中央研究院生物多樣性研究中心
Biodiversity Research Center, Academia Sinica
biodiv@gate.sinica.edu.tw
02-2789-9621

Microbial Diversity and Bioinformatics

Unexpected Metabolic Versatility of Aerobic Methanotrophs

Prof. Sung-Keun Rhee

Department of Microbiology
Chungbuk National University, Korea

Time: 2023. 03. 03 Fri. 14:00

Venue: Auditorium, 1st Floor,
Interdisciplinary Research Building
跨領域科技研究大樓1樓演講廳

Host: Dr. Yin-Ru Chiang 江殷儒研究員

~Attendee are suggested to wear mask~
~與會者建議請配戴口罩~

中央研究院生物多樣性研究中心
Biodiversity Research Center, Academia Sinica
biodiv@gate.sinica.edu.tw
02-2789-9621

Microbial Diversity and Bioinformatics

Abstract

Atmospheric methane (CH_4) is a potent greenhouse gas responsible for about 15% of the total greenhouse effect. The amount of CH_4 in Earth's atmosphere is continually increasing. The diffusive flux of CH_4 is oxidized by aerobic methanotrophic bacteria at oxic-anoxic interface in terrestrial environments, thereby reducing CH_4 emission. Methanotrophs were long assumed to have a limited substrate spectrum, including methane, methanol, and occasionally other C1 compounds, but no substrates containing carbon–carbon bonds.

To date, there has been a clear distinction between thiotrophic and methanotrophic microorganisms. In the seminar, a new methanotroph from a wetland, showing respiratory oxidization of sulfur compounds will be presented. We also experimentally demonstrated that thiotrophy and methanotrophy are metabolically compatible, and both metabolisms can be expressed simultaneously in a single microorganism. These findings suggest the mixotrophic bacterium as a possible component of the methane and sulfur cycles in wetlands and set a new framework for better understanding methane and sulfur cycle interaction in natural and engineered wetlands.

It was found that methanotrophs of 'Ca. Methylacidiphilum' strains IT5 and IT6, derived from geothermal environments unexpectedly grew on C3 intermediates of propane oxidation as sole carbon and energy sources. The complete biochemical pathway for utilizing C3 substrates was predicted by genomic and transcriptomic analyses and supported by physiology and substrate specificity tests. Additionally, one of the isolates, strain IT6, respired a nitrogenous greenhouse gas, N2O, as an alternative electron acceptor in anoxic conditions. Thus, the discovery of a novel function of CuMMO, the ability to utilize C3 compounds and respire an alternative electron acceptor expand the current metabolic traits of methanotrophs.