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Author: Mr. Gaurav Yadav
India

Dr. Roohi Roohi
India

COMPARATIVE METAGENOMICS OF HIGH- ALTITUDE HYPERSALINE AND FRESHWATER
LAKE AND LIPIDOMICS ANALYSIS OF POLYEXTREMOPHILES ISOLATED FROM
HYPERSALINE LAKE REVEALS POTENTIAL LIPID BIOSIGNATURE

Abstract

Extreme terrestrial, mars- analogue environments consist of extreme of salinity, pH, temperature, pressure, metal content and radiation. Microorganisms surviving in such conditions are extremophiles. Majority of condition on Mars are polyextreme in nature, therefore, finding the habitability requires the investigation of polyextremophiles. Polyextremophiles are categorised as thermoacidophiles, thermoalkaliphiles, haloalkaliphiles, psychrohalophiles, psychroacidophiles, epsosalophiles and epsopsychrophiles. Ladakh is a diverse, polyextreme mars- analogue site in India which includes sand dunes, hypersaline freshwater lake, hot springs and ice glaciers. In our study, we collected sample from two lakes: (i.) Tso kar hypersaline lake (TKHSL), (ii.) Tso moriri fresh water lake (TMFWL) and determined the microbial diversity using metagenomic analysis. The most abundant phylum at TKHSL are firmicutes followed by proteobacteria while the most abundant phylum at TMFWL is proteobacteria followed by actinobacteria. Comparative differential relative abundance has showed the pseudomonadota to be dominant at TMFWL while bacillota to be dominant at TKHSL. Further, we isolated three polyextremophilic bacteria *H. alkaliphila*, *H. bluephagenesis* and *Halomonas SSL3* and performed lipidomics analysis using an UHPLC-HRMS with *E. coli* as control. Total 889 lipids belonging to 58 classes of lipids are detected. Statistical analysis is done using Metaboanalyst 4.0. Lipidomics results shows lipid profile of *H. alkaliphila* is significantly different compared to mesophile *E. coli* and polyextremophiles *H. bluephagenesis* and *Halomonas SSL3*.