

# Rethinking the Role of Carbs in Your Dog's Diet

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Analysis by Dr. Karen Shaw Becker

## STORY AT-A-GLANCE

- Like many humans, most dogs these days eat carb-heavy diets, even though canines have no (zero) nutritional requirement for carbohydrates; the diseases they acquire also mimic those in the human population
- Veterinarians Chris Zink and Donna Raditic took a deep dive into the phenomenon, and discovered it's not only the carbs, but how they're processed that can create disease in canine companions
- Kibble is produced using an extrusion process that causes significant damage to ingredients; this can in turn create systemic inflammation and a host of disorders and diseases in pets fed these ultraprocessed products
- My recommendation is to feed your dog the highest quality diet you can afford, including a variety of nutritionally balanced, unprocessed, or minimally processed whole foods

According to sports medicine and rehab veterinarian Chris Zink, and my friend and veterinary nutritionist Donna Raditic — and this will come as no surprise to many of you reading here today — decades ago, in what has apparently become the time-honored tradition of rigging scientific research to produce a desired result, the sugar industry was able to convince Harvard University researchers to produce a study suggesting that dietary fat was the most significant nutritional cause of heart disease.<sup>1</sup>

The study was published in no less than the esteemed New England Journal of Medicine, and as Drs. Zink and Raditic write in an article for Canine Sports Productions, it “laid the foundation for decades of nutrition misinformation perpetrated on the public by well-meaning organizations such as the American Heart Association.”<sup>2</sup>

There are three main components of nutrition: fat, carbohydrates, and protein. Since protein is the most expensive of the three, and with fat off the table (literally), it was a given that the promotion of low-fat eating would result in higher consumption of sugar (carbohydrates). This was a boon for big sugar, but certainly not for human health. Not surprisingly, diets loaded with grains and sugars have resulted in an epidemic of obesity, diabetes, heart disease, and cancer.

Zink decided to investigate whether ingesting high levels of carbohydrates might also be a problem for dogs, who have always been and are **scavenging (facultative) carnivores**, not omnivores or vegans as the ultraprocessed pet food industry would have us believe.

# Adult Dogs Require ZERO (0) Carbs to Sustain Life

Zink's investigation uncovered the following facts:

- The majority of dogs in North America (estimates suggest 80% to 90%) are fed kibble
- On average, kibble contains between 46% and 74% carbohydrates<sup>3</sup>
- Percent carbohydrates required by adult dogs to sustain life: 0 (zero)<sup>4</sup>

*"These facts suggest that it is critically important to understand the role of carbohydrates in kibble dog foods," write Zink and Raditic, "which contain more carbohydrates than either fat or protein, to be sure that they promote health and longevity for our dogs. As you'll see, however, it's not the carbohydrates that are the problem, but how those carbohydrates are processed during the manufacture of kibble."*

## The Kibble Manufacturing Process

The fact is, about 95% of dry pet food is manufactured using the extrusion process, which turns ingredient mixes into kibble. It also causes significant damage to those ingredients.

Here's how the process generally 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 drying pet food at 160°C (320°F) to 180°C (356°F) can significantly reduce its nutritional value.<sup>5</sup> 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 decreases concentrations of the linolenic, DHA and EPA (omega-3) and linoleic (omega-6) **essential fatty acids**, and increases the concentration of oleic acid (omega-9 monounsaturated). The increase in oleic acid may point to lipid oxidation of the smaller kibbles during the drying process. Lipid oxidation can create off-flavors and aromas, as well as potentially rancid, toxic compounds.

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, protein denaturation (i.e., changing the protein's molecular structure), starch gelatinization, and inactivation of nutritionally active factors. In the final step, as Zink and Raditic explain:

*"The pellets are then passed through a heated dryer to remove any remaining moisture and the food is sprayed with animal fats to improve flavor, vitamins to attempt to replace those damaged during the heating process, artificial colors to improve visual appeal, and preservatives."*

*That's how it's done. Kill off some of the nutrients, then spray them back on. Interestingly, this is also the similar multi-step food processing, termed 'ultra-processing' that is used to produce our ready-to-eat-breakfast cereals!"*

# The Maillard Reaction and AGEs

Zink and Raditic continue:

*“It turns out that the superheating process during the production of kibble changes the quality of some nutrients in a way that no spray can replace.<sup>6</sup> When certain amino acids within a protein are heated in the presence of sugars, a series of chemical rearrangements occurs, called the Maillard reaction.<sup>7</sup>*

*The final products of this reaction are called **advanced glycation end-products** or AGEs. This process is irreversible and it actually decreases the availability of certain amino acids in the dog’s food, because they become bound up as part of the AGEs.<sup>8</sup>*

*These AGEs are absorbed in the gut and enter the circulation, where they are distributed to all parts of the body. Because AGEs are big and bulky, they are resistant to degradation, so they accumulate and gradually become part of the protein structure of the entire body.<sup>9</sup> Studies are beginning to demonstrate the numerous effects these AGE-modified proteins have on health and disease in both humans and our canine companions.”*

Some of the known effects of AGEs include:

