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Bypass protein-Theory and concept

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Abstract

The ruminant animal has the unique advantage of microbial digestion in the rumen. This relationship between host animal and microbial population presents some unique advantages and disadvantages to the animal in terms of using dietary nutrients. The greatest advantage, obviously, is the utilization of dietary fiber. The microbes digest these feedstuffs and derive energy for their growth and maintenance while producing volatile fatty acids for the energy needs of the host animal. Other important products of this microbial digestion are the microbes themselves. They supply the major portion of the animal's protein needs as microbial protein. However, it is inefficient to feed an animal natural protein. The microbes also have the ability to utilize compounds such as urea to provide nitrogen for the synthesis of microbial protein, when dietary protein is less digestible to them. The term "bypass protein" describes dietary protein that, either by some means of alteration or because of type of protein, is resistant to degradation by the rumen microbes. This undigested dietary protein would "bypass" the rumen and would be potentially available to meet the protein needs of the host animal after digestion in the small intestine.; Dairy Day, 1986, Kansas State University, Manhattan, KS, 1986;

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BYPASS PROTEIN - THEORY AND CONCEPT

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Background

The ruminant animal has the unique advantage of microbial digestion in the rumen. This relationship between host animal and microbial population presents some unique advantages and disadvantages to the animal in terms of using dietary nutrients. The greatest advantage, obviously, is the utilization of dietary fiber. The microbes digest these feedstuffs and derive energy for their growth and maintenance while producing volatile fatty acids for the energy needs of the host animal. Other important products of this microbial digestion are the microbes themselves. They supply the major portion of the animal's protein needs as microbial protein. However, it is inefficient to feed an animal natural protein. The microbes also have the ability to utilize compounds such as urea to provide nitrogen for the synthesis of microbial protein, when dietary protein is less digestible to them. The term "bypass protein" describes dietary protein that, either by some means of alteration or because of type of protein, is resistant to degradation by the rumen microbes. This undigested dietary protein would "bypass" the rumen and would be potentially available to meet the protein needs of the host animal after digestion in the small intestine.

Advantages of Bypass Protein

A thorough understanding of the utilization of dietary protein would allow diets to be formulated whereby nitrogen needs of the microbes could be met by cheaper sources of nitrogen, such as urea, and the more costly natural protein would be used by the host animal. Bypass values for several proteins are listed in Table 1. A value of 25% for soybean meal, for example, indicates that approximately 75% of soybean meal would be degraded in the rumen and 25% would bypass to the small intestine for utilization by the host animal. Values range from a low of 25% for soybean meal to 80% for blood meal. Protein sources such as blood meal, dehydrated alfalfa, and brewers dried grains that have been heated during drying tend to have increased the bypass value.

Applications of Bypass Protein

To apply the concept of bypass proteins, one must remember that if the protein requirement of an animal is being met by feeding a particular protein source, then replacing this protein source with a high "bypass" protein would not result in an improvement in animal performance. Performance cannot be improved

if adequate protein is already being fed. The best use of "bypass" protein would be to lessen the cost of dietary protein while maintaining the same stage of production. For example, soybean meal that would be 75% degraded in the rumen could be replaced by a combination of urea and a bypass protein to more optimally meet the nitrogen needs of the rumen microorganisms and the protein needs of the host animal. One should not pay a premium for a high bypass protein supplement expecting increases in animal performance, but instead should decrease the costs of natural protein in the diet and maintain animal productivity.

Much more information is needed on protein sources regarding their rumen degradability and on animal responses to these types of proteins fed in combination with urea before we can fully utilize these concepts to optimize animal production efficiency.

Table 1. Bypass estimates of protein sources

Protein source	% Bypass
Blood Meal	80
Meat Meal	64
Corn Gluten Meal	60
Brewer's Dried Grains	55
Distiller's Grains	54
Dehydrated Alfalfa	50
Distiller's Grains plus Solubles	49
Soybean Meal	25