

Animal Protein By-product Feedstuffs for Dairy Cattle ¹

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Animal protein sources are high in protein content and generally much more resistant to microbial degradation in the rumen than most of the commonly fed plant protein sources. In general, ruminant protein degradation of animal proteins rank, bottom to top, as follows: blood meal; hydrolyzed feather meal; meat and bone meal; fish meal (Table 1). The protein requirements of lower-producing cows can be met from the microbial protein synthesized in the rumen since about 60 to 85% of the protein entering the small intestine is from microbial protein. The availability of microbial protein may not be optimum for high-producing cows. Several studies have shown an increase in animal performance with increasing levels of bypass protein. The optimum level of undegradable protein intake appears to vary between 35 and 40% of total dietary crude protein.

Caution is suggested in using animal protein feedstuffs since palatability, cost per unit of protein, consistency of product and impact on animal performance are key factors to successful dairying. In using such products, start with levels of 3% since higher levels may reduce dry matter intake and animal performance. Also, several investigators have reported a reduction in milk fat percentage with fish meal supplementation. There is evidence suggesting that combinations of highly undegradable protein

sources give better results when fed in conjunction with adequate degradable protein.

BLOOD MEAL

Blood meal contains approximately 87% crude protein (dry matter basis) of which 20% is degraded in the rumen. This ingredient contains a total lysine content of about 9% with a minimum biological availability of 80%.

HYDROLYZED FEATHER MEAL

Hydrolyzed feather meal (HFM) is the product resulting from the treatment under pressure of clean, undecomposed feathers from slaughtered poultry, free of additives and/or accelerants. Feather meal contains approximately 85% crude protein (dry matter basis) of which 30% is degraded in the rumen. Although HFM has a relatively poor balance of amino acids, it is a good source of sulfur because of its high cystine content. It should contain not less than 75% digestible crude protein as measured with pepsin-HCl. Studies at the University of Florida using 3 to 6% HFM in corn silage-based total mixed rations resulted in milk production equal to that obtained using soybean meal rations.

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MEAT AND BONE MEAL

Meat and bone meal is the rendered product from mammal tissues, including bone, which contains approximately 54% crude protein (dry matter basis) of which 50% is degraded in the rumen. It contains a minimum of 4.0% phosphorus with the calcium level not more than 2.2 times the actual phosphorus level.

MEAT MEAL

Meat meal is defined the same as meat and bone meal except that no minimum phosphorus level is required.

FISH MEAL

Fish meal contains approximately 67% crude protein (dry matter basis) of which 40% is degraded in the rumen. Fish meal has an excellent amino acid profile, close to that believed required for growth and milk production. Even so, considerable differences in degradability of various FM, ranging from 30 to 70%, have been reported. Variability in degradability of FM in the rumen is probably due to variation in processing conditions. Protein degradability of FM depends on several variables during the manufacturing process such as the length of time the raw fish are stored before processing, whether or not formaldehyde is added as a preservative, the type of dryer used, the duration of heating and the extent of addition of fish solubles. In addition, the residual lipids in fish meal which are rich in polyenic fatty acids may undergo oxidation during storage that reduces extractability of lipid and solubility of protein.

Table 1. Composition of animal protein feedstuffs as compared to plant protein supplements high in escape protein (asfed).

Feedstuff	DM (%)	CP (%)	UIP (%) ¹	TDN (%)	Ca (%)	Phos (%)
Animal protein						
Blood meal	92	80	82	61	0.29	0.24
Fish meal	90	60	65	63	5.30	3.10
Feather meal	90	80	70	63	0.20	0.72
Meat and Bone meal	92	50	63	66	10.00	5.10
Plant protein						
Brewers' grains	90	25	54	62	0.30	0.48
Corn gluten meal	90	60	55	81	0.02	0.62
Distillers, corn	90	27	52	78	0.09	0.36
¹ UIP = undegradable intake protein (bypass protein)						