MONTANA STATE UNIVERSITY
NORM ASBJORNSON College of ENGINEERING

Evaluation of Methanotrophic Activity and Growth in a Methanotrophic-Heterotrophic Co-Culture

by
Ayse Bengisu Kilic
M.S. Candidate, Thesis Defense
Chemical & Biological Engineering Department
Montana State University

Department of Chemical & Biological Engineering

Tuesday, July 20, 2021
10:00AM – 11:00 AM
210 Roberts Hall
Via Webex:
https://montana.webex.com/montana/j.php?MTID=mfc7d70daa93ffcc34e4598fcc135a855

ABSTRACT

Methane is a potent greenhouse gas (GHG) and accounts for 20-30% of the GHG emissions globally. In nature, methane is utilized as a sole carbon and energy source by a group of bacteria referred to as methanotrophs. Methanotrophs have been reported to have the ability to form close associations with other microorganisms such as heterotrophic bacteria in the environment. Therefore, understanding methanotrophic activity and growth in a microbial consortium with heterotrophic bacteria is of interest from an environmental and biotechnology perspective. In this study, a methanotroph; *Methylocystis sp.* NLS7 and a heterotrophic bacterium, *Pseudomonas chlororaphis,* were co-cultivated in a methane-fed bioreactor with a dialysis membrane device used to separate the species physically. It was hypothesized that the co-culture would exhibit enhanced methanotrophic activity and microbial growth of NLS7 in NLS7- *P. chlororaphis* co-culture. The methane-oxidation rate and microbial growth rate of NLS7 were evaluated as a functional response variable to the presence of *P. chlororaphis*. In addition, the effects of NLS7 growth were evaluated on the growth of *P. chlororaphis*. Our findings indicated that the presence of *P. chlororaphis* does not have any beneficial effects on *Methylocystis sp.* NLS7 activity and growth. However, the growth of *P. chlororaphis* in the co-culture with solely methane as a carbon source indicated that *P. chlororaphis* is likely gaining carbon and energy from by-products of methane oxidation by *Methylocystis sp.* NLS7 since *P. chlororaphis* could not utilize methane as a carbon and energy source. The results of this study give us an important insight into the activity and the growth of methanotrophic consortia in methane-driven ecosystems. The knowledge can be expanded into methane bioconversion technologies where high value-added product development is targeted.

214 Roberts Hall
P.O. Box 173920
Bozeman, MT 59717-3920
www.chbe.montana.edu

Tel 406-994-2221
Fax 406-994-5308
Email ChBE@montana.edu

Mountains & Minds