Title:	C02 - fixing, h2-utilising haloalkaliphilic anaerobic chemolithotroohs from lonar lake
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Abstract:	Chemolithoautotrophs are a group of microbes that grow on inorganic carbon sources (e.g., CO 2 and CO) and electron donors like H 2 , NH 3 , S 2- , Fe 2+ etc. These microbes play a crucial role in not only carbon biogeochemical cycling but also the elemental cycles of hydrogen, iron, sulphur, nitrogen, etc. Studying these microbes from extreme conditions is desired in expounding the known thresholds of life. These are also of interest as catalysts in developing CO 2 utilisation biotechnologies like microbial electrosynthesis and gas fermentation. In this study, an attempt was made to elucidate the anaerobic chemolithoautotrophic microbial diversity that utilises CO 2 as a carbon source and H 2 as an electron source for growth and metabolism from the highly saline-alkaline sub-surface sediments of Lonar Lake. The sub- surface sediments were used to inoculate anaerobic serum flasks containing CO 2 and NaHCO 3 as the only carbon source and H 2 as the only electron source. The pH of the growth medium was maintained at 9, and salinity at 2%. The culture enriched under these conditions at an incubation temperature of 30°C had Vibrio sp. as their most dominant group (at > 91% relative 16S rRNA sequence abundance) followed by Catenococcus sp (2%). This enriched culture exhibited high levels of organic acid production: 559.31 ± 6.47 mg/L of acetic acid and 465.45 ± 6.33 mg/L of formic acid as CO 2 fixation products. To get a clear picture of the microbial players involved in CO 2 fixation, isolation of pure culture(s) from the enriched culture was undertaken under autotrophic and heterotrophic conditions. Heterotrophic cultivation resulted in the isolation of Vibrio diabolicus, a facultative anaerobe originally isolated from a deep-sea hydrothermal field. It is a known EPS (Exopolysaccharide)-secreting bacteria reported only from marine neutral environments and has not been reported for autotrophy yet. Autotrophic cultivation also led to the isolation of a Vibrio diabolicus strain. This strain has the ability to grow under complete autotrophic conditions and also at high alkaline levels. Other strains belonging to this species have not exhibited these features so far. Therefore, this study reports on a novel V. diabolicus strain capable of autotrophy. The results of this study bridge the gap in our knowledge about the CO 2 -fixing anaerobic microbial diversity prevailing in saline- alkaline environments. The CO 2 -fixing ability of the enriched and isolated microbes can be further explored in microbial electrosynthesis systems for organics production.
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