Nutritional Interventions Targeting Ammonia

Ammonia emission is an environmental problem due to its nitrifying and soil-acidifying properties and its potential to affect human and animal health. Ammonia emission can be reduced by precision nutrition (see above and also Table 10-9). Studies by Van der Peet-Schwering et al. (1997) and Aarnink et al. (1993) showed that reducing protein by one percentage point reduced ammonia emission by approximately 10%.

Ammonia emission can also be reduced by decreasing the pH of urine and/or manure. Because a large portion of ammonia emission is derived from urine deposited on manure-coated slats rather than from the manure in the pits, changing the pH of urine is most effective (Aarnink et al. 1998). Mroz et al. (1996) demonstrated that by replacing $CaCO_3$ (limestone) in the diet with $CaSO_4$ (gypsum), $CaCl_2$ (calcium chloride), or calcium benzoate (not yet an approved feed ingredient), ammonia emission could be reduced by 30%, 33%, and 54%, respectively. The drop in urinary pH was approximately 1.3 pH units for $CaSO_4$ and $CaCl_2$, while the drop was 2.2 pH units for calcium benzoate. Den Brok et al. (1997) showed that using benzoic acid for this purpose actually improved feed conversion (from 2.92 to 2.83) while decreasing ammonia emission by 40%. Van Kempen (in press) used adipic acid and phosphoric acid (which can substitute for other P sources in the diet) to reduce urine pH and thus ammonia emission. Both compounds effectively reduced urine pH and significantly reduced ammonia emissions.

Verdoes and Camp (1998) studied the effect of acidifying urine on odor emission. The data reported were not conclusive because the experimental design was not complete. (A proper control was not used. Instead, data were compared to data from another research center.) The data, however, did suggest (according to the authors) that acidifying urine resulted in a 64% reduction in odor emission. These data are encouraging and warrant further study.

To reduce ammonia emission,

- Follow precision-nutrition guidelines.
- Add urine-acidifying compounds to the feed, such as phosphoric acid or adipic acid (very effective), or monocalcium phosphate or calcium sulfate (may increase sulfur odors, both moderately effective).

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Table 10-9. Effect of low-protein diets on N excretion and ammonia emission during the grow-finish period, lbs.

	Grower and Finisher Protein Level, %[1]	
	17.8% and 15.4%	16.2% and 13.5%
Intake	2.43	2.17
Retention	0.79	0.79
Excretion		
Total	1.64	1.38
In manure	1.20	1.00
In air	0.44	0.38

[1]The grower and finisher periods covered the weight ranges from 68-39 lbs and from 139-223 lbs, respectively.
Source: Latimier et al. 1993.