



# *Dairy Update*

**ANIMAL PROTEIN QUALITY CONTROL  
FOR DAIRY RATIONS**

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Dairy cow feeding is becoming more complex each year. As the cow's genetic potential increases, the need for higher, more precise planes of nutrition are required. A vital link in the nutrition scheme is to feed dairy cows for maximum protein efficiency. This often necessitates the use of traditionally uncommon feedstuffs such as meat and bone meal (M&BM) and blood meal in rations. The use of animal proteins can make an important contribution toward a dairy cow's protein (undegradable intake protein and degradable intake protein) and amino acid requirement.

## MEAT AND BONE MEAL

Meat and bone meal is an excellent, nutrient dense ingredient in dairy rations providing protein, calcium, and phosphorus. It generally consists of animal by-products from beef, pork and poultry packing plants. It can also originate from fallen animals. Because its source is derived from different species, nutrient composition and relative value in dairy rations will vary between different sources. Inclusion levels of meat and bone meal can be comfortably fed up to 2.5 lb per head daily.

Several factors need to be evaluated when considering a M&BM supplier. First and most important is the quality of the meat and bone meal. Second, what are the nutrient guarantees for protein, fat, fiber, calcium, and phosphorus. Third, what is the cost and consistent availability of the product. These questions will be addressed except for number three, which must be individually determined.

\*This material was prepared by the Van Hoven Co., in conjunction with the Dairy Extension at the University of Minnesota. The Van Hoven Co. is a renderer of animal proteins and fats for use in the animal feed industry.

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## PROTEIN

The importance of by-pass protein and by-pass amino acids in obtaining maximum protein efficiency is a concept that has gained acceptance among dairy nutritionists. Most commonly fed protein sources contain some by-pass protein. The protein, for example, in soybean meal is 25% to 30% undegradable. However, there are several protein sources such as grain by-products that are 50% to 60% undegradable. Likewise, primary products from the rendering industry such as meat and bone meal (50% to 60% undegradable) and blood meal (75% to 85% undegradable) are excellent sources of by-pass protein. Because of the protein quality and inherent by-pass value, rendered proteins can serve as an important nutrient source in achieving maximum protein efficiency.

### BY-PASS PROTEIN VALUES

<u>Protein source</u>	<u>% by-pass</u>	<u>% degradable</u>
49% soybean meal	35	65
Corn gluten meal	55	45
Canola meal	28	72
Meat and bone meal	55	45
Blood meal	80	20

Due to variability of raw materials in M&BM, protein, calcium and phosphorus levels may vary between various suppliers. This does not make one source better than another. It only implies that one supplier (typically the higher protein supplier) is likely to be more expensive. Typically, the higher the protein guarantee, the lower the calcium and phosphorus levels and vice versa. However, since you are buying more than protein when you purchase M&BM, higher calcium and phosphorus levels will partially offset the price of differential for the lower protein guarantee.

### TYPICAL M&BM PROFILES

	<u>% protein</u>	<u>% calcium</u>	<u>% phosphorus</u>
45% meat & bone meal	45	10.0	5.1
50% meat & bone meal	50	8.0	4.1

One important consideration to the dairyman is proper heat processing. Proper M&BM processing requires that the animal by-product material be cooked to a temperature of 250° to 260°F. This heat processing serves two important functions: 1) The product is sterilized, and 2) The heat applied during processing, and probably the inherent nature of the protein yields a protein source with excellent by-pass qualities. The best measure for estimating protein quality is a modified pepsin digestibility test. A guarantee of not less than 90% pepsin digestibility should be guaranteed on the tag.

## FAT AND AOM STABILITY

The feeding practice of adding fat to dairy rations has gained acceptance among dairy producers. Meat and bone meal, in addition to being an excellent protein source, is also a good source of fat. The content in M&BM will range from 9% to 12% fat, depending on your supplier.

All fats are prone to potential rancidity (off flavor and odor) caused by peroxide formation. M&BM should be stabilized with an antioxidant such as BHT, TBHQ, or Ethoxyquin to prevent the formation of peroxides. (See Fat Quality Control for Dairy Rations (Dairy Update 112) for a more detailed description of peroxides and testing procedures.) Antioxidant addition will ensure adequate storage life. M&BM should have a guarantee AOM stability of not more than 20 MEQ of peroxides at 20 hours.

## FIBER

Fiber in animal protein is comprised of digestive material which has been processed into the M&BM. For example, when beef by-product is processed, rumen matter should be emptied prior to processing into M&BM. If not, fiber levels will increase proportionally to the amount of rumen matter entering the cooking process. A crude fiber level of not more than 4% should be specified.