- AGEs create a state of chronic systemic inflammation, which is associated with the development of cancers in both humans and dogs<sup>10,11</sup>
- AGEs can hinder the repair of tissues, especially tissues that have a high protein content, such as ligaments and tendons;<sup>12</sup> this, in turn, can lead to more rapid signs of aging
- AGEs in humans have been linked to atherosclerosis, kidney disease, retinopathy, osteoarthritis, neurodegenerative diseases, and diabetes mellitus
- Increased levels of AGEs in dogs have been seen in diabetes, cataracts, osteoarthritis, canine cognitive dysfunction syndrome, vascular dysfunction, and atherosclerosis
- The immune system interacts with AGEs resulting in increased production of inflammatory cytokines; this can lead to an increase in allergic responses in the gut, expressed as inflammatory bowel disease<sup>13</sup>

The content of AGEs in ultraprocessed pet foods is about the same as in processed human food products. In pet food, AGEs levels in canned food are higher than in kibble, which are higher than in a fresh, minimally processed diet.<sup>14,15</sup>

However, as Zink and Raditic point out, the average daily intake of AGEs by dogs is a whopping 122 times higher than that of humans (as a percentage of metabolic body weight).<sup>16</sup> This is exacerbated by the fact most dogs eat some type of ultraprocessed pet food their entire life.

These data certainly suggest that by reducing our dogs’ ingestion of dietary AGEs, we would likely improve their overall health and longevity.

## Take-home Message: Feed as Much Whole, Fresh Food as Possible

The take-home message here is that when kibble, regardless of the protein form used, exits the extruder, enough nutrients have been destroyed that manufacturers must add them back in (using synthetic replacements) to meet minimal nutritional requirements.

There's also the potential for **cancer-causing chemicals in kibble**, as well as the deleterious effects of the Maillard reaction, including advanced glycation end products (AGEs), which in humans have been shown to exacerbate diabetes and interfere with kidney function, and are linked to aging, Alzheimer's disease, neurologic disease, and cancer.

Of course, pet food companies producing kibble will never conduct research evaluating the levels of these compounds in their products, since the results would be catastrophic for sales. But the nonprofit organization **CANWI (Companion Animal Nutrition and Wellness Institute)**, which Dr. Raditic and I co-founded, is.

The results of the first study comparing AGEs in dry, canned, and fresh food are in. Just as you would expect there are significantly more of these damaging chemical compounds in canned and dry food, as compared to raw pet food. A lifetime of consuming only highly refined foods and no real, fresh food has the same consequences in all mammals — ill health.

*"It is not our intent to make the reader feel guilty for feeding kibble," Zink and Raditic explain. "We both fed kibble for many years, and still use it for training treats and when traveling. Kibble is convenient and inexpensive as compared to fresh foods. Many dogs have done well on kibble diets for decades. But after learning of the detrimental effects of the products of heat-processed foods on canine metabolism, we decided to try doing just a little better."*

*"We strongly believe that most dogs will benefit from the replacement of at least some portion of their highly processed foods with a fresher alternative. Certainly, the evidence suggests that for dogs with allergies, chronic osteoarthritis, diabetes, or other chronic diseases, replacing highly processed food with a fresher alternative is likely to improve their health and longevity. Why not give it a try?"*

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 food they can truly thrive on is to mimic their ancestral diet (unprocessed, and the bulk of calories coming from protein and healthy fat) as closely as possible without breaking the bank.

My essential recommendation is to feed your pet (and your entire family) 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 specie-specific 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 minimally processed foods your dog or cat consumes, the better.

Sources and References

<sup>1</sup> [Kearns, C.E. et al. JAMA Intern Med. 2016 Nov 1;176\(11\):1680-1685](#)

<sup>2</sup> [Chris Zink, DVM PhD DACVSMR and Donna Raditic DVM DACVN, Canine Sports Productions](#)

<sup>3,4</sup> [National Research Council, National Academy of Science, “Nutrient Requirements of Dogs and Cats”, 2006 Edition, p 317](#)

<sup>5</sup> [PetfoodIndustry.com, April 14, 2011](#)

<sup>6,8,13</sup> [Teodorowicz, M. et al. Front. Immunol. 13 September 2018, Sec. Nutritional Immunology Volume 9 - 2018](#)

<sup>7</sup> [Hodge, J.E. J. Agric. Food Chem. 1953, 1, 15, 928-943](#)

<sup>9</sup> [John, W.G. and Lamb, E.J. Eye \(Lond\). 1993;7 \(Pt 2\):230-7](#)

<sup>10</sup> [Ramasamy, R. et al. Glycobiology. 2005 Jul;15\(7\):16R-28R](#)

<sup>11</sup> [Gentzel J.B. \(2013\) Vet World 6\(9\):632-639](#)

<sup>12</sup> [Vlassara, H. et al. Lab Invest. 1994 Feb;70\(2\):138-51](#)

<sup>14,16</sup> [van Rooijen, C. et al. J Agric Food Chem. 2014 Sep 3;62\(35\):8883-91](#)

<sup>15</sup> [Crissey, S.D. et al. J Anim Sci. 1997 Aug;75\(8\):2154-60](#)

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