

CEREALS IN PET FOODS

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Whole grain cereals have received a great deal of positive press lately as human nutritionists champion their benefits in the wake of the Atkins phenomenon. The accolades are long overdue. No other family of plants has contributed more to the advancement of human civilization than have the cereal grains. Wheat and barley were man's first domesticated crops, cultivated in the Fertile Crescent (southwest Asia) in 8500 BC. Rice was eastern Asia's first crop in 7500 BC and corn was Central America's in 3500 BC. Were it not for the cereal grains, humans might never have evolved beyond small tribes of nomadic hunter-gatherers.

Today wheat, barley, corn and rice still dominate the diets of humans globally. They also represent a significant portion of the diet of most dogs. This can easily be verified with a quick calculation. Consider a dry dog food containing 25% protein, 15% fat, 10% moisture, 3% fibre and 7% ash. Add these percentages together and the total comes to 60%. The remaining 40% is carbohydrate, the largest component of most dry pet foods. This carbohydrate comes primarily from one or more cereal ingredients.

Carbohydrate is not an essential nutrient for dogs. The function of the carbohydrate in dog food is to supply digestible energy. In other words, the corn, rice or wheat contained in a dog food serves the same nutritional purpose as the Corn Flakes®, Rice Krispies® or Shredded Wheat® that you may have eaten for breakfast this morning. Energy is required for all body functions and dietary carbohydrate is an excellent source of digestible energy for both dogs and humans.

CEREAL QUALITY AND DIGESTIBILITY

The quality of the cereal in a pet food is greatly dependent on the conditions under which the cereal was grown, harvested and stored. Cereals grown or stored in wet conditions can become moldy. These molds can produce

mycotoxins which are harmful to dogs. Fortunately it is possible to test for the presence of mycotoxins in cereal ingredients before incorporating them into dog foods.

The digestibility of the cereal ingredients in pet foods depends on processing. Uncooked cereal starch is largely indigestible to pets, while cooked starch may be close to 100% digestible. Dry pet foods are made in a pet food extruder in a process called gelatinization. Gelatinization is defined as the "complete rupture of starch granules by a combination of moisture, heat, pressure and mechanical shear". Complete starch gelatinization is required to maximize the digestibility of cereal ingredients for dogs.

Since carbohydrate is the biggest component of most dry dog foods, the quality of the cereal ingredients and the way they are cooked both have a huge impact on the quality of the total pet food. One of the biggest challenges for pet food manufacturers is achieving consistency in these parameters from batch to batch. Failure to do so can result in a batch of food causing digestive upset, loose stools or diarrhea in dogs.

CEREAL INGREDIENT DEFINITIONS

Cereals are often included in pet foods as whole grains, in which case they appear in an ingredient list by their name or their name with a simple descriptor, for example corn, whole corn or ground corn. If instead of using the whole grain, a specific part is used, it will be identified on a list by the name of that part, for example rice hulls, oat bran or wheat germ (see Diagram 1).

Because cereal grains are widely used in breads, pastries, pasta and other human foods, there are many pet food ingredients that are by-products of the human grain milling industry. Some examples include corn gluten, wheat middlings and brewers rice.

The Association of American Feed Control Officials (AAFCO) publishes a list of definitions for the cereal ingredients used in pet foods (see table 1). One of these terms has found its way into colloquial speech. When we talk of something being "run of the mill", we're actually using a grain milling term referring to the leftovers at the end of the milling process. There is a pet food ingredient that originates from the same root: mill run.

There are two questions that I am often asked regarding the cereals used in pet foods. The first question is: "are pet foods with meat as a first ingredient better than those with a cereal as the first ingredient?" and the second is: "is one cereal better than the others?"

The answer to the first question is no, pet foods with meat as the first ingredient are not necessarily better than those with a cereal listed first. In fact, a food with a meat as its first ingredient may contain less meat than one that lists a cereal first. Look at the two recipes below. Recipe A would have poultry meal listed first on its label. Recipe B would have poultry meal listed second after rice, yet Recipe B contains more poultry meal than Recipe A.

	Recipe A	Recipe B
Poultry meal	150 kg	250 kg
Whole rice	125 kg	200 kg
Whole corn	125 kg	50 kg
Whole wheat	100 kg	0 kg
Total	500 kg	500 kg

Recipes can easily be designed to ensure that a meat heads the ingredient list. For example, with Recipe B, if some of the whole rice was replaced with rice flour, brewers rice, rice bran and rice hulls, poultry meal would move ahead of all of these rice components, yet the recipe could be virtually the same.

