

Feline Diabetes and Obesity: The Preventable Epidemics
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Today, the cat is the favorite house pet in the United States, at least if your definition of “favorite” is “most numerous.” The cat has outnumbered the dog, the previously “most numerous” pet species, for a decade or more and this trend shows no signs of reversing itself anytime soon. Those of us involved in any of the pet care industries or professions know very well that we are seeing more and more well-cared-for felines, belonging to people and families that are intensely bonded to their kitty family members. Men, as well as women, in all socioeconomic strata, are attached to their pet cats in a way that I could never have anticipated in 1977 when I graduated from veterinary school. In short, the cat has become not only legitimate as a pet underfoot, but also a focus of attachment and affection for humans who are often willing to do anything and everything necessary to provide their felines long, healthy, and happy lives.

This desire and willingness to care for a pet cat’s every need has resulted in some significant improvements in health and longevity for felines today. For example, the increasingly common indoor existence enjoyed by cats has greatly reduced the incidence of most infectious diseases within cat populations and has markedly curtailed death and injury to cats from automobile accidents, attacks from dogs or wildlife, or other sources of trauma. More routine spaying and neutering of household pet cats has positively affected the number of abandoned and neglected cats put to sleep in shelters. Unfortunately, while so much is better for cats today, this species has nonetheless paid a price for the heightened level of care it receives from the millions of devoted cat owners in the country. That price is loss of health associated with poor nutrition in the form of commercial dry cat food diets.

First, some background on the evolution of the cat for context. Today’s domestic cat evolved from one or more small wild cat species in Africa and southern Europe. The environment in which these progenitor cats developed was vegetation sparse and small-animal-prey rich, causing this top-predator mammal to become dependant on meat, and meat’s primary energy nutrients, protein and fat, for sustenance. Over time, some of the pathways for carbohydrate metabolism that were developing to a high degree in herbivorous and omnivorous species in more carbohydrate-rich environments were discarded by the primitive cat. In fact, eventually this species so drastically rearranged its processes for dietary energy extraction that its metabolic systems began to use protein for energy at a constant, almost invariable rate, without the switches for up- and down-regulation of that protein “burn” (gluconeogenesis from amino acids) that is active in omnivores and herbivores. That is, the cat will use dietary protein for routine energy production at a high level EVEN in situations where dietary protein is very limited. Because of these evolutionary “choices” made long ago, the cat rapidly begins to consume its structural proteins for energy during starvation or protein deprivation of any other kind (e.g., protein-restricted diets). In short, the cat is a “carbohydrate cripple” with a huge protein dependency!

Given the forgoing, it is not at all surprising that we now find many of our feline patients fat, sluggish, and eventually, diabetic. For all of our good intentions in bringing the cat into our homes as a pampered pet, we have done the species a tremendous disservice in providing its members a diet far more appropriate for a cow in a feedlot than an obligatory carnivore. Because of the food technology of dry food production, dry cat foods are loaded with carbohydrate from cereal. This carbohydrate is absolutely required in the extrusion process; dry pet foods are essentially breakfast cereal for pets with a little added meat meal for palatability. Further, because this cereal undergoes processing at high heat and pressure during extrusion, it becomes pre-digested and enters the pet's bloodstream essentially as "sugar." Nothing in the cat's evolutionary development could possibly have prepared it for a steady diet of this sugar laden "junk food."

Not all cereals are created equal, of course. Some have much higher glycemic indices than others, meaning they cause a greater rise in blood glucose when consumed and digested. Perhaps the most offensive of all cereals used in pet foods is corn, (from which corn syrup is derived, giving a good idea of how much sugar corn actually contains). Because it is plentiful and cheap in this country, corn is one of the favorite dry pet food cereals used by the industry. Sadly, even the most expensive, so-called premium dry pet foods contain high amounts of this ingredient.

An additional consideration is the cat's unique system of satiety signals from food. Logically, because the cat evolved in an environment rich in protein and fat, but deficient in carbohydrate, consumption of fat and protein evolved as the signal to the cat that it could cease intake. Consumption of carbohydrate, however, has a minimal effect on intake in the cat even as energy requirements are met and exceeded with this nutrient. Thus, not only is the cat relatively incapable of handling repetitive substantial carbohydrate loads of the kind represented by dry cat food, it is also unable to respond appropriately to that consumption with appetite satisfaction. The end result is cats that overeat, constantly flood their systems with glucose overloads, spiking repeated surges of insulin from their limited carnivore's pancreatic reserve, and become obese. For a large number of cats, their metabolic systems eventually become overwhelmed by this unphysiologic chain of events and its unremitting stress on the pancreas, resulting in diabetes.

