7

Cooked Versus Raw

A GROWING NUMBER OF CAT OWNERS are choosing to feed all-raw foods to their cats. These owners report improved coats, increased activity and better overall health in their cats. Some medical conditions such as diabetes mellitus and inflammatory bowel disease may respond better to all-raw foods than to traditional kibble. However, much of the debate on raw feeding is based on opinions and anecdotes rather than solid clinical evidence. Many of the benefits attributed to all-raw feeding may be due to factors other than the food being raw. For example, all-raw diets are high in moisture, free of preservatives, use fresh ingredients, are low in starch and have a low glycemic index. These characteristics also apply to home-made meals that include cooked meats.

I personally recommend feeding raw fruits, raw or steamed vegetables, and cooked meats to cats. In my experience, this way of feeding delivers the benefits associated with all-raw feeding without the risks. This chapter will review the benefits and risks of feeding all-raw versus partially-raw foods to cats. Section 7.1 will discuss the benefits of raw feeding. Section 7.2 will discuss the benefits of home-cooked meals. Section 7.3 will discuss the risks of raw feeding.

7.1

Beneficial Characteristics of All-raw Foods

The beneficial characteristics of all-raw foods can be summarized as follows:

They contain no additives, texturizers, or stabilizers
They are low in starch, which reduces the risk of hyperglycemia in cats
They are high in moisture, which promotes body water turnover
They contain digestive enzymes which help promote food digestion
They contain phytonutrients that are found only in fruits and vegetables

7.1a

The Absence of Additives in Raw Foods May Provide Intestinal Benefits

The absence of additives, texturizers or stabilizers in raw foods may account for their reported success in managing some cats with inflammatory bowel disease.

Very few scientific studies have been published on all-raw feeding, but one worth mentioning is a May 2002 report (Glasgow et. al.) by Angela Glasgow and colleagues at the School of Veterinary Medicine, UC Davis. Glasgow's study involved 22 kittens of two age groups (7 and 20 weeks) that had originated from a breeding colony predisposed to intestinal problems. Several strains of harmful bacteria, including *Giardia, Cryptosporidia* and *Campylobacter species,* were isolated from the stools of the kittens. Most of the kittens had loose stools at the start of the study. The 22 kittens were randomly assigned to one of two groups. One group was fed an all-raw diet; the second group was fed a premium brand of commercial cat food.

After one week on the study, the kittens on the all-raw diet all had noticeably improved stools. After one month, all kittens on the all-raw diet had firm stools, while the kittens on the commercial diet still had soft-to-liquid stools. These differences persisted to the end of the feeding trial. The researchers found that feeding all-raw did not reduce the degree of inflammation in the intestines nor did it decrease the number of harmful bacteria in the gut, so they concluded that the improvements in stool quality must have been due to other factors.

Raw pet foods do not contain several types of additives found in commercial pet foods, such as stabilizing gums (e.g. guar, xanthum), preservatives (e.g. propionic acid, sorbic acid) and/or texturizers (e.g. carrageenan). Some of these ingredients may not be well tolerated by some cats. For example, carrageenan has been reported to cause intestinal inflammation in some cats (Strombeck, 1999). It is not clear from Glasgow's study whether additives contributed to the loose stools in the kittens fed commercial cat food, but it is one possible explanation.

It is worth mentioning here that in the above study, one kitten in the raw-fed group died of dilated cardiomyopathy due to taurine deficiency after 10 months on the trial, despite the fact that the food had been tested and shown to contain enough taurine to meet minimal requirements. I will return to the issue of taurine deficiency in section 7.3c of this chapter.

7.1b

Blood Glucose Regulation: All-raw Diets Versus Kibble

Raw starch is indigestible to cats. Uncooked rice or spaghetti cannot be fed to a cat. All-raw diets, therefore, do not contain starchy ingredients such as cereal grains, pasta or potato. This contrasts sharply with kibble, where a significant percentage of calories come from starch. The kibble manufacturing process relies on *starch gelatinization* to form the expanded porous structure which is characteristic of all kibble pet foods. All kibble cat food, even high protein/low carbohydrate cat kibble, contains significant amounts of digestible starch.

Cats are carnivores and their metabolic pathways are very different to those of omnivores, such as dogs or humans. Hexokinase and glucokinase are two enzymes produced by the liver to control glucose metabolism. Hexokinase is activated at low glucose concentrations, whereas glucokinase is involved in "mopping up" excess glucose and is only activated when blood glucose concentration is high. In dogs and humans, hexokinase and glucokinase can both be activated depending on blood glucose concentrations. In contrast, cats have virtually no glucokinase activity. While hexokinase activity is normal in cats, cats have no ability to "mop up" excess glucose in their blood. This puts cats at greater risk of developing hyperglycemia when fed high starch meals. Persistent hyperglycemia can lead to metabolic complications, such as insulin resistance and diabetes mellitus. Hyperglycemia can also contribute to chronic inflammation, since excess glucose in the blood can attach itself to blood proteins such as hemoglobin, or to protein receptors on the surface of cells. Cats fed high protein/low carbohydrate foods are much better able to maintain ideal blood glucose concentrations even after consuming large meals or being deprived of food for several days (Kettlehut, Foss and Migliorini, 1978).