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TERM	AAFCO DEFINITION	EXAMPLE
Bran	Pericarp (outer portion) of the grain	Wheat bran
Broken or Brewers	Small fragments of kernels that have been separated from larger kernels	Brewers rice
De-hulled	Having the outer covering (hull) removed from the grain	De-hulled oats
Endosperm	Starchy portion of the seed	n/a
Flakes	An ingredient rolled or cut into flat pieces with or without steam conditioning	Flaked corn
Flour	Soft, finely ground meal, separated from bran, obtained from the milling of cereal grains. It consists essentially of starch and gluten of the endosperm	Rice flour
Germ	The embryo found in seeds and frequently separated from the bran and starch endosperm during milling	Wheat germ
Gluten	The tough, viscid nitrogenous substance (protein) remaining when flour is washed to remove the starch	Corn gluten
Grain	Seed from cereal plants	n/a
Grits	Coarsely ground grain from which the bran and germ have been removed, usually screened to uniform size.	Corn grits
Groats	Cleaned grain with hulls removed	Oat groats
Ground	Entire cereal grain ground or chopped	Ground corn
Hulls	Outer hard covering of grain or seed	Rice hulls
Meal	An ingredient which has been ground or otherwise reduced in particle size	Corn meal
Middlings	A by-product of flour milling comprising several grades of granular particles containing different proportions of endosperm, bran, germ, each of which contains different levels of fibre	Wheat middlings
Mill run	Ungraded and uninspected material from the mill, containing coarse bran, fine bran, shorts, germ, flour as well as end product of milling.	Wheat mill run
Pearled	Dehulled grains reduced by machine brushing into smaller smooth particles	Pearled barley
Polishing	Having a smooth surface produced by mechanical processing usually by friction	Rice polishings
Rolled	Having changed the shape or size of particles by compressing between rollers	Rolled oats
Shorts	A by-product of flour milling comprising fine particles of bran, germ, flour and offal from the tail of the mill	Wheat shorts
Starch	The digestible carbohydrate component of the seed endosperm	Corn starch
Whole grain	Entire grain of cereal	Whole wheat

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The second question – “is one cereal better than the others?” – is a little harder to answer. Cereals are definitely not all the same. Corn, rice, wheat, barley and oats all have different compositions and properties and this affects how they behave in the body.

Here are a few examples.

Some cereals are “naked” grains meaning that they do not have an outer hull. For example, corn is a naked grain, while rice and barley have hulls. Hulls are largely composed of insoluble fibre, so naked whole grains tend to be more digestible than whole grains with hulls. Some pet foods may use de-hulled grains, such as de-hulled oats or de-hulled barley to improve the digestibility of these ingredients.

While all cereals have a bran component, the composition of this bran is unique for each cereal. For example, wheat bran is about 40% total dietary fibre, with insoluble fibre and soluble fibre existing in a ratio of about 4:1. Oat bran, on the other hand, is less than 20% total dietary fibre and its insoluble to soluble ratio is close to 1:1. The unique fibre in oat bran is particularly effective at reducing blood cholesterol levels in humans.

Different cereals have different glycemic indices. A food’s glycemic index refers to how quickly the food is broken down and released into the pet’s blood as glucose. Of the various cereals, corn has the highest glycemic index, barley the lowest and rice falls in between. A lower glycemic index may be beneficial for dogs suffering from diabetes mellitus.

Barley and oats contain beta-glucans, a specific type of fibre not found in other cereals. Recent research in humans has shown numerous health benefits associated with the consumption of beta-glucans. It’s not known whether these benefits also apply to dogs. It does appear however that beta-glucans may not be well tolerated by some dogs. Some dogs experience loose stools or diarrhea when fed pet foods containing even small amounts of oats or barley.

A final difference in the cereals lies in their potential to be allergenic to dogs. Wheat gluten-induced enteropathy, a disease analogous to human celiac disease, has been documented in a few breeds of dogs, most notably the Irish Setter. As well, a review of 253 dogs of different breeds suffering from food-associated skin disease found that adverse reactions to beef, dairy products or wheat accounted for 68% of cases. A further 25% were due to adverse reactions to lamb, egg, chicken or soy, and the remaining 7% were reactions to a variety of other food ingredients.

It is worth noting that the incidence of true food allergies in dogs is far smaller than most people think. Veterinary dermatologists estimate that among all cases of allergic skin disease in dogs, only about 10% are due to food allergies (most are due to inhalant allergens such as dust or pollen). If food allergies represent 10% of all cases of allergic skin disease, and allergies to corn, barley, rice and oats are all captured within the 7% category, then the incidence of allergies to any one of these four cereal ingredients among dogs with allergic skin disease is less than 0.7%.

Cereals are often unjustly criticized. They’re called cheap fillers. They’re blamed for causing allergies. These criticisms are not justified. Cereals have supplied man and dogs with highly digestible dietary energy for more than a hundred centuries. Combined with other high quality ingredients, cereal grains are an integral part of a healthy, balanced diet.