Use of calcium nitrate double salt in cattle (methane emissions)

Last update: 5 September 2023

- **Type of challenge**: Environment.
- **Challenge**: Climate change (enteric methane emissions).
- **Animal category:** Cattle for fattening and dairy cattle.
- **Technique:** incorporation of calcium nitrate double salt as feed material in complementary feed (Calcium nitrate double salt is listed in the EU Catalogue of feed materials).
- **Mode of action:** Calcium nitrate double salt acts as an alternative hydrogen sink. It captures the hydrogen produced in the rumen during fermentation of feedstuffs. This hydrogen would otherwise combine with carbon to produce methane. Instead, the calcium nitrate double salt combines with hydrogen to produce ammonia, which can be used by the rumen microbes to grow and contribute to milk protein synthesis.
- **Potential efficacy:** Up to 10% reduction in methane emissions when included at a level of 1.6% of the total diet dry matter (equivalent to 1% nitrate).
- **Nature of evidence of efficacy:** More than 25 peer-reviewed publications and meta-analyses; positive evaluation by national authorities (Belgium, the Netherlands and Denmark).
- **Factors impacting on efficacy:** the effect of calcium nitrate double salt is only dose-dependent and is equally effective in all diet types.
- **Mode of use:** Calcium nitrate double salt must be incorporated into mixed feeds at a maximum rate of 1.6% of the total diet.
- **Requirements/limitations:** It must be used in mixed feeds at the recommended inclusion rates to achieve nitrate dilution and reduce risk of overfeeding on farm. Diets that include calcium nitrate double salt must be reformulated to ensure correct amounts of crude protein are supplied and excess levels are avoided. Exceeding 1.6% of the total diet may result in nitrite formation that can have adverse effects on animal health (methemoglobinemia). Not usable in organic production systems.
- **Economic consequences:** The inclusion of calcium nitrate double salt in the diet has the potential to replace some dietary protein and calcium. Therefore, the increased cost associated with the inclusion of calcium nitrate double salt is partially offset by its value as a source of nitrogen and calcium.
- **Side effects:** The limitation of the concentration to 1.6% of the total diet dry matter avoids adverse effects of nitrates on animal health. There is no impact on milk production and animal performance.

- **References:**
  - Feng et al. (2020). Antimethanogenic effects of nitrate supplementation in cattle: a meta-analysis. J. Dairy. Sci. 103:11375-18451. https://doi.org/10.3168/jds.2020-18541
  - Covenant Enteric Emissions Cattle – Measure 8: Nitrate
- **Other techniques**: Unsaturated fat sources (linseed, rapeseed fats), methane inhibitors (Asparagopsis taxiformis, 3-NOP, tanniferous forages), shift in rumen fermentation pattern (tannins, high digestible forages, probiotics, organic acids, essential oils, decreasing forage-to-concentrate ratio), lower emission intensity (increasing feeding level, increasing feed efficiency, decreasing grass maturity).

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