# Here's What Kibble Processing Does to Fresh Food

Raw food contains all its original nutrients, but when high heat is applied for the extrusion of kibble, the molecular structure of proteins change, as well as the nutritional content of the food. Researchers decided to find out if adding fresh chicken meat to the mix would help.

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- A 2017 study demonstrated that applying the extrusion process to fresh chicken meat renders it no more digestible than lesser protein sources in ultraprocessed pet food
- Extrusion, the process used to make most kibble, changes the molecular structure of some ingredients — especially animal protein — and destroys the nutritional content of others
- If you can't avoid feeding your pet kibble, take steps to introduce as much fresh food into his or her diet as possible

As many of you who visit here regularly know, the ultraprocessed pet food industry stays very busy searching for "new and novel" inexpensive ingredients (often byproducts of the human food industry recycled into something saleable) to use in their dog and cat food formulas.

The industry also routinely measures their inferior ingredients against actual fresh animal meat to see if they can find a point of distinction that allows them to market against fresh diets. For example, here's a typical headline in a pet food industry journal: "Byproduct protein digestibility may rival fresh chicken."[1]

## Pet Food Processing Methods Destroy Nutrients in Fresh Food

In 2017, Norwegian University of Life Sciences researchers conducted a study to see if adding fresh chicken meat to processed dog food made with hydrolyzed salmon protein and poultry meal increased protein digestibility.[2] Not surprisingly, the extruded chicken meat didn't improve digestibility because as the researchers correctly observed, "extrusion seemed to negate the higher digestibility" of the chicken.

The researchers believe "heat during extrusion may be the culprit in reducing raw chicken's nutritional value." They observed that single amino acid digestibilities, especially for aspartic acid and cysteine, known to be heat sensitive, "revealed a disproportionate reduction when tested in the extruded food compared to when tested alone."

Again, this is not surprising. Raw food contains all its original nutrients — nutrients that are lost during cooking of any kind, and especially during the high and prolonged heat cooking, plus extrusion, used to manufacture ultraprocessed pet food.

So let's look again at the journal article headline: "Byproduct protein digestibility may rival fresh chicken." A more accurate headline would be: "Heat extrusion kills vital nutrients in fresh chicken meat, making extruded chicken meat in processed dog food no more digestible than salmon protein hydrolysate (SPH) or poultry meal."

For the record, the SPH was made from a gag-inducing blend of viscera (intestines), heads and frames of salmon. As for poultry meal, here's AAFCO's definition:

> *"Poultry Meal is the dry rendered product from a combination of clean flesh and skin with or without accompanying bone, derived from the parts or whole carcasses of poultry or a combination thereof, exclusive of feathers, heads, feet and entrails. It shall be suitable for use in animal food. If it bears a name descriptive of its kind, it must correspond thereto."*[3]

For those of you unfamiliar with the USDA inspected-and-failed feed-grade ingredients in most commercial pet foods, poultry meal is considered a step up from poultry by-product meal, because the latter contains "necks, feet, undeveloped eggs and intestines." It's also important to note that many bird species fall into the category of "poultry," including chickens, turkeys, ducks, geese, pigeons, guinea fowl, quail, ostrich, emus, and more.

## How the Extrusion Process Damages Pet Food Ingredients

Extrusion is the process used by pet food manufacturers to turn ingredient mixes into kibble. About 95% of dry pet diets are manufactured using the extrusion process. Extruding batches of ingredients with high meat content is considered challenging by pet food manufacturers, which tells us undesirable changes occur to animal meat during extrusion.

Here's how the process works: Batches of dog or cat food ingredients are mixed, sheared and heated under high pressure, forced through a spiral shaped screw (either a single screw or a twin-screw) and then through the die of the extruder machine. The result is called extrudate, which is a ribbon-like product that is subsequently knife-cut and dried.

The extrusion process involves extremely high temperatures. Research shows that more nutrients are lost as the temperature increases, and that drying pet food at 160°C (320°F) to 180°C (356°F) can significantly reduce its nutritional value.[4]

In small-sized kibble (4 mm or about .16 inch), a drying temperature of 200°C (392°F) lowered concentrations of the amino acids proline, total lysine, and reactive lysine.

It also markedly decreased concentrations of the linolenic (omega-3) and linoleic (omega-6) essential fatty acids, and increased the concentration of oleic acid (omega-9 monounsaturated). The scary part is how damaging heat is to fragile fatty acids; the increase in oleic acid may point to lipid oxidation (damaged fats) of the smaller kibbles during the drying process.

Lipid oxidation can create off-flavors and aromas, as well as potentially toxic compounds that cause harm when consumed.

