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Title:	CO2 fixing lithotrophs from a highly haloalkaline environment of the Lonar lake
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Abstract:	<p>Chemolithoautotrophic microorganisms play an important role in carbon and energy metabolism in different environments through the fixation of CO₂ using inorganic energy sources such as hydrogen (H₂) and hydrogen sulfide (H₂S). These microbes are also of interest for the development of CO₂-based bioproduction technologies. Acetogenic bacteria belong to this group. These are obligate anaerobes that reduce CO₂ into acetate and conserve energy via the Wood–Ljungdahl pathway (WLP). These microorganisms have been reported from various natural but mostly normal environments. Not much is known about their ecology and diversity in extreme environments, such as saline soda lakes. Such environments host unique microbial communities that possess exceptional metabolic capabilities due to their adaptation to harsh growth conditions. In the present study, intending to improve our understanding of CO₂ fixing microorganisms in extreme environments, I attempted the enrichment of chemolithoautotrophic bacteria from a highly saline and alkaline environment of the Lonar lake with CO₂ and H₂ as the only carbon and energy sources, respectively. The experiments were conducted under 2% salinity and 7 or 9.6 pH conditions. The enrichment of chemolithotrophs was tracked by monitoring the growth via OD measurements and the production of organic acids via HPLC. At pH 7, the production of acetic acid (467.4 ± 7.4 mg/L) and formic acid (307.8 ± 3.4 mg/L) suggested successful enrichment of the CO₂ fixing chemolithotrophs. In the case of pH 9.6 condition, only formic acid (88.9 ± 1.3 mg/L) production was observed. It suggests the enrichment of novel microbes, which are capable of growing and conserving energy by fixing CO₂ and H₂ into only formic acid. It is an interesting observation, which warrants further investigations. A unique growth pattern comprising of black colored aggregates and thread-like structures was observed in the culture flasks. Microscopic characterization revealed the presence of oval-shaped bacteria aligned in long chains in these structures. In conclusion, successful enrichment of the chemolithotrophic microorganisms was achieved from the sediment samples of an extreme haloalkaline environment in this work. Further characterization through metagenomics is expected to reveal the most abundant CO₂ fixing lithotrophs in the enriched cultures.</p>
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