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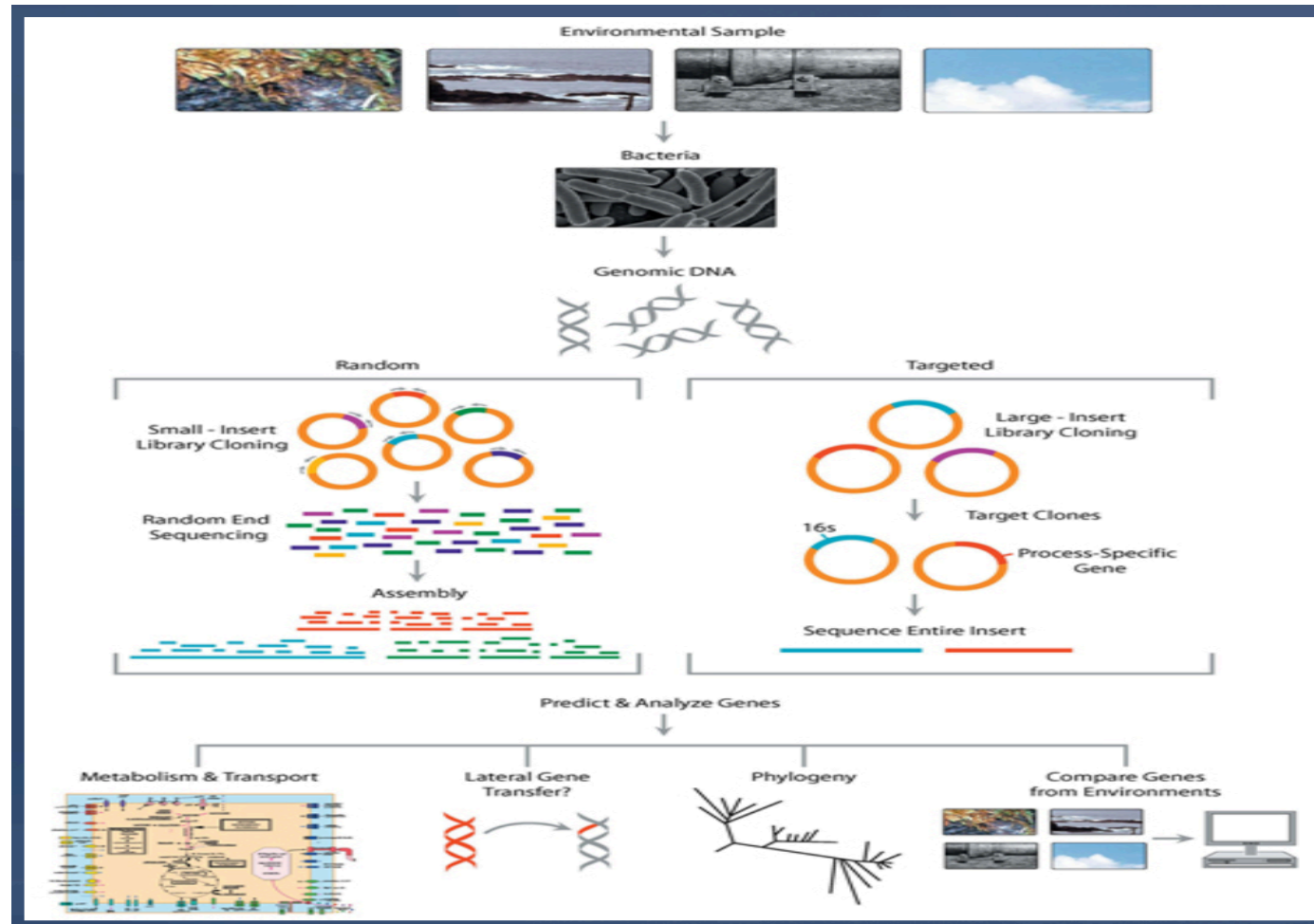
# **Surface Stimulation to Enhance Metabolic Reaction & Increase Biogas Yield in Anaerobic Digesters**

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# Surface Stimulation to Enhance Metabolic Reaction & Increase Biogas Yield in Anaerobic Digesters

**Research Team:** K. Chandran, R. Farinato, D.R. Nagara, R.Sambrotto, P. Somasundaran, B. Vasanth & L.R. Viana  
**Overview:** Investigate Anaerobic Digesters micro habitat through DNA analyses and pathways in the production of biogas and how it can be manipulated through electro-chemical stimulation.