The high temperature used in extrusion and the short timeframe to process (under five minutes) creates continuous chemical and physical alterations to the ingredient mixture. These changes include vitamin loss and protein denaturation (i.e., changing the protein's molecular structure).

One of the most health-damaging side effects from consuming a lifetime of extruded food is the mass consumption of advanced glycation end products — damaging compounds created during the manufacturing process that negatively affect the long-term function of every organ system.

## Extrusion Destroys Vitamins, Restructures Protein Molecules

According to a 2008 report by the Animal Nutrition Group at Wageningen University in the Netherlands, the extrusion process primarily destroys vitamin A, vitamin E and the B-group vitamins in dry food ingredient mixtures.[5] No data on vitamins D or K was available for the report.

The percentage of vitamin loss during extrusion varies widely, from a low of 4% loss of thiamin to a high of 65% loss of vitamin A. And keep in mind that B-group vitamins are water soluble, meaning your pet's body can't store them — they must be provided daily through diet.

The protein sources used in dry pet food formulas are often a combination of animal and plant. Less costly plant proteins don't contain amino acids sufficient for the nutritional needs of carnivorous dogs and cats, which is why plant-based pet foods need so many synthetic supplements added to be labeled "complete and balanced" per **AAFCO** standards.

Amino acids don't fare well during extrusion. A study cited in the Animal Nutrition Group report "… observed a large overestimation of the available lysine content such that the amino acid pattern relative to lysine in these diets may not be optimal to promote health."

In my opinion, the lack of adequate amounts of fresh meat (vs. plant-based protein) and reduction in amino acids due to processing techniques could be one of the main reasons we are seeing more heart disease, including dilated cardiomyopathy (DCM), in many companion animals today.

> *The report continues, "In addition to lysine, other amino acids such as arginine, tryptophan, cysteine and histidine can also be affected by the extrusion process. Of particular importance may be the sulphur amino acids (cysteine and methionine) which are often limiting in diets for cats as these amino acids are susceptible to oxidation.*"

Not coincidentally, it's the amino acids cysteine and methionine that dogs need to make taurine, and taurine deficiency is one factor that increases a pet's likelihood of heart disease. Taurine is only found in seafood and meat (there's no taurine in grains or plant matter), which means cats are also at risk of heart disease if they do not consume meat-based diets.

In the case of plant-based proteins like soy and corn, denaturation makes these biologically inappropriate foods easier for pets to digest. However, denaturation is only beneficial to meat-based proteins if the protein sources are substandard, which is the case in the vast majority of popular dry dog and cat food diets.

Rendered meat by-products are a common protein source in dry pet food, and they are indeed difficult for dogs and cats to digest and assimilate. Denaturation takes place first during the rendering process, which converts slaughterhouse waste into meat meals (dried meat powders are easier to transport) and again during the extrusion process. Denaturation breaks down and modifies the structure of protein.

Unfortunately, denaturation of high quality meat used in human-grade dry pet foods also occurs. Denaturation of biologically appropriate protein has the opposite effect of what is achieved with grain-based and low-grade animal meat. Denaturation makes these once healthy proteins more difficult for your dog or cat to digest and assimilate.

That's why protein digestibility decreased in the Norwegian pet food study — the fresh chicken meat was subjected to the extrusion process.

## Ready to Go Fresh?

If you're a regular visitor here, you know I advocate feeding your dog or cat the highest quality diet you can afford. The top five types of pet food I recommend are a variety of nutritionally balanced, unprocessed (living) or minimally processed (frozen, air dried or freeze dried), whole food diets. That's because the goal in feeding pets a diet they can truly thrive on is to mimic their **ancestral diet** as closely as possible without breaking the bank.

My essential recommendation is to feed your pet (and yourself) as much unprocessed, fresh food as you can afford. If you can't afford to feed an entirely fresh, living, raw or gently cooked diet, offer fresh food snacks instead. Research shows that providing any amount of healthy foods to dogs and cats is better than no healthy food at all.

Other options to consider: Feed, for example, two to four fresh food meals out of 14 in a week, or do a 50/50 split, meaning one meal a day is a processed pet food, and the other is a fresh food meal. Take small steps toward providing the best diet you can afford for your dog or cat, and keep in mind that any amount of species-appropriate fresh food snacks and meals is better than none.

Every bite of food your pet swallows is either healing or harmful; all foods impact the body in some way. The more fresh, living, whole foods your dog or cat consumes, the better.

### Sources and References


[1] PetfoodIndustry.com, March 22, 2017

[2] Journal of Animal Physiology and Animal Nutrition, January 3, 2017

[3] AAFCO

[4] PetfoodIndustry.com, April 14, 2011

[5] Q.D. Tran, 2008. Extrusion Processing: Effects on Dry Canine Diets