## CALCIUM AND PHOSPHORUS

The calcium and phosphorus in M&BM are excellent sources of their respective nutrients. A high calcium content in M&BM carries little economic value due to the low cost of equivalent calcium sources such as calcium carbonate. However, the phosphorus level in M&BM is of economic importance.

Unfortunately, some sources of M&BM produce a product with inconsistent phosphorus levels. Therefore, it is important to analytically check your supplier of M&BM for phosphorus guarantees. Once you have identified a reputable and consistent supplier, work with that supplier on an ongoing basis.

## SALMONELLA IN FEED

Salmonella in feed is a concern to many producers when purchasing animal proteins. Unfortunately, there is no simple, economical and quick test to determine whether a feed contains salmonella. However, the Animal Protein Producers Industry (APPI) is an organization formed to research salmonella in the rendering industry. The information they gain from their research is passed along to member companies to help eliminate salmonella from rendered proteins. Plus twice every year, the organization collects samples from each of its members over a three month period to determine salmonella rates at each plant.

Purchasing M&BM from a member of APPI is a positive step in combating the potential of salmonella contamination.

## QUESTIONS TO ASK YOUR M&BM SUPPLIER

What is the protein level of the M&BM and what is the guaranteed pepsin digestibility? (Pepsin not less than 90%)

What is the fiber level? (not more than 4%)

What is the fat level?

Is the M&BM stabilized with an antioxidant? (BHT, TBHQ, or Ethoxyquin)

Do you guarantee an AOM stability of less than 20 MEQ of peroxides at 20 hours?

What is the calcium and phosphorus guarantee?

Is the supplier a member or purchasing from a member of APPI?

What is your supplier's salmonella recontamination rate for the previous 12 month period?

## BLOOD MEAL

Blood meal is produced from clean, fresh animal blood from beef, pork and poultry packing plants. Blood meal when processed properly is a uniform, high quality protein ingredient. In dairy rations, blood meal is an excellent high protein nutrient with excellent by-pass qualities. Blood meal is also one of the best sources of the amino acid lysine in dairy rations.

## PROCESSING METHODS

Blood meal is processed by different methods, which have a definite impact on its nutritive value in dairy rations. The various methods are Flash Dried (Ring Dried and Drum Dried), Spray Dried, and Conventional Cooker Dried blood meal.

Flash Dried Blood Meal is a collective term that can describe several different drying processes. Typically, a large portion of the moisture (water) is mechanically removed. The subsequent semi-solid blood mass is then transferred to a flash dryer where the more tightly bound water is rapidly removed. The minimum biological availability for lysine is 80%. However, it is interesting to note that many Flash Dried Blood Meal products have a lysine availability of about 90%. An improperly adjusted dryer (increasing the normal temperature to increase drying capacity) will produce a lower quality blood meal.

Ring Dried Blood Meal is a form of Flash Drying. This process is extensively used in the rendering industry. As with any ingredient, proper plant procedures and optimum temperature control will positively influence the quality of the blood meal produced. Properly processed Ring Dried Blood Meal is the preferred method of drying by many nutritionists due to its consistent quality. The Ring Dried process produces a product that is almost black in color and should be of a very fine particle size.

Spray Drying is a process commonly used in the drying of whey proteins and dried fats. Spray Dried Blood Meal produces a product that is readily soluble in water. Therefore, it can be used in products like milk replacers. Spray Drying is an acceptable processing method, but is less common and more expensive than Flash Dried Blood Meal.

Conventional Cooker Dried Blood Meal is the oldest of the blood processing methods. This type of Blood Meal is processed in a batch type rendering cooker and there may be a great variation in the biological availability of the lysine. This process produces an inferior product relative to protein availability and value to the dairy cow. For example, the lysine bioavailability from Ring Dried Blood Meal is typically 90% or higher vs. less than 50% for Conventional Cooker Dried Blood Meal.

## PROTEIN AND PEPSIN DIGESTIBILITY

Protein level among various blood meal sources will vary from 80% to 91% crude protein. The best evaluation to determine proper processing is: 1) What was the method of processing (detailed above), and 2) What is the pepsin digestibility guarantee? A guarantee of no less than 90% should be required.

NRC AMINO ACID PROFILES (% of DM)

	<u>Blood meal</u>	<u>Meat and bone meal</u>
Crude protein	86	50.9
Arginine	3.59	3.65
Histidine	5.18	0.96
Isoleucine	0.91	1.47
Lysine	7.44	2.89
Methionine	1.05	0.68
Threonine	3.63	1.60
Tryptophan	1.05	0.28
Valine	7.52	2.14