**Technical Information:** The methanogens are known to possess new coenzymes and pathway which use hydrogen to reduce carbon dioxide or in some cases acetate to produce methane. In order to understand the interaction among the diverse flora of Archaea, in a Anaerobic Digester, a DNA sequencing Analysis will be performed to identify the micros present.

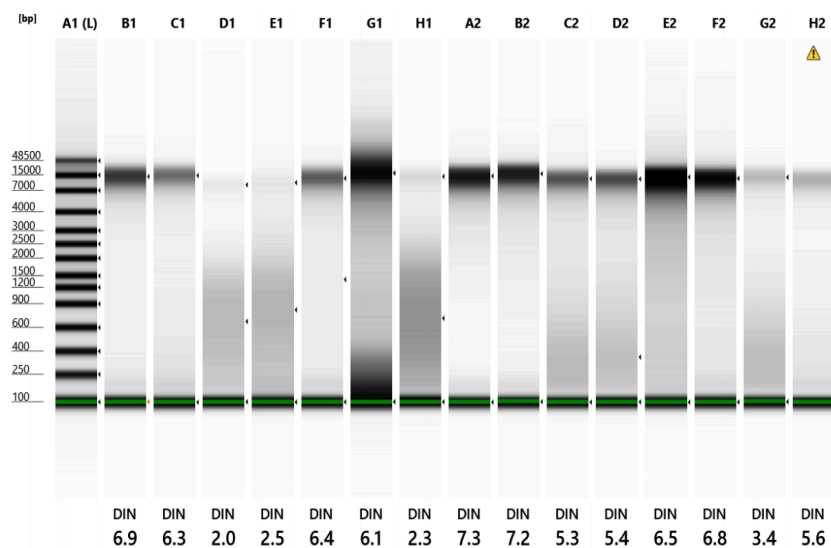
# Industrial Relevance

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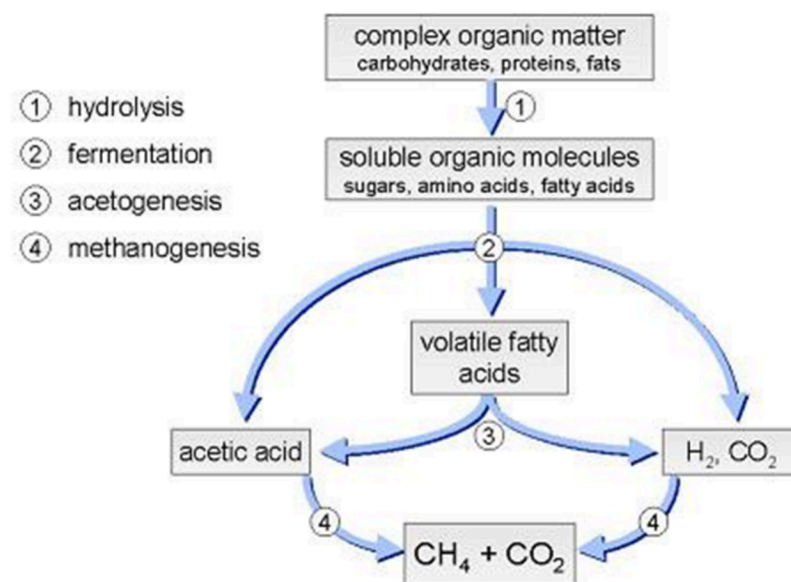
- The world's total production of alcohol from cane molasses is more than 13 billion liters/annum (3.42 billion gals).
- The 295 distilleries in India produce 2.7 billion liters of alcohol and generating 40 billion liters of wastewater annually.
- Distillery wastewater has potential to produce 38.8 billion cubic feet of biogas (11.3 billion KWh).
- Distillery the influent Wastewater COD concentration is between 85,000 – 110,000 mg/L equivalent to 7.46 billion pound of COD / annum.
- One of the major treatment used for this type of high COD load is Anaerobic Digester.

