

Fishmeal: Understanding why this Feed Ingredient is so Valuable in Poultry Diets ¹

Richard D. Miles and Jacqueline P. Jacob²

INTRODUCTION

Fishmeal is a high protein feedstuff often included in poultry diets. It is usually marketed at 65% crude protein, but the crude protein content can vary from 57 to 77%, depending on the species of fish used. Several species of fish can be processed into fishmeal, but the most common is Menhaden. Menhaden accounts for about 90% of U.S. fishmeal production.

Most fish species can not be harvested year-round. As a result, there is seasonal variation in protein content, depending on the species of fish used. The crude protein content of fishmeal is usually highest during the Menhaden harvest. During the month of May, the protein content increases as the Menhaden harvest begins. When lower protein species are harvested at other times of the year, the protein content decreases.

The price of fishmeal varies throughout the year and is a reflection of the seasonal variation in the supply of fish. The price of fishmeal is usually the highest during the winter months when the supply is lowest. The price also varies from year to year

depending on the price of other protein sources, in particular soybean and other oil meals.

The moisture content of fishmeal is normally low in order to facilitate storage and transport. If the moisture content remains at the acceptable lower limits the meal will be more likely to have a low bacterial and/or mold count. Antioxidants must be added to the meal to ensure proper stabilization during extended periods of storage.

Fishmeal contains three major nutrients; protein, fat and minerals (ash).

PROTEIN

Fishmeal is added to poultry diets as a source of highly digestible, "high quality", animal protein. Protein is added to poultry diets to supply the amino acids required for maintenance, growth and egg production. Animals synthesize proteins from 22 amino acids. However, animals cannot synthesize all 22 of these amino acids. Amino acids which can not be synthesized by animals, and therefore must be supplied in the diet, are classified as essential. Those that can be synthesized by the animal are termed nonessential. Of these, a few cannot be synthesized at

1. This document is PS30, one of a series of the Animal Science Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida. Original publication date October 1997. Reviewed March 2009. Visit the EDIS Web site at <http://edis.ifas.ufl.edu>.

2. Richard D. Miles, professor, and Jacqueline P. Jacob, poultry extension coordinator, Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida, Gainesville, 32611.

a rate fast enough for maximum growth and, therefore, are considered dietary essentials.

The nutritional value of any protein is directly related to the amino acid composition of that protein. A protein that does not contain the proper amount of required (essential) amino acids would be an imbalanced protein and would have a lower nutritional value to the bird. Proteins of cereal grains and most other plant protein concentrates fail to supply the complete amino acid needs of poultry, due to a shortage of methionine and/or lysine. Soybean meal, which is widely used in poultry diets, is a good source of lysine and tryptophan, but it is low in the sulfur-containing amino acids methionine and cysteine. Fishmeal is an excellent source of all of these amino acids. A well-balanced protein, such as that found in fishmeal, is considered to be of high nutritional value for the bird.

Feedstuffs are combined to meet the bird's need for the most limiting amino acids, as well as other nutrients and energy. This can sometimes result in a higher than required protein content of the diet due to the presence of other amino acids in excess. The excess amino acids are not used for the function of protein synthesis. Instead they are deaminated and their carbon skeletons used as an energy source or stored for use as an energy source at a later time. This method of furnishing excess amino acids is very expensive and is an inefficient overall use of the dietary protein.

Using synthetic amino acids, diets can be formulated which meet the bird's amino acid requirements but with a reduced total protein content. This provides the appropriate levels of essential amino acids while avoiding large excesses of other amino acids.

Fishmeal contains an excellent quantity and profile of amino acids which can also offset the deficiencies of certain limiting amino acids in cereal grains. The protein in fishmeal is an excellent source of the essential amino acids lysine, methionine and tryptophan. It is because of this that fishmeal is often used as the supplement of choice for vegetable protein, especially soybean meal.

MINERALS (ASH)

Fishmeal is an excellent source of calcium and phosphorus for poultry. The ash (mineral) content of fishmeal can range from 10 to 25%. The higher ash content is usually an indication of a higher calcium and phosphorus level. The calcium and phosphorus are in a highly available form, unlike some of the calcium and phosphorus in plant proteins. One of the only minerals in fishmeal that is not readily available to poultry is the trace mineral selenium. The selenium in fishmeal exists in the form of selenoproteins which are not considered to provide readily available selenium to the bird.

ENERGY

The energy content of fishmeal is directly related to the percentage of protein and oil (fat) in the meal. Usually the metabolizable energy (ME) value of fishmeal ranges from 2500 to 3200 Kcal ME/kg. The quantity of oil present in fishmeal depends on the species, feeding habits of the fish, and the method of processing.

The use of antioxidants in the preservation of fishmeal is essential in order to ensure a higher ME value for the bird. Without stabilizing the fishmeal with antioxidants, the ME of the meal may be reduced by as much as 20%. Prior to the development and use of antioxidants by the fishmeal industry, it was common practice to turn piles of processed meal in order to dissipate the heat arising from the oxidative process. Occasionally, these piles of stored meal or during transit, fishmeal would combust spontaneously and cause fires and decrease the nutritive value. It was common several years ago to hear of ships sinking due to fires caused by spontaneous combustion of fishmeal. Today, transatlantic transported fishmeal, by law, must contain an effective antioxidant.

FATTY ACIDS

The oil present in stabilized meal has a relatively low concentration of linoleic acid, an essential fatty acid for poultry. However, the oil is an excellent source of the essential fatty acid, linolenic. The fatty acids present in the oil in fishmeal can contribute to the requirement of poultry for essential fatty acids.

Supplementing low levels of fishmeal in broiler and laying hen diets has been shown to increase the omega-3-fatty acid content of broiler meat and eggs. Current knowledge in the area of cardiovascular disease indicates that the presence of the omega-3-fatty acids in the human diet is related to a lower incidence of heart attack.

CONCLUSIONS

Fishmeal is an excellent source of protein for poultry since it contains adequate quantities of all the essential amino acids required by chickens, and is an especially good source of lysine and methionine.

Fishmeal can vary considerably in quality, depending on processing conditions used in its manufacture. For more details on how fishmeal is produced, refer to the publication "Fishmeal in poultry diets: Understanding the production of this valuable feed ingredient" (PS-12).