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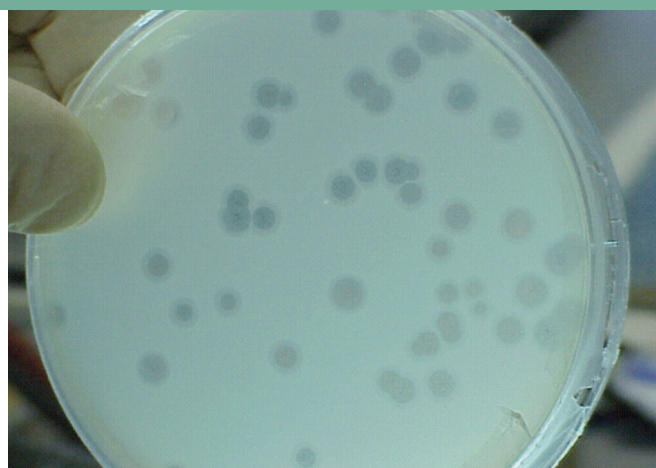
# Reducing Emissions from Livestock Research Program

## Archaeophage therapy to control rumen methanogens

Phage therapy is becoming increasingly important as a means of eradicating or controlling microbial populations and has the potential to be used to reduce methane emissions from ruminants. Phages (bacterial viruses) could be used to directly reduce methanogens, or to help establish rumen populations that will out compete methanogens for hydrogen, such as reductive acetogens.

This project seeks to amass a collection of archaeal viruses (both lytic and temperate) that are capable of infection across the spectrum of dominant methanogens that have been identified in the rumens of cattle and sheep under a wide variety of feeding and production systems. This phage library will be evaluated to a 'proof of principle' stage, for its capacity to reduce methane generation during rumen fermentation.

Initial experimental work has focused on the development of a novel method based on modification of a soft agar overlay method for screening strains of methanogenic archaea for the activity of lytic viruses (phage). The lack of an available phage for testing the soft agar overlay screening method and for use as a positive control is being addressed through collaboration with a research group in the USA led by Professor Larry Baresi. This group will send a *Methanobrevibacter smithii* phage PG.



Viral plaques on a lawn of *E. coli*.

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## The program

The Reducing Emissions from Livestock Research Program is a national collaborative program focused on developing practical on-farm options for significantly reducing emissions from livestock while simultaneously increasing productivity. The research will develop more accurate data on emissions from sheep and cattle and the levels of mitigation achieved using a range of strategies.

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## Project objective

To establish a collection of archaeal viruses that infect the spectrum of rumen methanogens, and establish 'proof of concept' evidence that archaeophage therapy has viable potential to reduce methane emissions from ruminal fermentation in sheep and cattle.



Anaerobic canister for maintaining Hydrogen-rich growing conditions.

## Progress

Several environmental samples have been tested for the presence of a phage able to infect and lyse the six methanogenic archaeal strains routinely subcultured in the Queensland Government laboratory, but to date, lytic phages have proven difficult to isolate and/or detect. Some newly isolated methanogens appear to have temperate phages, however, further testing is required. Experiments have also begun to refine the methods used for screening.

Cultures of eight strains of methanogenic archaea have been treated with the commonly used inducing agent, mitomycin C, and tested for the presence of increased concentrations of phage DNA. Several of the strains contained increased concentrations of DNA in culture fluid and extracted DNA is being tested using a molecular fingerprinting method to identify whether it is viral in origin. Future work includes continuously improving methodology to isolate and detect archaeophages and increase samples for screening.



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