# Goals of the Proposal

1. Perform DNA Sequencing Analysis from several Anaerobic Digesters and Rumens of Cows.
2. Understand the mechanism of the surface changes on Archaea cell membrane to enhance metabolic reaction of glucose and increase methane (CH<sub>4</sub>-biogas) production.



DNA Integrity Number (DIN)



Biogas Mechanism pathways

# Research Methods/ Techniques

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## Research Methods:

- Obtain sample strain from 14 Anaerobic Digester coming from different Industries (Distillery & Food Processing)
- Obtain samples from the Rumen, Reticulum, Omasum and Abomasum of 8 cows for a total of 32 samples.

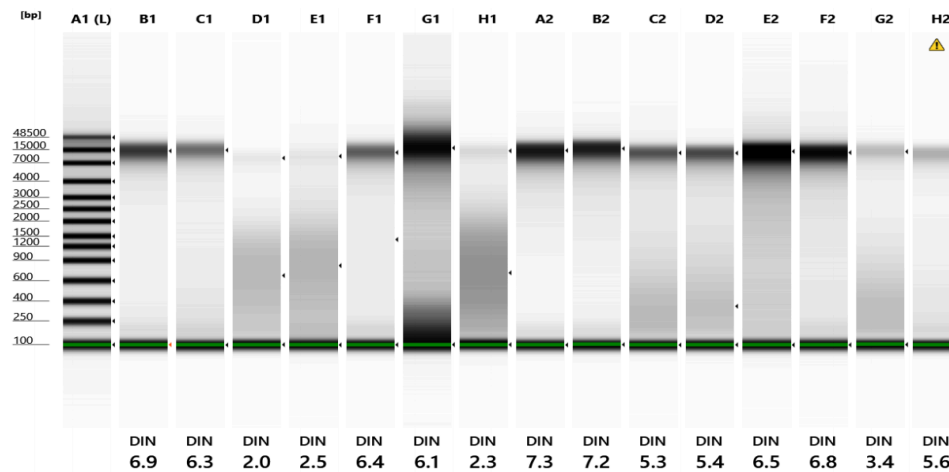
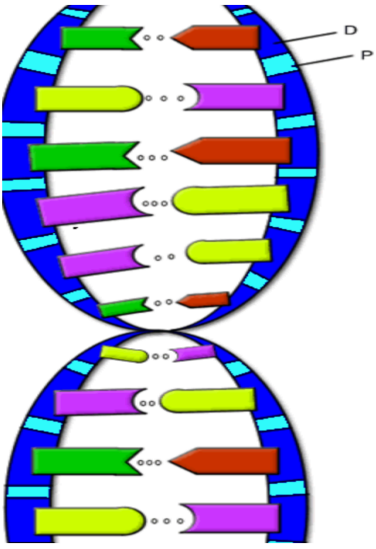
## Techniques or Equipment's:

- DNA Sequencing Analyses (DNA isolation process)
- Metagenome Sequencing Analysis (Who is there and what are they doing ?)
- Library construction
- Data Analysis

# Outcomes/ Deliverables

## Outcomes:

- DNA analyses was performed.
- Samples DNA Molecule was degraded during shipment and storage.
- Out of the 46 samples taken 38 had a DNA Integrity Number (DIN)  $< 6.5$ . Meaning the length of the DNA chain is not adequate or broken.



DNA Integrity Number (DIN)  $< 6.5$

- Purity of DNA was  $> 1.6$  meaning the sample was not contaminated.

# Outcomes/ Deliverables

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## Moving forward:

- Resample the 38 samples that had a DIN < 6.5
- Purchase DNA/RNA shield reagent to preserve DNA molecule during shipment and storage.





## Duration of Project and Proposed Budget

**Duration: September, 2019 – December, 2019**

**Cost Estimated Proposed Budget: \$15,000 - \$18,000**