IMPACT: AIR POLLUTANTS EMISSIONS

Reference 24

Hou, Y; Velthof, GL; Oenema, O 2015 Mitigation of ammonia, nitrous oxide and methane emissions from manure management chains: a meta-analysis and integrated assessment GLOBAL CHANGE BIOLOGY, 21(3), 1293-1312. 10.1111/gcb.12767

Background and objective

Animal excreta in housing and manure storage systems, from grazing animals voided on pastures and from land following manure application are main sources of ammonia (NH_3) and nitrous oxide (N_2O). To make a quantitative assessment of the impacts of a suite of NH_3 mitigation measures on NH_3 emissions at individual stages.

Search strategy and selection criteria

Studies related to manure management and emissions of NH_3, N_2O and methane (CH_4) were searched using the bibliographical database Scopus, until the beginning of 2014. Specific search terms were combined, depending on animal category (animal, livestock, pig, swine, cattle or cow), manure type (slurry, waste, manure, compost, farmyard manure, digestate, liquid or solid), management measures (feeding: feed, diet, dietary manipulation or dietary crude protein; animal housing: housing, barn, slatted floor, deep litter, solid floor or straw floor; manure processing: acidification, acidified, separation, separated, digestion or biogas; slurry storage: storage, crust or cover; solid manure storage: compaction, cover, stockpiling, static piling, turning or compost; field application: band spreading, trailing hose, trailing shoe, injection, injected, incorporation or incorporated), and emissions (ammonia, methane, nitrous oxide or greenhouse gas emissions). 1) Only data from studies with reference treatments (i.e. without mitigation/processing measures) were included in our database, so as to allow side-by-side comparisons; 2) To maximize the number of studies, both laboratory and field experiments were taken into account.

Data and analysis

For calculation of grouped effect sizes, a mixed-effects mixed-effects model was used and performed in the nlme package of R statistical software Version 3.1. Experimental sites were considered as a random effect factor, to allow accounting for variances among studies. The mean effect size and the 95% confidence intervals (CIs) of each categorical group were estimated. The significance of the effects on emissions was statistically assessed at 0.05 level.

Number of papers	Population	Intervention	Comparator	Outcome	Quality score
37	Livestock production systems	Low crude protein (CP) diet	No reduction of dietary CP	Metric: Ammonia (NH_3) emissions; Effect size: Logarithm of ratio of the considered metrics in the intervention to the considered metrics in the control	56.25

Results

- The NH_3 emission decreased by 24% to 65% with a lowering of the CP content. The largest decrease was derived at a CP reduction of > 4%.
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Factors influencing effect sizes

- Dietary crude protein (CP) : The largest decrease was derived at a CP reduction of > 4%.

Conclusion

Lowering the crude protein content of feedis a strategy that consistently reduce NH_3.