In switching a cat from kibble to all-raw feeding, an owner is switching from a high starch, potentially inflammatory diet to a low starch, less inflammatory diet. This may be especially beneficial to cats at risk of chronic inflammatory conditions such as inflammatory bowel disease or allergies.

7.1c

Moisture Content: All-raw diets Versus Kibble

Raw foods, like canned foods, are much higher in moisture than kibble. Many cats fed dry foods do not drink enough water to compensate for the lack of moisture in their food. High moisture intake is not only important

for urinary tract health, but it also helps to reduce the risks of constipation and megacolon. High moisture intake also helps to prevent dehydration, promotes joint lubrication in older pets, and helps to promote satiation in overweight cats. Pets benefit from high moisture intake and this is most easily achieved by feeding them fresh foods. For more information on urinary tract health, see chapter 10.

7.1d

Enzymes in Raw Foods

Many raw foods contain enzymes which can help to promote healthy digestion in the intestines. Two examples are bromelain from pineapple, and papain from papaya.

It is important to distinguish between the enzymes found in raw fruits and vegetables versus those found in raw meats. The enzymes present in raw meats are acid-labile and as such are largely inactivated by stomach acid. A 1989 research trial in dogs (Griffin, Alderson and Farndon) studied digestive enzymes isolated from pork pancreas (a concentrated source of meat-based digestive enzymes). This study found that 90% of these enzymes were destroyed by stomach acid and therefore did not contribute to digestion in the small intestines of the dogs. Plant-based enzymes, on the other hand, are acid-stable. The digestive benefits of raw feeding are derived from the enzymes found in raw fruits and vegetables, not from those found in raw meats.

7.1e

Phytonutrients in Fruits and Vegetables

Human dietitians encourage humans to eat several servings of fresh fruits and vegetables each day. Fruits and vegetables contain a wide variety of phytonutrients not found in other foods. These phytonutrients include beta-carotene (carrots, pumpkin), lycopene (tomato, grapefruit), glucosinolates (broccoli, spinach), ellagic acid (strawberries, raspberries), anthocyanidin (blueberries), isoflavones (soy), catechins (green tea) and others. The role of these phytonutrients in reducing the risks of cancer and other chronic inflammatory diseases is only beginning to be understood.

7.2

Home-cooked Meals—The Benefits of Raw Without the Risks

We summarized the beneficial characteristics of raw foods as follows:

They contain no additives, texturizers, or stabilizers
They are low in starch, which reduces the risk of hyperglycemia in cats
They are high in moisture, which promotes body water turnover
They contain digestive enzymes which help promote food digestion
They contain phytonutrients that are found only in fruits and vegetables

All of these beneficial characteristics also apply to home-cooked meals that include cooked meats. Home-cooked meals do not contain additives or preservatives. They are high in moisture and generally low in starch (although it is possible to include cooked starch in home-made recipes). The enzymes and phytonutrients in plant ingredients are present in home-cooked meals, even if the vegetables are cooked. Most phytonutrients are heat-stable. Laboratory analyses of steamed vegetables such as broccoli, spinach, carrots, and cabbage, show that these foods retain high levels of antioxidants and phytonutrients after cooking. In some cases, cooking may help to release phytonutrients stored within seeds or plant cell walls. For example, lycopene is a potent antioxidant found in tomatoes. The lycopene content of raw tomatoes is about 2,500 µg per 100g. The lycopene content of tomato sauce is six times higher at about 15,000 µg per 100g. Cooking tomatoes helps to release lycopene and make it available for uptake from the gut.

7.3

The Risks Associated With Feeding Raw Meats to Cats

There are some significant risks in feeding raw meats to cats. These include:

Food poisoning as a result of bacterial contamination
Nutrient deficiencies as a result of anti-nutritional factors
Dilated cardiomyopathy as a result of taurine deficiency
Reduced digestibility of protein
Deficiencies and imbalances due to badly formulated raw recipes

7.3a

Bacterial Contamination and Food Poisoning

Pets have a much higher tolerance for bacterially contaminated foods than do humans. Pets that are allowed to run free often scavenge for food and often suffer no ill effects. However, it is incorrect to assume that pets are immune to food poisoning. Consider the number of pets who become sick eating kibble that has been contaminated with salmonella. The bacterial risk from feeding raw meats is considerably higher.

The abstract below is from a 2003 report entitled "Septicemic Salmonellosis in Two Cats Fed a Raw-Meat Diet" (Stiver et. al.).

