

## Nitrate but not docosahexaenoic acid reduces methane production in lactating dairy cows

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Feeding measures, such as increasing the proportion of cereal grains in ruminant diets may lower enteric methane (CH<sub>4</sub>) production. However, such an increase may counteract the aim of using the lowest possible amount of human edible feed resources per unit of animal product. The use of feed additives in ruminant diets to reduce CH<sub>4</sub> would therefore be a suitable alternative mitigation option. Nitrate (NO<sub>3</sub>) as feed additive was proven to effectively reduce CH<sub>4</sub> production in lactating dairy cows. Furthermore, specific fatty acids have been evaluated for their effect on rumen fermentation, and docosahexaenoic acid (DHA; an omega-3 fatty acid; C22:6 n3) has been shown to have a particularly marked effect on rumen microbial metabolism. Micro-algae enriched in DHA reduced CH<sub>4</sub> production *in vitro*. Only the isolated effects of NO<sub>3</sub> and DHA on CH<sub>4</sub> emission have been described in literature. Therefore, this experiment was designed to investigate whether the effect of feeding a combination of NO<sub>3</sub> and DHA on CH<sub>4</sub> production in lactating dairy cows is additive.

Twenty-eight lactating cows were blocked according to parity, lactation stage, milk production and presence or absence of rumen cannula. Within blocks, cows were randomly assigned to one of the following treatments: C) Control; N) NO<sub>3</sub>; D) DHA; or N+D) NO<sub>3</sub>+DHA. Cows assigned to treatment N or N+D were gradually adapted to increasing levels of dietary NO<sub>3</sub> over a period of 21 days to prevent the occurrence of methemoglobinemia. No DHA was fed before the start of the experimental period.

Cows were fed a total mixed ration (TMR) consisting of 20% grass silage, 50% corn silage and 30% concentrates on a dry matter (DM) basis. Additives were included in the concentrates. The calculated inclusion levels for NO<sub>3</sub> and DHA were 22 and 3.0 g/kg DM of TMR, respectively.

After a 12-day adaptation to the experimental diets, cows were moved to climate respiration chambers from day 13 until day 17 for measurement of CH<sub>4</sub> production. A feed restriction was imposed during the CH<sub>4</sub> measurement period to avoid confounding effects of dry matter intake (DMI) level on CH<sub>4</sub> production.

Cows produced on average 368, 264, 369 and 298 g CH<sub>4</sub>/day on treatments C, N, D and N+D respectively. For CH<sub>4</sub> expressed in g/d, an interaction between NO<sub>3</sub> and DHA was found. No significant interaction effects were found, however, if CH<sub>4</sub> was expressed in g/kg DMI or in g/kg fat and protein corrected milk (FPCM). Per kg DMI cows receiving NO<sub>3</sub> produced significantly less CH<sub>4</sub> (17.5 g/kg DM versus 22.4 g/kg DM) than cows receiving no NO<sub>3</sub> in their diets.

In conclusion, NO<sub>3</sub> but not DHA reduced enteric CH<sub>4</sub> production and there were no NO<sub>3</sub> x DHA interaction effects on output parameters of interest (i.e. CH<sub>4</sub> in g/kg DM and g/kg FPCM).