

Air Quality Education in Animal Agriculture (AQEAA) Webcast Presentation
“Targeted Feeding Strategies to Reduce Air Emissions from Animal Agriculture”
January 16, 2009

Was the 7.1 lb/hd decrease in ammonia emissions noted by Dr. Cole per day, or over the entire feeding period using phased feeding?

Andy: It was per animal over a 180 day feeding period.

We have noticed a 50% mass loss of as-excreted COD on the surface of feed lots. What have you seen with and without adding water?

Andy: We lose about 50% of the N. We think we might be losing about half the carbon too. That is a guess, but we think it is logical.

Was there a decrease in pig performance with reduced crude protein (CP) in the diet in the results from Carter et al. (2008)?

Scott: No decrease in pig performance or carcass traits. The data suggests that less than 4% decrease in crude protein (CP), long with appropriate amino acid additions, will not affect performance or carcass traits. Reducing CP more than 4% may have an impact. We stick with 3-4% reduction in CP, supplement amino acids, and we done several studies without impacting performance or carcass.

What is the effect of pH drop on VFA emissions?

Andy: A drop in pH decreases ammonia emissions in the rumen, but has the opposite effect with volatile fatty acids (VFA).

Scott: When we increase fiber content of the diet to reduce ammonia emissions much of the pH drop in the slurry is due to VFA content. So we are increasing VFA in the slurry. As Andy mentioned, a decrease in pH reduces ammonia emissions, but higher pH reduces sulfide emissions. Lower pH tends increase some of those volatile fatty acids as well. It is give or take. You may improve one odorant/emission by changing pH but increase the emissions of another one.

What is the effect of CP reduction on animal weight gain and protein content?

All presenters: The effects will depend on a number of factors including the following: 1) animal age/stage of maturity, 2) diet energy density (i.e. potential weight gain), 3) do we decrease ruminally degradable or “bypass” protein, 4) other factors. In our studies with steam-flaked corn based diets we see a 4 to 7% decrease in average daily gain and gain conversion (lbs of gain/lb of dry matter intake) when we decrease dietary crude protein from 13.5 to 11.5% (dry matter basis). However, with dry-rolled corn based diets we would expect less effect.

I noticed the differences in building losses of ammonia that were presented by Mark and Alex. Would you like to comment on possible reasons for those differences?

Mark: I think depending on when you make the measurement you are going to get a huge difference in the outcome. Whenever you make measurements you need to think about the pH, ambient temperature, amount of nitrogen on the floor, wind speed and things like that. Ambient temperature is a huge factor. Ammonia emissions from the floor are linearly related to temperature with essentially 0 emissions at or below freezing.

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Alex: In addition to the factors Mark mentioned, the design of a study and measurement methods also make a difference. Additionally, some nitrogen in runoff may be put into the 'unaccounted' category or considered as a loss to ammonia when it is in fact, a runoff loss.

What recommendations do you have for EPA as they consider ammonia emissions reporting and the role of diet on ammonia emission?

Mark: Making measurements from a barn or facility will be fraught with problems because of environmental effects. The emissions from a facility may be high on a warm day but very low the next day if it is cooler. Monitoring diet is easier because you can measure what is fed.

Scott: Decreasing crude protein fed to pigs is clearly shown to reduce ammonia emissions for all types of facilities. The difficulty is in determining how much reduction is realized for each % decrease in diet CP.

Alex: I would recommend decreasing CP intake, but that must be balanced with performance.

Kevin: It sounds like researchers have a responsibility to not only record diet and emission data, but also specify environmental conditions and describe the manure handling, storage and treatment practices at the research site.

Andy: I agree that we need to balance potential environmental effects with animal performance/economics. We also need to realize that animal requirements and chemical composition of feed ingredients are not constants and can vary greatly. Although the nutritionist may be formulating diets for a specific nutrient content (say 13% crude protein), in the real world the crude protein concentration of the diet will vary from day to day (typically 11.5 to 15% crude protein).

Were there any effects on milk production when decreasing CP and increasing energy in dairy?

Alex: Most studies did not report decreased performance with decreasing dietary CP concentration. If and when the diet becomes deficient in metabolizable protein and amino acids, the performance of the cow will suffer. The point when this happens will depend on the overall composition of the diet, the composition of the CP (degradability and amino acid profile of RUP), and the production level of the cow. Just increasing the energy density (to a point) with other nutrients meeting the requirements of the cow, will not have a negative effect on production.

Mark: The work suggests that the cow's protein and amino acid requirements might be a little more complicated than we have currently captured in our requirement systems and thus there may be additional opportunities for improving efficiency and reducing N excretion. In the work presented, there was a loss in production when we lowered metabolizable protein by reducing dietary CP from 17% to 14.4%, but the loss was much less than predicted by the NRC model and much less than occurred when energy and protein were reduced in concert.

For dairy, if cows are fed correctly and manure is managed according to 'BMPs', how much ammonia emission is inevitable (e.g., as % of feed N), trying to get at 'inevitable losses'?

Alex: This is a good question and I'm not aware of any estimates of 'inevitable losses'.

Mark: I also do not know the answer to this question, but it is going to depend on how quickly the manure is removed from the barn, how long it is stored, how it is applied to the land, and ambient temperatures. Given that we end up with almost half of the dietary N excreted as urea, keeping losses to a minimum would seem to be a challenge.

Have any of you tried to simulate the changes in carbon foot print base in changes on manure composition?

Andy and Alex: I have not.

Mark: I have not.

Are producers starting to implement practices to reduce air emissions based on their diets? If not, what's the road block that's holding them up?

Andy: The major road block is the risk of changing the diet...how will that affect animal performance and economics? Do I want to take that risk when there is not a penalty for feeding that level of crude protein?

Mark: Risk is a big issue. We don't want to drop below levels that do not support maximum production. It boils down to economics. If there are regulatory dis-incentives for feeding high levels of protein, then producers will cut back.

Alex: Nutritionists are beginning to realize that crude protein is a major factor and can be decreased safely from 17% down to 16% without reducing milk production, even in high-performing cows. There is less certainty below that.

Scott: It is a risk:benefit ratio. The addition of fiber decreases energy levels and changes in diet can affect on performance, carcass traits. Should also look at the fertilizer value of the manure, more nitrogen in the manure can make it more valuable to the crop farmer. Have to look at manure cost...whole farm aspect, not just diet and what's leaving the building.