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Title

Characterization of Bacteria Isolated from Briny Water Lenses in Siberian Permafrost

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Abstract

Aerobic, heterotrophic bacteria were isolated from briny water lenses in Siberian permafrost. These water lenses form due to salting out of the soil as the in situ temperature drops and remains at about -10 C. Samples ranged in age from 30,000 to 40,000 years old and salinity was 120 g/l. Seventeen organisms were isolated by direct plating on R2A +- 3% NaCl at 4, 10.5, or 22 C and represented the following genera: *Psychrobacter*, *Arthrobacter*, *Frigoribacterium*, *Paenibacillus*, *Bacillus*, *Subtercola*, *Microbacterium*, *Rhodococcus*, and *Erwinia*. Isolates were psychrotolerant (optimum growth temperature = 24 to 33 C); while halotolerance ranged from 0 to 10% NaCl. Rate of resazurin reduction was used to measure metabolic activity and correlated well with growth rate in the presence of 3% NaCl ($r^2=0.89$ to 0.99). Spore-forming bacteria did not reduce resazurin at -10 C. When detected, resazurin reduction at -10 C occurred at very low rates (0.6 fmol/cell/day); except the *Psychrobacter* sp. (6 fmol/cell/day). In addition, only the *Psychrobacter* sp. had a detectable growth rate at -10 C (0.02 1/day). These data suggest that at -10 C spore-forming isolates survived as spores, non spore-forming isolates survived by maintaining metabolic activity sufficient only for cell repair, and the *Psychrobacter* sp. survived by maintaining metabolic activity sufficient for cell repair and reproduction.