PGGRC PUBLIC INFORMATION

Introduction

Under the Kyoto Protocol, New Zealand is required to reduce greenhouse gas emissions to 1990 levels by 2008 -2012. New Zealand is unusual among OECD countries in that methane (43%) and not CO_2 is our major greenhouse gas. Most of New Zealand's anthropogenic methane arises from pastoral agriculture through emissions from grazing ruminants. Total emissions from agriculture are estimated to rise above 1990 levels by 2008. Because the point source (grazing animals) is clearly defined, these emissions are potentially amenable to management. This proposal is aimed at developing methods for lowering ruminant methane in order to meet our international obligations.

PGGRC's research has a flow of medium to longer-term outcomes leading up to and into the 2008–2012 Kyoto first commitment period. The long-term research is intended to extend into the first commitment period but the consortium will be evaluated after 5 years.

Strategically, it is important that New Zealand develops and controls methods for lowering ruminant methane emissions. There is an economic imperative as well as an environmental one. In the year 2000 the animal–based biological and food processing industries of New Zealand had an export value of $10B FOB yet is responsible for approximately 43% of New Zealand's greenhouse gases via ruminant methane. Any perceived adverse effects on the environment from ruminant methane emissions are likely to result in negative effects on exports.

The programme focuses on lines of investigation that can lead to practical on-farm methods of reducing methane emissions. It is recognised that these methods need to be safe, leave no residues in meat and milk, be cost effective and be applicable to grazing animals. It is intended that safe, acceptable and effective methods be incorporated into strategies, practices and technologies. There are at present no proven methods[1] for controlling methane emissions on-farm, so a substantial part of this programme will be to generate new knowledge on natural processes involved in methane formation in grazing ruminants. Before sound strategies for lowering ruminant methane emissions from grazing animals managed in New Zealand can be identified, there is a need for a greater understanding of the biological factors involved.

[1] *(Note: a vaccine developed by CSIRO in Australia, purported to reduce methane from sheep by 10-20% is undergoing trials but to date there is no published proof of function for this technology. PGGRC plans to trial this vaccine under NZ conditions)*

PGGRC's research is based around information that AgResearch has generated over the past 8 years during research directed towards understanding factors influencing methane formation in New Zealand sheep and cattle and from international links developed with groups working in the same field. Specialised microbes (methanogens) in the ruminant produce methane during digestion of forage in the rumen as outlined in the Figure below. It is intended that the current investigation for anti-methanogen processes and compounds be continued and expanded in an integrated manner in order to move more quickly to solutions. PGGRC's research will comprise three broad lines of investigation involving forage factors, rumen factors and host animal factors involved in methane formation. The initial period of 3-4 years is intended to uncover a range of potential target processes and/or compounds from which most likely targets will be chosen. It is anticipated that tests with animals will be carried out in years 3-5 and fieldwork and systems research will be phased in to the programme conjointly in order to be well positioned for on-farm implementation.

There will be several outcomes from the Consortium's research:

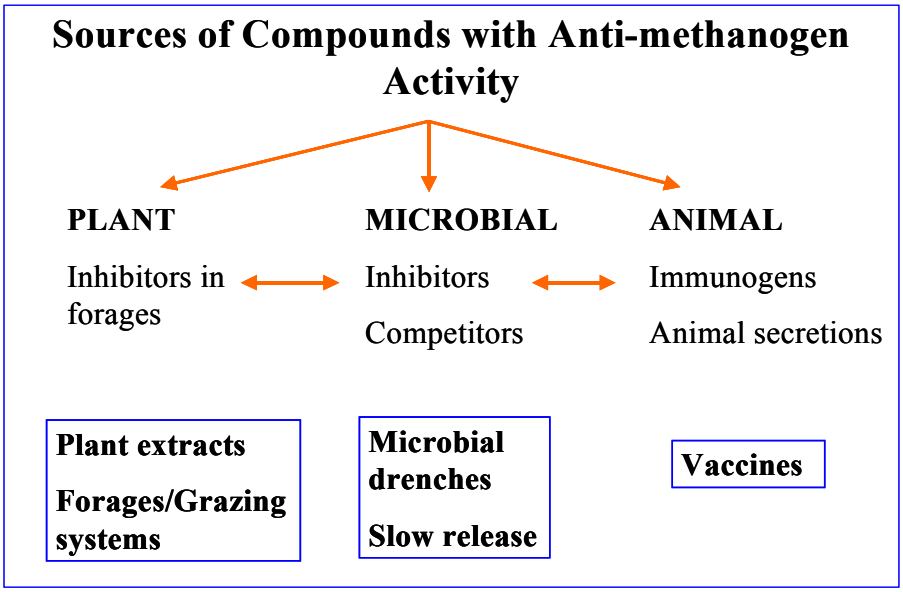
Environmental – meeting Kyoto protocol and sustainability for animal-based industries

Economic – minimising carbon tax liabilities, growing added-value exports, improved animal nutrition and welfare (sustainable production), export of mitigation technology (as world-leaders)

Social – sustaining rural communities

Initially, the focus of the research will deliberately be for a solution via rumen processes because identified solutions should have widespread applicability to New Zealand dairy, sheep and beef productions systems on flatland and hill country properties.

Potential sources of compounds that may have anti-methanogen activity.



The achievement of a successful outcome will require a more extensive multi-disciplined capability in key areas of molecular biology, microbial ecology, chemistry, immunology and rumen physiology so that short and long term goals can be achieved.

The six key science areas of investigation, and a brief description are:

Rumen microbial strategies to lower methane emissions

- Exploit rumen processes which influence methanogenesis and the survival of methanogens to provide novel on-farm strategies

Forage and plant inhibitors to lower methane emissions

- Identify and quantify inhibitory properties of forage inhibitors

Genomics for identifying methanogen inhibition targets

- Compare and contrast rumen and non-rumen methanogens in order to pin-point areas of archael/bacterial 'weakness'

Animal factors affecting methane emissions

- Quantify the genetic and environmental components of between-animal variation

Proof-of-function of possible methane-reducing technologies

- Animal assessments to establish potential of possible on-farm technologies, safety, and acceptance to consumer

On-farm testing

- Acceptability at a farm systems level (to follow successful leads from above)

These areas of science investigation form interlinked strands that will inform, negate and encourage certain lines of ongoing research (the go/no go questions for the Science Advisory Group).

Conclusion

This programme will carry out methane-mitigation research for solutions tailored to our farming system. NZ's competitive advantage comes from grazing animals rather than animals kept indoors or fed supplementary or complementary diets. Targets for research will include anti-methanogens, methanogen displacers and rumen modifying substances.