

## Fishmeal in Poultry Diets: Understanding the production of this valuable feed ingredient <sup>1</sup>

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High quality fishmeal is recognized by animal nutritionists as an excellent source of protein, energy, minerals and vitamins. Worldwide, millions of tons of fishmeal are produced annually. The majority of the fishmeal produced is included in commercial diets for poultry, swine, dairy cattle, mink and fish.

Good quality fishmeal demands a higher price than other high protein feedstuffs. Its proper use, however, requires a knowledge of not only its nutrient profile but of how it was produced. An understanding of fishmeal production will give users a better understanding of how the various factors interact to influence the quality of fishmeal.

### What Types of Fish are Used?

Fishmeal can be made from almost any type of fish but is generally manufactured from two main types. These two types of fish differ both in their ability to store oil as well as where in the body oil is stored.

The first type includes a group referred to as "lean fish." This includes such species as cod and haddock. In these species the oil is stored primarily in the liver. The flesh (fillets) contain very little oil.

Fishmeal from this type of fish has a low oil content (2 to 6%) since the livers are removed before processing. Of course, if the livers are added back, or the whole fish is used, the oil content would be higher. The whole fish is not usually used since cod and haddock are prized for the fillets. Since the fillets are used for human consumption, the fishmeal from these lean fish are made principally from the offal (white fish frames) remaining after filleting. "White" fishmeal commonly contains a higher concentration of ash (minerals) since the bony frames (head and racks) of previously filleted cod, haddocks, etc. are used. White fishmeal constitutes only 10% of the world fishmeal production.

The second type of fish used to manufacture fishmeal stores oil in certain parts of the flesh. They are high oil fish and, unlike the lean fish, are not prized for their fillets. They are commonly referred to as "industrial fish." Such species as herring, menhaden, anchovy, pilchard, sardines and mackerel fall into this category. Approximately 90% of the world fishmeal production is from these high oil species.

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1. This document is PS12, one of a series of the Animal Sciences Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida. Original publication date February 1997. Reviewed March 2011. Visit the EDIS website at <http://edis.ifas.ufl.edu>.
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Most species of fish used for the production of fishmeal have a similar protein content that averages approximately 16% in the whole fish. This whole body protein content will vary by only plus or minus 2 to 3%. The fishmeal derived from these fish will, therefore, all be fairly similar in protein content. The oil (fat) content in fish species is much more variable than their protein content. The amount of oil in fishmeal is directly dependent on the efficiency of the oil removal at the time of processing.

### **Where are the Fish Processed?**

Fish can be processed at sea in factory ships or caught and stored until they are transported to a coastal processing factory. Fish is a highly perishable raw material and spoilage will occur if not processed in a timely manner. Preservation using chemicals, ice or refrigerated sea water is common.

### **How are the Fish Processed?**

Fishmeal is made by cooking, pressing, drying and grinding the fish. When no oil needs to be removed, such as with lean fish, the pressing stage is often omitted. During cooking, the fish move through a long, steam-jacketed, screw conveyor cylinder. Cooking coagulates the proteins and is a critical process responsible for sterilizing the product and preparing it for liquor (a mixture of oil, water and protein) removal. Once cooked, the liquor is removed by pressing. The solid residue that remains after pressing is called "presscake." The liquor is centrifuged to remove the oil. This oil is often further refined before being transported to storage tanks. Prior to storage, it is essential to add an antioxidant. The antioxidant will stabilize the oil so that oxygen will not cause damage during storage. The stored oil must not come into contact with air, heat or light in order for its quality to be maintained until it can be incorporated into feeds for poultry, pets, fish or other uses.

The liquid removed from presscake is referred to in the processing industry as "stickwater." This liquid may contain as much as 20% soluble protein and is valuable. The stickwater is evaporated to a thick syrup containing 30 to 50% solids. This material can be sold as "condensed fish solubles" or it can be added back to the presscake and dried with

it. Therefore, one can purchase presscake meal or a whole meal (where all of the solubles have been added back).

The meals are then dried so that the moisture content is low enough to allow the meal to be stored and transported without mold or bacterial growth. If overdrying occurs, the meal can be scorched and the nutritional value of the meal will be adversely affected. Drying can be either direct or indirect. Direct drying is the most rapid and requires very hot air to be passed over the meal as it is rapidly tumbled in a cylindrical drum. If this process is not carefully controlled the fishmeal may be scorched. Indirect drying requires a steam-jacketed cylinder or a cylinder containing steam-heated discs which tumble the meal.

Once the fishmeal is dried it has to be ground, screened to the correct particle size, packed in bags or stored in silos for bulk delivery to companies throughout the world.

### **What Type of Fishmeal is Commonly Produced in the U.S.A.?**

In the U.S.A., the majority of the fishing industry is in the Gulf of Mexico and the Atlantic Ocean. The main industrial fish harvested is menhaden. In fact, 98% of the fish oil produced in the U.S.A. is from menhaden, a high oil species. The oil is considered by fish processors to be a by-product of fishmeal production. This is just the opposite viewpoint taken by soybean processors. These processors consider the soybean meal to be a by-product of oil production. No matter which viewpoint is taken, however, both "by-products" have an important place in animal diets.

Smaller quantities of fishmeal produced in the U.S.A. are made from herring, redfish, and white fish. This fishmeal is low in oil, and comparatively higher in ash than the fishmeal from menhaden because of the relatively large amount of bone it contains compared to the amount of muscle.

## **How Can You Identify Good Quality Fishmeal?**

Good quality fishmeal is a brown powder which will average between 60% and 70% protein. The oil content in the meal will range from 2% to greater than 14%. The moisture level will commonly range from 6 to 12%. The ash content will range from 18% (more common for an industrial fishmeal) to 25% (more common for a white fish meal).

The odor of fishmeal, as would be expected, is that of fish. It is easily distinguished from other ingredients. If an acrid "scorched" smell is present this usually indicates overheating or scorching. If this occurs, a blackish dark-brown color is common and the quality of protein is usually affected in a negative manner.