Assuming the preceding description of the present state of nutrition for pet cats is correct, how could this possibly be? How and why would a multi-billion dollar US pet food industry "conspire" to foist essentially "poisonous" food off on cat owners, often at very high prices and at exclusive, inconvenient outlets such as veterinary facilities and pet stores? To begin to answer that question, we must go back, once again, into history. At the middle of the last century, there were no commercial pet food products to speak of. Pet animals were fed from the table or the local butcher's discards. However, during the 50s and 60s, the market for convenient dog foods began to grow. Companies like Purina Mills, a cereal grain processing company, recognized this emerging market and began to make baked biscuits for dogs. Over time, Purina and other cereal-processing companies began producing kibbled dog food with the same technology used in making breakfast cereal for humans. At the same time, Alpo began to can discarded meat scraps and/or

condemned meat for dogs. Because of their convenience and affordability, both types of food had appeal for dog owners and growing sales of these products encouraged additional output by these and a few smaller processors.

Unfortunately, these early attempts to produce dog foods were driven entirely by a desire to find profitable uses for excess commodities, specifically corn and other grains as well as meat unfit for or unused for human consumption, rather than a desire to provide genuinely health-promoting foods for pet dogs. Because Alpo's canned meat was completely unsupplemented for vitamin/mineral balance, it caused serious deficiency diseases in dogs that consumed it as most or all of their diet. As a result of the resulting scandal, the company decided to add a general vitamin/mineral supplement to its canned meat, and all other processors followed suit. Purina and other companies making kibbled dog food also began adding vitamins and minerals to their kibble, which was marketed as an adjunct to fresh meat or canned meat foods for completeness.

As decades passed, many dog owners began to favor kibbled dog food because of its economy, convenience and keeping qualities. Pet food-producing companies responded to this market demand by adding protein ingredients to their kibble in an attempt to produce a more complete dry food. Finally, the American Association of Feed Control Officials (AAFCO), a regulatory body that then supervised the quality and safety of livestock feeds, agreed to accept responsibility for supervising pet foods as well. For the first several years of this oversight responsibility, AAFCO reviewed available literature and compiled a list of minimum and maximum levels of key nutrients that must be present in a dog food labeled as complete and balanced. No actual feeding studies were required, but random samples of a company's foods (this requirement applied to canned as well as dry foods) were expected to meet the established minimums and maximums. Even though this was an important improvement in the assurance of the quality of these foods, their ingredient content continued, and continues to this day, to be ingredient-cost and ingredient-availability driven. Meeting nutrient requirements is achieved by adding supplements when the ingredient mix that is most cost effective does not provide the right balance alone.

Into this environment enters the cat as an increasingly "kept" pet for which owners began to clamor for complete and balanced commercial foods as well. While it was understood by manufacturers that the cat had some unique nutritional requirements as a result of its status as an obligatory carnivore (e.g. the need for preformed vitamin A because the cat cannot synthesize this vitamin from dietary beta-carotene as humans and dogs can, the need for high levels of arginine and taurine because of high use and limited internal synthetic capabilities for these amino acids, the need for dietary arachidonic acid because of an inability to produce this fatty acid internally, etc.), these requirements were somewhat cavalierly addressed by the pet food companies, as we will explore shortly in the matter of the devastating taurine-deficiency problem with most canned cat foods that arose in the late 1980s. Certainly, the cat's completely unique metabolic machinery designed for high production of energy from protein and near exclusion of carbohydrate as an energy substrate was entirely ignored. Essentially, as dry cat foods began to emerge

in response to cat-owner demand, they were little more than dry dog foods, processed into smaller, cat-sized kibble, with a slightly different vitamin/mineral mix added.

In fact, both canned and dry cat foods are the product of marketing and food technology considerations, not the science of feline nutrition. Witness the fact that canned and dry forms of the exact same formula of any brand with corresponding forms, have entirely different macronutrient profiles. Canned product has relatively high protein (usually about 40-55% **on a dry matter basis**), moderate fat (usually 25-35% DMB) and low carbohydrate (usually about 2-8% DMB). Dry foods bear absolutely no nutritional resemblance to their corresponding canned version. A dry food will typically have about 20-33% protein, 10-25% fat, and 20-50% carbohydrate! In addition, dry foods often have relatively high fiber content (5-8%) while canned foods, unless they have fiber deliberately added as a separate ingredient, have negligible fiber. Why would different physical forms of the exact same formula, for the exact same “life stage,” have such very different macronutrient contents? Do kittens and cats have different needs depending on whether they are eating canned or dry? The short answer is no, of course not. The cat has the exact same macronutrient needs whatever form of food it consumes, so why the great difference in these formulas?

