no liquid water to fresh water, which is the severe environment for many halophiles. Although the water activity in evaporites is extremely varied, some euryhaline halophiles were included in the evaporites. For example, we isolated *Bacillus* sp. from limestone. We discuss about the tolerance in some euryhaline halophiles to the stress of a wide range of water activity.