

Director's Digest



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AREA CODE 312-827-0139

APRIL, 1982

No. 150

BY-PASS PROTEIN FOR CATTLE

An important potential market for animal by-products, in particular meat-and-bone meal and blood meal, is as a by-pass protein source for cattle. To answer the question of what by-pass protein is, consider that cattle are ruminants; that is, they have a four-compartmented stomach followed by a conventional large and small intestine. The first two compartments of the stomach, basically, serve as a large fermentation vat; the third compartment is a "de-watering press" to reduce moisture content of material coming from the first two compartments; and the fourth compartment is the true stomach, which, along with the small and large intestines, has the same function as in pigs or other simple-stomached animals.

The "fermentation vat," containing countless billions of bacteria, is the key to by-pass protein. Through a continuous fermentation, simple fatty acids are produced from fiber and carbohydrates, to be used for energy by the bacteria and by the animal. Ammonia from non-protein nitrogen sources, such as urea, or from the partial breakdown of feed protein is re-worked into bacterial protein, which is washed into the intestines by the normal wave-like motion of the digestive system. The bacterial protein is used by the animal to partially meet its protein requirements.

The problem is that to have the best conversion of ammonia to protein by bacteria, there must be enough energy and ammonia present at the same time. This problem is demonstrated most dramatically in high roughage (hay or

silage) rations. High fiber feeds, typical of growing rations for beef cattle, as an example, are slowly digested and release energy gradually. Ammonia from urea or more soluble feed protein sources, on the other hand, is quickly available. As a result, there is not enough energy present at a given time to make protein from available ammonia. The ammonia not used for protein production is wasted and the animal does not get enough protein to support economical growth.

A new approach to feeding cattle on high roughage rations is to combine a readily available ammonia source, such as urea, with a by-pass protein. Urea will provide inexpensive ammonia to satisfy the protein needs of the bacteria. By-pass protein, feed protein that has been broken down by the bacteria only to a limited extent, passes into the lower digestive tract. There it is digested and absorbed (or largely excreted in the case of over-heated proteins) in the same fashion as it would be if fed to a chicken or a pig. The combination of protein from bacteria and by-pass feed protein complement each other in meeting the needs of the animal. Obviously, a more soluble feed protein, such as soybean meal, could be used by increasing the total level of protein in the ration. However, this would be an expensive way to get the same response which could be gotten from urea and a good by-pass protein.

The important thing to consider is that cattle have requirements for amino acids from feed protein, just as do simple-stomached animals. These requirements for amino acids have not been determined for cattle as they have for pigs and chickens. However, it is reasonable to expect that combinations of bacterial protein made from urea and meat-and-bone meal or blood meal (alone or with one or more additional sources of by-pass protein) would optimize cattle growth and feed efficiency. In addition, cost of production should be substantially lower than that obtained from present feeding systems.

It should be emphasized that by-pass protein works best with high-roughage rations. With high grain feeding programs, there is enough energy to permit efficient urea utilization, so feeding by-pass protein would not be cost-effective.

Previous work reported by Klopfenstein from the University of Nebraska ("Feed-stuffs," Vol. 53, No. 29, pp. 23-24, July 20, 1981) has shown that meat-and-bone meal or blood meal are good sources of by-pass protein in combination with urea. FPRF has an active program of research underway with beef cattle to study the value of these products alone and combined with other by-pass protein sources. In addition, proposals are being considered for research on by-pass protein for dairy cattle - a significant new market opportunity for animal protein.

What is by-pass protein? An exciting new way to use animal by-products for cattle feeding.