The demands of food technology in the production of a dry kibble using the process of extrusion, (same as breakfast cereal for humans) dictate the macronutrient profile of dry pet foods. Extrusion is the expansion and “popping” of kibbles through a high heat, high pressure process that will not occur without substantial starch content in the slurry that is fed into the extruder. A canned food formula, sent through an extruder, will end up a damp puddle at the end of the machine, rather than fluffy, air filled kibbles ready for drying. So, tons of corn, rice, wheat, oats, barley and other grains (the less expensive the better, of course) are added to the meat meal and low volume ingredients that comprise dry pet foods **because the product form will not materialize otherwise.**

Further, dried kibble is almost completely unpalatable for the typical cat. This is not surprising; one would expect that this species would recognize high cereal foods as “not food.” In response, an entire industry has grown up, right alongside the expansion of the dry dog and cat food industry, to produce and provide potent palatability enhancers for coating pet food, especially cat food. These palatability enhancers may be acidified yeast (cats like the taste and/or mouth feel of acid substances), but more commonly are meat “digests.” Digests are produced when food animal entrails are fermented into a sprayable liquid mixture with acid added and then sprayed onto the outside of the dry cat food kibble. Few pet owners, including those adamantly opposed to the feeding of raw foods to their pets, would be so complacent about commercial dry pet foods if they witnessed the production and application of this ingredient. Thus, cats are essentially “tricked” into the consumption of a food they would not ordinarily consume, through the application of tasty outer coatings. One is reminded of the application of candy coatings on the outside of children’s breakfast cereal to enhance the consumption of relatively low nutritional-value breakfast foods.

Now, contrast the formulation and production of dry cat foods with the formulation and production of canned or “wet foods.” The starch requirement that extrusion places upon dry pet food production is absent in wet foods. Pates, even chunked, sliced, or grilled meats, go perfectly well into a sealed can that is then sterilized in a high-heat retort. Happily, high meat formulas are highly palatable for cats, who recognize such ingredients as appropriate foods for their nutritional needs, which they usually eat happily without additional palatability enhancers added.¹ Thus, canned foods have macronutrient profiles that are high protein, moderate fat and low carbohydrate, because this is the nutrient profile of meat-based food that will not be extruded and will not require palatability enhancers. This is quite different from the macronutrient profile of dry foods, which are slave to the food technology of extrusion and the resulting need for intense palatability enhancement with “sugar coatings” of fermented digest post production. The ingredients and macronutrients of the different forms of cat food are dictated by the requirements of food technology, not the science of feline nutrition. To this day, not one person at any of the major or minor pet food companies has ever questioned the wisdom of feeding diets that are 30-50% pre-digested carbohydrate to an obligatory carnivore, and our cats have paid the price for that negligence.

Many pet owners believe that commercial pet foods are safe and efficacious to feed to their pets because they have been “feeding trial tested” and shown to be complete and balanced by this method. The AAFCO statement on many pet foods bears testament to the fact that the contents of the can or bag have undergone some kind of feeding trial that guarantees that the food in the container is good for your pet. This statement is extremely misunderstood by most pet owners and misleads them into believing that only good can come of feeding the product on which this statement appears. To illustrate this problem, let’s go back in recent history.

In approximately 1988, a young cardiology resident at the University of California at Davis by the name of Dr. Paul Pion noticed something rather interesting. One of his feline patients, a cat he was treating for congestive cardiomyopathy, had an extremely low serum taurine level. Taurine is an essential amino acid in the cat (meaning it cannot be synthesized in sufficient quantities by the cat to meet its ongoing needs and must be supplied in the diet), known to be required for proper eye and cardiac function in this and many other species. Dr. Pion’s patient was fed an exclusive diet of a “high quality” premium commercial canned cat food, which should have supplied all of the taurine this cat required. After all, the food was “feeding trial tested” and shown to be

¹It is true that some canned foods, especially those that have low protein and/or low fat content (e.g. those that purport to be helpful in such disease conditions as renal failure or urolithiasis), are not well accepted by cats. This is because of their extremely abnormal macronutrient profiles for an obligatory carnivore. Other canned foods have high levels of indigestible fiber (wood cellulose), supposedly because this slows the absorption of sugar and calories from the food in which it is included. This is supposed to assist in the control of overweight and/or diabetes. The foods do neither very well. High fiber diets, canned and dry, limit the digestion and absorption of many vital nutrients, especially in a species with a short gastrointestinal tract and limited capability to extract nutrients from vegetation. They represent an irrational approach to meeting the nutritional needs of the overweight or diabetic cat and contain egregious amounts of simple carbohydrate, including carbohydrate and sugar from corn.

complete and balanced for all life stages in these feeding trials. Surely this cat's heart disease was not due to consumption of a taurine-deficient diet?

