Microbial Populations Shift During Mesophilic and Thermophilic Anaerobic Digestion—Phase 1: Biological Hydrogen Gas Production from Lab-Scale Batch Anaerobic Digester using Various Substrates

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Low-cost & carbon rich fuels emit large amounts of greenhouse gases.
Hydrogen gas is known as one of the most clean and sustainable type of energy that yields 3 times higher than fossil fuels (Momirlan et al., 2005).
Currently, most energy utilization from anaerobic digestion is methane oxidation, which increases global warming potential because its combustion significantly emits CO₂ (greenhouse gas) (The Geography of Transportation Systems, 2017).
H₂ has the highest energy content compared to other gases in biogas. Also, the hydrogen ignition generates water, not CO₂, as the end-product (Balat M., 2008).

**RESULTS AND DISCUSSION**

- Multi-variable analysis via RDA shows COD, VFA and ammonium ions concentrations combined directly influenced high H₂ content in RDA1 component.

**BACKGROUND AND SIGNIFICANCE**

- Biological H₂ production generated during anaerobic digestion is a fraction accounted within the 1%.
The microbial substrate competitions during anaerobic digestion inhibits high biohydrogen gas content formation.

**METHODOLOGY**

- Batch experiments continued using C. butyricum, C. beijerinckii, C. hydrogeniformans and Lactobacillus spp.
- Molecular biology to determine population in samples using next generation sequencing.
- Repeat experiment to determine if the process of methanogenesis can be interrupted.

**ON-GOING AND FUTURE WORK**

- COD, VFA, alkalinity and NH₄⁺-N were observed over 18 days (data shown only no spike reactors)

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