Ammonia emissions: the next regulatory battleground

As attention shifts to ammonia emissions, dairies should consider ration formulation changes to lessen them

By Larry Chase and Mike Van Amburgh

Ammonia emissions from livestock operations, already a hot-button issue in Europe, are getting the attention of environmentalists, the U.S. Environmental Protection Agency and many dairy states. California, Idaho, Iowa and Minnesota are imposing air quality regulations that might include ammonia. Other states and national regulators may follow suit.

Are ammonia emissions real? It's estimated that a dairy cow excretes 55 to 80 pounds of ammonia-nitrogen per year, primarily through urine and feces. In current dairy management systems, 40 to 60 percent of this may volatilize into the air in barns and during storage and application.

A number of surveys, which have "estimated" total global ammonia emissions, indicate that domestic animals produce about 40 percent of the emissions. Cattle are thought to account for 50 to 60 percent of emissions by domestic animals, or about 20 to 24 percent of the total global ammonia emissions.

What can be done?

Ration formulation is the initial control point for ammonia emissions. It offers an opportunity to decrease both daily nitrogen intake and excretion without impairing milk production. (See June's *Northeast DairyBusiness*, page 27.)

A 1996 trial conducted by Bill Stone (Table 1) at Cornell University shows that nitrogen excretion in urine and feces could be reduced 26 percent without lowering milk production. It's been estimated that a 13- to 20-percent decrease in urine and feces nitrogen excretion may decrease ammonia volatilization by 30 to 35 percent. A trial conducted at the University of California reported a 28-percent decrease in ammonia emissions in dairy heifers when diet nitrogen intake was lowered by 14 percent.

In Stone's trial, the three rations varied primarily in protein content. Cows did some sorting of the ration so actual ration protein content was higher than formulated. The trial revealed that:

- Milk production and nitrogen excreted through milk were similar for all rations.
- Feed nitrogen intake increased as ration crude protein (CP) level increased.
- The primary route of excretion of excess nitrogen was through urine, not feces.

Other options

Other management practices that could decrease ammonia emissions from dairies are currently used on European farms or large U.S. swine operations. They include:

- Frequently flushing floors with water or a mild acid solution.
- Using sloped floors with an opening in the middle to separate urine from feces.
- Covering manure storages.
- Incorporate manure slurry into the soil.

Most of these options are far more expensive to implement than ration changes. Taking that route to reduce ammonia emissions is a win-win option: It lowers feed costs and odors while improving profitability and, most likely, neighbor relations. ■

Table 1 Nitrogen intake and excretion by dairy cattle

	Diet 1	Diet 2	Diet 3
Formulated CP, % *	16.7	17.8	19.2
Consumed CP, % *	18.7	19.8	22.1
Milk, lbs./day	99	101	100
Feed N intake, g	711	751	878
Fecal N excretion, g	208	214	234
Urine N excretion, g	251	278	393
Milk N excretion, g	208	209	220

**Diet protein values reflect actual protein consumed by cows after adjusting for the quantity and nutrient composition of feed refusals.*
Source: Dr. Bill Stone. 1996

To cut N excretion

1. Have a consistent supply of high quality forage available.
2. Use forage harvest and storage methods that lower soluble protein levels.
3. Feed forage neutral detergent fiber (NDF) at 0.95 to 1.05 percent of bodyweight.
4. Balance rumen proteins and carbohydrates to optimize microbial protein synthesis.
5. Use feeding management practices that stimulate high dry matter intake.
6. Consider multiple group TMRs for lactating dairy cows.

FYI

■ To see the recently released National Academy of Science report on ammonia emissions, go to this website: www.nap.edu/openbook/030908461X/html/1.html

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