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Isolation and Characterization of Chemoautotrophic Hydrogen-Oxidizing Bacteria from Natural Environment

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One of the major causes of global warming is the increase CO_2 in the atmosphere due to fossil-fuel combustion. Some international agreements for reducing the amount of CO_2 emissions have been reached and as a result, many studies on CO_2 removal from combustion gas have been performed, and recently the techniques for biological CO_2 fixation by photoautotrophs have been developed.

In this study, microorganism that can biologically fix CO_2 by chemoautotrophs but not photoautotrophs is isolated from the nature(fresh and sea water), and its characteristics is investigated The isolated strains include hydrogen-oxidizing marine bacterium strain YN-1 and fresh water bacterium identified as a *Aeromonas* sp. strain JS-1. they use the molecular hydrogen and CO_2 as energy and carbon soures. Growth charateristics of the strains and also several factors for improving the CO_2 fixation rate are examined, its results show that these strains have a good growth to high CO_2 concentration(40%). And cell dry weight is about 13.4g/l after continuous cultivation of strain YN-1 for 76 hours. To increase CO_2 fixtion rate of strain YN-1, optimal operating conditions were determined using a factorial design models. The continuous cultivation were performed under each conditions with four cultivation factors such as H_2, O_2, CO_2, and pH which thought to be affected CO_2 fixation. The cell dry weight is 11.4 g/l at 48 hours as exponential growth time. The optimized condition by factorial design was H_2:O_2:CO_2:pH=840:210:110:6.7, and in which cell dry weight was 12.3 g/l. Strain YN-1 and strain JS-1 can fix CO_2 via the reductive TCA cycle and the Calvin-Benson cycle, respectively. To identificate of strain YN-1, the 16S rDNA sequence was performed. The similarities, however, between strain YN-1 and several reference organisms(hydrogen-oxidizing bacteria) were low such and identity of 91% with *Shewanella benthica* and *Aeromonas media*, and 90% with *Aeromonas eucrenophila*(ATCC 233309T). Therefore, we propose that strain YN-1 is a new CO_2-fixing hydrogen-oxidizing marine bacterium based on the results of 16S rDNA sequence analysis.