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Production of Greenhouse Gas from Ruminants and Their Mitigation Strategies

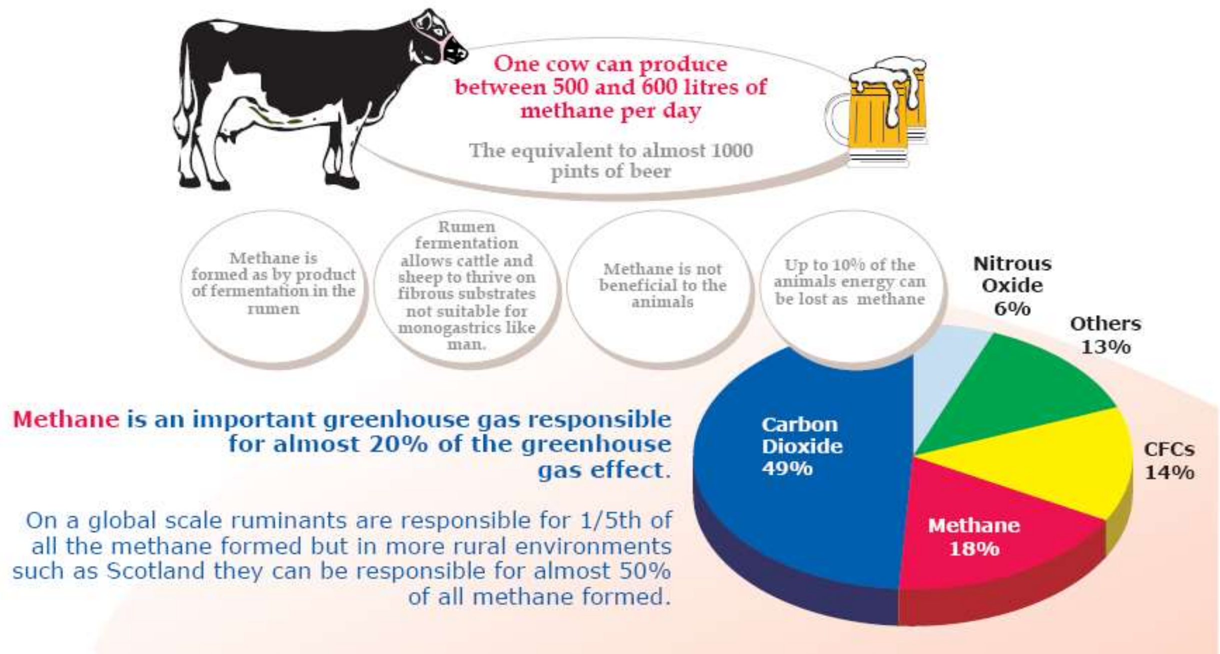
Shamim Ali
Assistant Professor, Khalsa College of Veterinary and Animal Sciences, Amritsar, Punjab

SUMMARY

The methane gas emitted by an animal is considered to be biogenic in nature and therefore is often excluded accounting for total GHG emissions. In the global warming methane is second to carbon dioxide that accounts 16% of all GHG emission globally. The methane production in ruminants can be reduced to a great extent by following certain mitigation strategies such as improvement in feeding, feeding of probiotics, genetic improvement of animals, defaunation and feeding of oils etc.

INTRODUCTION

The greenhouse gases (GHG) emitted from animal production mainly include carbon dioxide (CO2), methane (CH4), and nitrous oxide (N2O). The methane emitted by an animal is considered to be biogenic in nature and therefore is often excluded accounting for total GHG emissions. In the global warming methane is second to carbon dioxide that accounts 16% of all GHG emission globally (Scheehle and kruger 2006). The ability of methane to retain heat (global warming potential) is 21 times more than carbon dioxide (EPA 2008). Methane production from ruminants has been identified as the single largest source of anthropogenic CH4 (Mathison *et al.* 1998). The rumen is the home to billions of microbes, including bacteria, methanogens, protozoa and fungi. These microbes breakdown feed to produce volatile fatty acids (VFAs), carbon dioxide, ammonia and methane. Ruminants typically lose 2–15% of their ingested energy as eructated methane.



Hence mitigating methane losses from cattle has two important benefits. Firstly it may reduce the methane means a lower concentration of greenhouse gases (GHGs) in the atmosphere. Secondly less methane production may increase the efficiency of livestock production.

Different Mitigation strategies

Improved nutrition strategies

Lovett *et al.* (2005) demonstrated that increased fiber-based concentrate use at pasture reduced enteric methane per kilogram of animal product.An increased proportion of starch in the diet changes ruminal volatile fatty acid (VFAs) concentrations in such a way that less acetate and more propionate is formed, and the supply of hydrogen for methanogenesis is limited.

Genetic selection of animals methane (CH4) is second only to carbondioxide, Cattle that eat less than their peers of equivalent live weight and average daily gain have a low residual feed intake (RFI) and are more feed efficient, as shown by lines of cattle divergently selected for RFI (Arthur *et al.* 1996).Hence selection for reduced RFI will lead to substantial and lasting methane abatement.

Use of Probiotics

Wallace and Newbold (1993) found that probiotics improved productivity by 7–8% resulting in reduced methane production per unit of product (milk or meat) in dairy cows and growing cattle.

Forage type and quality

Methane production was reduced (7% and 40%) by increasing DMI and the proportion of concentrate in the diet. Methane production was lower with legume than with grass forage (28%).Legumes generally have higher dry matter intakes and produce more milk solids. This reduces methane emissions per unit of milk or meat production.

Defaunation

Defaunation results in reduced methane production due to reduced fiber digestion and reduced methanogen population is also associated with protozoa.

Oil

Addition of oils to ruminant diets may decrease methane emission by up to 80% in vitro and about 25% in vivo. Addition of unsaponified fats or oils to the diets of ruminants suppresses methane production.

CONCLUSION

The methane production in ruminants can be reduced to a great extent by following the different mitigation strategies which may be useful in combating the problem of global warming being caused by methane produced by ruminants.

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