

## Director's Digest



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### Evaluation of Feather and Hair Meals for Ruminants

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In many areas in the U.S.A. as well as in other countries high protein feedstuffs are in short supply. Cyclic price changes may be severe in years when fish protein or soybean are in shorter supply than usual. Conversely, the packing and rendering industries are faced with the problem of disposing of by-products such as feathers and hair. Feathers have been processed into hydrolyzed feather meal for a number of years but it is still not common to find hair meal on the market, probably because most of it goes into meat meal or tankage.

Both of these materials are very high in protein content. If the samples we have worked with are representative, feather meal is about 95% and hair meal about 97.5% protein (dry weight basis), assuming that the usual 6.25 factor is applicable for converting nitrogen to an equivalent protein basis. However, the nature of the proteins (primarily keratin) is such that more than normal processing is required to make the proteins usable in any degree to animals. The proteins are partially hydrolyzed with heat, pressure and alkali. Hair is more resistant than feathers to hydrolysis and the result is that normal cooking procedures for meat meal or tankage probably do not make much of it available for animals. In the meals that we have worked with, feather meal was digested to the extent of 90% and hair meal by 69% when digested with pepsin.

The amino acid composition of these meals would be of concern if used for swine, poultry or other simple stomached animals. In the case of our samples, hair meal has a relatively high content of lysine (4.5% vs. 6.2% for soybean meal) but the feather meal is low (1.5%). Methionine is

usually the next most limiting amino acid. Feather meal has a good content (1.14% vs. 1.21% for soybean meal) although hair meal is somewhat lower (0.91%).

A common method to evaluate protein sources is to determine the digestibility of rations with increasing amounts of a standard protein such as soybean meal being replaced with the test protein. When feather meal replaced 25 to 75% of the soybean meal in high roughage diets for lambs, digestibility of the protein averaged 59% in one trial and 45% in a second. Comparable values for hair meal were 53 and 43%. However, biological value (% of absorbed nitrogen which was retained in the animal's body) and nitrogen retention in the tissues (% of that consumed) were both higher than in lambs receiving the diet with only soybean meal. These studies need to be repeated with different types of diets; however, if these results hold up, they show that the protein from these meals was utilized very well as compared to a high quality meal like soybean.

One small feedlot trial has been carried out with feather meal in high roughage rations. In this instance feather meal (116 lb./T) replaced all of the soybean meal protein and a third treatment was used in which half of the soybean meal crude protein was supplied by feather meal and half by urea (a common feed ingredient). Final average daily gains were 2.49, 2.32 and 2.70 lb./day for the soybean, feather and feather-urea treatments. Corresponding values on feed conversion (lb. of feed required/lb. of gain) were: 7.91, 8.61 and 7.18. Thus, the feather meal-urea combination was considerably better than feather meal only and appreciably better than straight soybean meal.

After seeing the results of the feeding trial, we designed some experiments in the laboratory to evaluate feather meal-urea combinations. The results suggest that ruminal fermentation was maximal when 40 to 50% of the crude protein was supplied by urea; digestibilities were improved about 10% over feather meal or hair meal only. Thus, these data tend to confirm the feedlot results. In future work we will make these kinds of comparisons in digestibility studies with lambs.

Palatability studies have been carried out with hair meal in combination with cottonseed meal in a situation designed to simulate feeding of range cattle. Cattle would eat as much as 50% hair meal in this mixture. When hair meal was added at a level of 4.7% of a concentrate mix, no problems were observed in getting cattle to consume this when given a choice of it and a similar mix with cottonseed meal.