Methane Eating Bacteria (Methanotrophs)

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A new study reveals that a **bacterium** that devours the greenhouse gas methane could **limit the rate of global warming.**

[Ref - DTE]

About Methanotrophs:

- **Methanotrophs or Methanophiles** are prokaryotes that **metabolize methane** as their source of **carbon and chemical energy**.
- They grow best when the methane concentration is around **5,000-10,000 parts per million** (ppm).
- The bacteria oxidise the methane to **CO2 and biomass.**
    - **CO2** is a much less powerful greenhouse gas.

Key highlights of the study:

- The researchers screened a range of **existing methanotrophs** to identify those that **consume such low methane** (500 ppm) **at higher rates**.
- Methane levels in key emission sites are around **500 ppm**.
- They found that ***Methylotuvimicrobium buryatense* 5GB1C** performed the best at 500 ppm.
    - This strain **grew well even at 200 ppm**.
- *M. buryatense* can grow at **low methane concentrations** ranging from **200-1,000 ppm.**
- Other Methane-eating bacteria **(methanotrophs)** grow best when the methane concentration is around **5,000-10,000 parts per million (ppm).**
- The strain's **high methane consumption** rate is probably due to a **low energy requirement** and **greater attraction for methane**.
    - It attracts **more than five times of methane** than that of other bacteria.
- These features make this strain a promising candidate for **methane removal technology**.
- The researchers have proposed **designing biofilters** that contain nutrients necessary for the growth of microorganisms.

Benefits of methane-eating bacteria:

- Bacteria **produce biomass** after consuming methane which can be used as feed in **aquaculture**.
- For every tonne of methane consumed, the bacteria can generate **0.78 tonne of dry-weight** biomass methane.
- By incorporating **genetic changes** to the bacterial strain, **240 million tonnes of methane** can be prevented from major emission sites from entering the atmosphere by **deploying 50,000-300,000 treatment units for 20 years**.
- If the methane in the atmosphere was decreased by **300-1000 million tonnes by 2050,** global temperature can decrease by about **0.21-0.22°C**.
- Like other methane reduction strategies, this method **doesn't produce nitrous oxide** emissions, which have a significant **global warming potential**.

Challenges in scaling up the technology:

- **Controlling temperature**: As the optimal temperature range is 25-30 °C, both too-low and too-high temperatures become problematic for bacterial growth.
    - Controlling temperature is **expensive** and impacts both economic feasibility and **energy balance**.
- **Other challenges: Investment capital, Public acceptance, Lack of political will** and understanding in the private and public sectors.

About Methane Gas:

- Methane (CH4) is a hydrocarbon that is a **primary component of natural gas**.
- It is also a **greenhouse gas (GHG),** so its presence in the atmosphere affects the earth's temperature and climate system.
- It is emitted from a variety of **anthropogenic (human-influenced) and natural sources**.
- **Anthropogenic emission** sources include landfills, oil and natural gas systems, **agricultural** activities, **coal mining, stationary and mobile combustion**, wastewater treatment, and certain industrial processes.
- Methane is more than **25 times as potent as carbon dioxide** at trapping heat in the atmosphere.
- Its concentrations in the atmosphere have **more than doubled** over the last 2 centuries.
- It is both a **powerful greenhouse gas** and **short-lived** compared to carbon dioxide.

Solutions for methane reduction:

- **Removal and decreased methane emissions** strategies,
- **Feed additives** for cattle,
- New **rice-farming** techniques,
- Advanced approaches to **oil and gas leak detection**,
- **Coal methane capture**, and
- Modern **water and waste facilities**.

