iFAST: The International Forum on Advanced Environmental Sciences and Technology

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8 p.m. CDT, 9 p.m. EDT, Wednesday, Sept. 4, 2024
1 a.m. GMT, 9 a.m. China, Thursday, Sept. 5, 2024

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Mary E. Lidstrom is professor emeritus of chemical engineering and of microbiology, and from 1996-2022 held the Frank Jungers Chair of Engineering at the University of Washington, Seattle. Lidstrom received her bachelor of science degree in Microbiology from Oregon State University. After receiving her master's and doctoral degrees in bacteriology from the University of Wisconsin, Lidstrom worked as a Leverhulme Postdoctoral Fellow in Microbiology at the University of Sheffield. Lidstrom has previously held academic appointments in microbiology at the University of Washington, in the Center for Great Lakes Studies in Milwaukee, Wisconsin, and in environmental engineering science at the California Institute of Technology. She is a fellow of the American Academy of Microbiology, a fellow of the American Association for the Advancement of Science, and a member of the National Academy of Sciences. From 2005 until 2021, Lidstrom was the vice provost for research and holds the title of vice provost emeritus. Over the past 50 years, research in the Lidstrom Laboratory has addressed various aspects of bacteria that grow on one-carbon compounds, including those that grow on methane. Current work is focused on developing microbially based technology for atmospheric removal of the potent greenhouse gas methane to slow global warming by 2050.

Methanotroph-based Methane Removal for Slowing Global Warming

Abstract: Methanotrophs are bacteria that grow on methane as their sole carbon and energy source, and strains are known that can consume methane from the atmosphere. Compared to other possible methane removal approaches, methanotrophs have the advantage of converting methane to CO2 plus biomass, a cobenefit that can be used as a sustainable protein feed additive for aquaculture, if it can be harvested. This presentation will focus on the aerobic methane-utilizing bacteria due to their high affinity for methane compared to other methanotrophs. Removal of methane in the atmosphere at scale will be extremely challenging due to the low concentration (1.9 ppm). Instead, we are addressing methane levels that exist in the air above emission sites such as landfills, rice paddies, oil and gas wells and discharge from anaerobic digestors (200-2000 ppm; 0.02-0.2%). We have identified an aerobic methanotroph in our strain collection that utilizes this highly dilute methane at 5-times higher rates than other published methanotrophs. The ability of this bacterium to use dilute methane well appears to be at least partly due to a high whole cell methane consumption capacity and a low non-growth associated maintenance energy. We propose a closed system bioreactor-based technology based on this bacterium to remove methane at 200-2000 ppm in air at scale and with economic feasibility. Such a system has an added advantage that it will not result in increased N2O emissions, which is a possibility when methanotroph populations are stimulated in natural communities, due to the intersection of the methane and nitrogen cycles in natural systems. This envisioned methane removal system has the potential to reach the scale needed to help slow global warming by 2050.

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