Over the months following his initial observation, Dr. Pion supplemented his original patient's diet with taurine and began to investigate other clinical cases of feline congestive cardiomyopathy. To his amazement, Dr. Pion discovered that virtually all of the cases he studied had low taurine levels in their bloodstream, and many of them improved dramatically, even returned to normal, when supplemented with taurine in addition to their regular diets, which were always canned commercial pet foods. Most of these cats were fed diets that had been "feeding-trial-tested" and shown to be complete and balanced for the appropriate life stage by this method.² How could such diets be responsible for a fatal disease condition in cats? How could foods produced by the "best" pet food manufacturers and tested according to the most stringent AAFCO guidelines be the direct cause of such pathologic deficiency in pet cats?

The answer, although not immediately evident, became clear over the first few months of Dr. Pion's investigation. The taurine in the implicated diets, often tested in the laboratory as adequate for the health of cats, was somehow not available to those cats when consumed in those diets. The processing of the canned formulations in the retort somehow "inactivated" the taurine contained in the foods so that it tested as adequate using laboratory methods, but in the "ultimate laboratory," the cat itself, the dietary taurine was not properly recognized and utilized. If this were the case, however, why didn't the feeding trials of these foods disclose this terrible flaw? Why? Because the vaunted feeding trials of which the companies and AAFCO are so proud are of such limited duration, usually no longer than 6 months, that only severe inadequacies and acute toxicities would ever be disclosed through them.

Further, had cats on a six-month feeding trial of a taurine-deficient diet developed congestive cardiomyopathy during the test period, it is extremely unlikely, prior to the problem discovered by Dr. Pion, that anyone would have recognized the condition as diet-related. Much more likely, any cat that developed cardiomyopathy during the test would have been diagnosed as having a congenital/hereditary defect and removed from the test cohort. Most cats would not become sufficiently deficient to develop overt clinical signs during the feeding trial. Thus, deficient diets were produced, feeding-trial-tested, and marketed for many years, causing the deaths of many cats, before a fortuitous turn of events and the keen observations of a young veterinarian allowed the problem to be identified and corrected. The pet food companies and their "rigorous testing for safety and efficacy" allowed the development of a fatal disease in thousands of cats, and that problem had to be discovered and corrected through the efforts of an outsider who was not even a nutritionist. The "scientific teams" within the implicated companies themselves were stunned by the discovery.

² J Am Vet Med Assoc. 1992 Jul 15;201(2):275-84 Response of cats with dilated cardiomyopathy to taurine supplementation.

The presently prevalent nutritional diseases of obesity and diabetes³ share stunning similarities with the taurine-deficiency disease of feline congestive cardiomyopathy. True enough, the disease associated with dietary taurine was a disease of nutrient deficiency, while diabetes and obesity in cats are diseases of nutrient excess. Both cardiomyopathy of taurine-deficiency and obesity/diabetes of carbohydrate-excess are diseases of insidious onset that can be attributed by non-astute or biased observers to chance or heredity. All are diseases that existed, and in the case of diabetes/obesity, continue to exist, despite assurances from nutritionists at major pet food companies and AAFCO that the diets causing them were, or still are, complete and balanced and perfectly healthful for cats. Both taurine-deficiency-cardiomyopathy and carbohydrate-excess-obesity/diabetes were made possible by inadequate laboratory testing of pet foods endorsed widely by pet care professionals, along with the pet food industry's failure to consider the effects of ingredient processing on ingredient nutritional value. Further, these diseases, and perhaps others yet to be uncovered in the future, are the result of an unfathomable failure by those most knowledgeable about the peculiar metabolic machinery and nutritional needs of the cat to properly consider those factors. By and large, the pet food industry has treated the cat like a "small dog," because it was expedient and seemed so harmless for so long.⁴

Please note that not all cats that consume substantial dry cat food become obese, or develop diabetes, or cystitis, at least not during the length of their lives, whatever that might be. Similarly, not all cats that consumed taurine-deficient canned foods in the 1980s developed congestive cardiomyopathy, at least not before the link to canned foods was discovered and corrected. We know that as harmful as cigarette smoking clearly is for human beings, not every person that smokes cigarettes will develop cancer, or emphysema, or heart disease, at least not before some other cause of death intervenes. These facts do not diminish in the slightest the unavoidable conclusions we have come to

³ So-called "idiopathic cystitis" of cats is also directly related to high carbohydrate intake (see Am JVetRes 2004; 65: 138-142 Evaluation of effects of dietary carbohydrate on formation of struvite crystals in urine and macromineral balance in clinically normal cats), not excessive mineral intake or inadequate water intake as has been advanced by pet food nutritionists for decades. Thus, this makes another entirely preventable epidemic in our cats caused by poor nutrition.

