

Nutrients in Swine Manure - Potential Environmental Pollutants

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One of the major issues facing the animal industry in the next century is maintaining and improving the environment. Pig production units (as well as other livestock production units) produce an abundance of wastes (manure) and odors. As time progresses, more and more pressure will be placed on animal production units to develop and implement procedures for managing manure and odors. This becomes increasingly important as urbanization moves into rural areas.

Currently, attention is being focused on the management of nutrients from manure and commercial fertilizer that is applied to soils. Most of the attention is currently directed toward nitrogen (N) and phosphorus (P).

Pig manure is a rich source of N and P, and has long been known to be an excellent nutrient source for crops when it is applied as fertilizer to crop and pasture land. It contains about 5% N and 3% P (dry matter basis). However, the amount of N and P that is applied as manure often is more than is needed by plants. When this occurs, the excess nutrients can be a potential pollutant of groundwater or surface waters. When applied in excess, nitrogenous products can be released into the air, nitrate N can leach into groundwater, or nitrogenous products can be transported into surface waters. While P does not leach into groundwater, it does move along with eroded soil into surface waters. When these nutrients get into our water supplies, they contribute to a deterioration in water quality.

Some of our recent research at the University of Kentucky has focused on investigating nutritional means of reducing the N and P content of swine manure. This research has been partially supported by a grant from the NPPC.

Basically, the N in pig manure arises from either unutilized dietary protein or from the breakdown of body protein. The unutilized dietary protein, in turn, is that portion of the dietary protein that is not digested, and also, those amino acids in the dietary protein that are digested but are in excess of the pig's requirement for growth.

Our research has shown that the amount of N excreted in the feces and urine is significantly reduced when one lowers the protein level of the diet and supplements the diet with amino acids. For example, let's assume that a diet for finishing pigs needs to contain approximately 14% crude protein to meet the pig's lysine requirement, which is .65% of the diet. Our research has shown that we can reduce the dietary protein level to 12% and supplement this diet with .15% lysine (from a lysine supplement), and performance will not be impaired (Table 1). At the same time, the low protein diet will reduce the N excretion by nearly 20% (Figure This type of diet (lower protein diet plus lysine supplementation) is cost-effective; in other

words, this type of diet is no more expensive than the higher protein diet. Thus, a reduced protein diet with added lysine is a very practical way of reducing N excretion by pigs.

Furthermore, one can reduce the dietary protein level even further (to 10% protein), but then one must supplement with more lysine 1.30% of the diet) as well as some of the other amino acids tryptophan, threonine, and perhaps methionine). This reduces the N excretion even further (Figure 1). However, this practice is not currently practical because tryptophan and threonine are too expensive to use as supplements.

There are other means of reducing N excretion. Producers should avoid feeding excessive protein levels because the excess amino acids from the protein will simply be converted to urea and excreted. Feeding protein sources that are poorly digested or that have a poor balance of amino acids also will result in excessive N excretion, and thus should be avoided.

Following good management practices so as to improve feed utilization by pigs also will help to reduce N excretion. Preventing feed wastage, keeping building temperatures in the pig's comfort zone, controlling diseases and parasites, and other similar good management practices will improve feed efficiency and, therefore, reduce N excretion by pigs.

In the next issue, we will discuss some of our research at UK that has dealt with nutritional means of reducing P excretion by pigs.

Table 1. Effects of Protein level and Lysine Supplementation on the Performance of Finishing Pigs^a

Diet	Daily gain, lb Feed/gain	
Corn-soy (14% protein)	1.54	3.29
Corn-soy (12% protein)	1.36	3.52
Corn-soy (12% protein) + .15% lysine^b	1.52	3.29

^aUniversity of Kentucky Exp. 7507; 16 pigs per treatment, 125-207 lb.

^bLysine HCl supplement at .19% of the diet (or 3.85 pounds/ton) supplies .15% lysine.

(Legend for Figure)

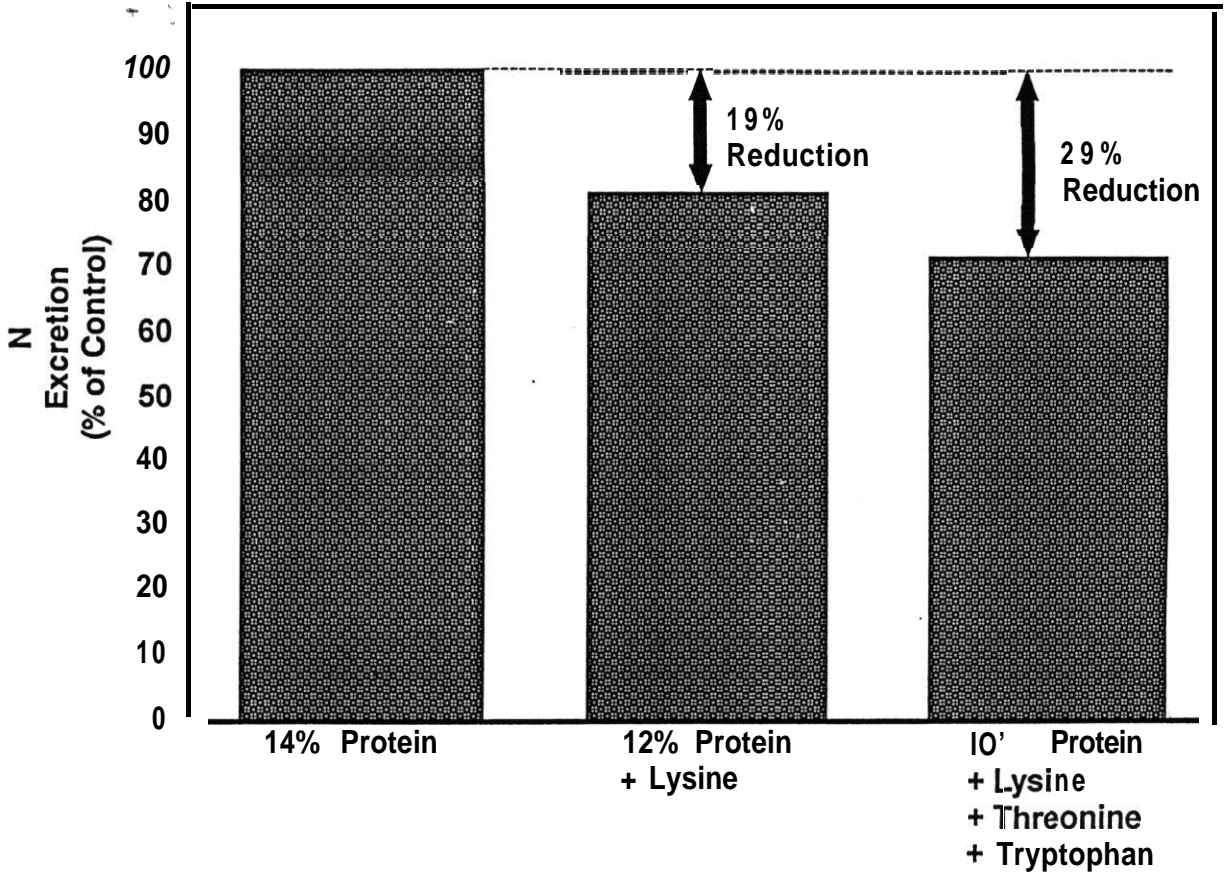


Figure 1. Effects of dietary protein level and amino acid supplementation on N excretion by finishing pigs. These data involve 24 pigs (eight/treatment) from two experiments conducted at the University of Kentucky. The average weight of the pigs was 197 pounds.