⁴ It is important to note that the canned foods of the Iams Company were never implicated in the taurine-deficiency scandal of the late 1980s. This was believed to be the result of that company's fortuitous use of significantly greater amounts of fish in their canned cat food products than most other companies. Fish is rich in taurine, and Iams' canned cat foods contained enough extra taurine to withstand harmful inactivation of that nutrient in the retort process. Further, the Iams Company more than any other has long insisted that the cat is a carnivore and should be fed as such. This is clearly the right idea; unfortunately the Iams Company's dry foods are bursting with highly processed carbohydrate like every other company's. To properly feed an obligatory carnivore like the cat, one needs include not only adequate amounts of unique essential micronutrients like taurine, Vitamin A and arachidonic acid, but one needs also to include adequate levels of vital macronutrients like protein and fat, and exclude harmful levels of carbohydrate. In short, one would need to feed a diet very like the one which provided the millennia of evolutionary pressures that produced today's domestic felines. No presently available dry cat food comes even close to this standard.

about the harmfulness of cigarette smoking, and the dangerousness of nutritionally deficient or excessive diets. Some people and animals are more resistant to environmental harms than others, but it is virtually impossible to tell which individuals these are before it is too late. Therefore, every individual in every susceptible population must be considered at risk.

What is to be done about the present rampant feeding of carbohydrate-laden dry cat foods? Shouldn't those who are gaining financially from the present high level of commercial pet food demand and who have the expertise to formulate and produce truly healthful feline diets, do so? Of course they should. The pet food companies that have set themselves up as the pet nutritional experts among us have the obligation to deliver the safety and efficacy they have been claiming for so long. Unfortunately, without intense consumer pressure, that is highly unlikely to happen.⁵ All pet food companies have enormous investments in their current dry formulations and the long term purchase of ingredients that will make up those foods. All have huge dry cat food plants and a customer base that they will not willingly convert to better types of food with smaller profit margins. Had Dr. Pion not discovered the taurine-deficiency connection to certain canned cat foods, and threatened the implicated companies with scathing public relations consequences if diet formulations were not immediately revamped and improved, we would still be treating congestive cardiomyopathy as a fatal disease of cats of "unknown etiology." Because of Dr. Pion's discovery and willingness to speak out loudly, feline congestive cardiomyopathy is essentially a historical disease today.

If you worry about switching forms of food because you have been convinced that dry food is essential to good dental health for your cat, consider this: veterinarians today, whose feline patients are almost always consuming dry food as their complete or nearly complete diet, are seeing as much oral and dental disease in their patients as ever before. While the feeding of a crunchy kibble may have an intuitive appeal for dental health, the reality is that there are no scientific studies that prove dry foods provide better dental health throughout a cat's life than wet foods do. In my practice, I have a majority of my patients consuming exclusively wet diets. My patients require no more regular dental care and experience no more disease of their teeth and gums than patients on other practices in which I have worked where dry food was the norm. There is no dental benefit from dry food that even begins to offset the terrible harm done from feeding the **wrong** metabolic fuel to our cats.

It is for us, all of us, to do as Dr. Pion did back in the late 1980s. This article is the beginning of what I hope will become a groundswell of support to apply intense and constant pressure on the companies that supply our cat foods. I call for all of you to think long and hard about whether you really believe your cats are doing well on "fritos, chips and breakfast cereal." Those of you with obese and/or diabetic cats, consider that your

⁵ Considering the tactics of denial and delay engaged in by American corporations in matters of human health (witness the recent Vioxx scandal in which it now appears that Merck knew for as long as 4 years before withdrawing the drug from the market that its popular and highly lucrative NSAID caused heart disease in people), it is hardly surprising that pet food companies show virtually no sense of urgency about correcting the problems with any of their highly profitable products for companion animals.

cats would most certainly be more fit and healthier had they not lived on junk food all their lives. If you hesitate to seriously consider making a change from dry food because kibble is so convenient and easy to feed, please consider what this convenience is costing your cat. Until the veterinary profession becomes more knowledgeable about feline nutrition, and the pet food industry faces and corrects the defects within its present dry formulations, you are your cat's only real advocate for nutritional health. So speak up!