ABSTRACT

Salmonella gastroenteritis and septicemia were diagnosed in two cats presented for necropsy. Both cats resided in the same household and were fed a home-prepared raw meat-based diet. Salmonella was isolated from multiple organs in both cats and from samples of raw beef incorporated into the diet fed to one of the cats. Sub-typing of the bacterial isolates yielded *Salmonella newport* from one cat and from the diet it had been fed. This report provides evidence that the practice of feeding raw meat-based diets to domestic cats may result in clinical salmonellosis.

The two cats in this 2003 report died from salmonella poisoning which they contracted from contaminated raw beef. Is this a risk worth taking?

The risks of feeding raw meats are not limited to pets. People who come in contact with raw-fed pets are also at risk. A 2002 study (Joffe and Schlesinger) examined the food and stools of dogs fed home-made, all-raw diets. This study found that 80% of the home-made raw foods contained *Salmonella* and 30% of the dogs fed these raw foods had *Salmonella* in their stools. Dogs defecate outdoors. Most cats defecate in litter boxes in the owner's home. This represents a significant health hazard for members of a raw-fed cat's household.

Furthermore, people do not need to be in direct contact with contaminated food or feces to be at risk. Pets that are fed contaminated foods shed bacteria in their environment. Young children, seniors and anyone with compromised immune function are particularly vulnerable.

The Delta Society (http://www.deltasociety.org/) oversees pet visitation programs in hospitals and nursing homes in the United States. In 2010, the Delta Society initiated a policy prohibiting animals that are fed raw diets from participating in their Pet Partners program. This is the statement the Delta Society published regarding its decision:

DELTA SOCIETY POLICY STATEMENT

After careful consideration of known scientific facts, and on the unanimous advice of the Delta Society Medical Advisory Group, who reviewed and took under advisement recommendations made by experts in animal-assisted interventions, infection control, public health and veterinary medicine from Canada and the United States, the Board of Directors voted to preclude animals eating raw protein foods from participating in Delta Society's Pet Partners program. This policy affects all Pet Partners, regardless of species or breed. Per the recommendations from the Medical Advisory Group, for the purposes of the Delta Society Pet Partners program, raw protein diets include any raw protein from any animal source, including beef, chicken, pork, fish, raw eggs or other domesticated or wild animal meat. Not affected by this policy are the following raw ingredients (as long as no raw proteins are incorporated): soy and other plant proteins, raw washed vegetables, grains, legumes, or other plants. (http://www.deltasociety.org, 2010)

The US Food and Drug Administration (FDA) published a warning about raw pet food in 2004. The FDA's paper states that the "FDA does not believe raw meat foods for animals are consistent with the goal of protecting the public from significant health risks, particularly when such products are brought into the home and/or used to feed domestic pets."

When the FDA and the overwhelming majority of experts in the fields of infectious disease and public health agree that feeding all-raw diets to pets is a public health risk, owners would be wise to take heed.

7.3b

Nutrient Deficiency From Anti-nutritional Factors

There are several anti-nutritional factors in raw meats that are inactivated by cooking. Examples include trypsin-inhibitors, thiaminase and avidin.

Trypsin is a digestive enzyme produced by a cat's pancreas and secreted into the small intestines to help digest proteins. Raw meats contain trypsin-inhibitors which inactivate this digestive enzyme.

Many types of raw fish, including whitefish, cod, herring, carp, pike, flounder and others, contain an enzyme called thiaminase which destroys thiamin (vitamin B1). Thiaminase is inactivated by cooking.

Biotin is an essential B-complex vitamin. Avidin, a glycoprotein in raw eggs, irreversibly binds to biotin, preventing its absorption from the intestines into the cat's body. Avidin is inactivated by cooking.

These and other anti-nutritional factors in raw meats are all inactivated by cooking. This greatly increases the nutritional value of the meal and ensures that all essential nutrients are being well absorbed into the cat's body.

7.3c

Dilated Cardiomyopathy From Taurine Deficiency

I mentioned at the end of section 7.1a that one of the raw-fed kittens in Glasgow's study died of cardiomyopathy due to taurine deficiency. A further 70% of the raw-fed kittens, which all appeared outwardly healthy, also had heart muscle changes consistent with taurine deficiency. For the final three months of the study, the raw-fed kittens were supplemented with taurine.

Two important facts must be emphasized. First, this study was conducted by the School of Veterinary Medicine at Davis, University of California. UC Davis is a pioneer in the field of taurine research. It was UC Davis research that discovered the link between taurine deficiency and dilated cardiomyopathy in cats in the 1980s. Second, the raw-fed diet fed in this study met the minimal requirement for taurine. In other words, the researchers were aware of the potential risk of taurine deficiency and had analyzed the raw food to confirm that it contained sufficient taurine to meet a cat's requirements.

So how did the kitten end up dying from taurine deficiency? Here's what the researchers wrote:

> . . . the amount of taurine available to the cat in a diet depends on a number of factors, such as the amount of protein, the quality of the protein, whether the diet is cooked or raw, and what other ingredients are present in the diet that might increase the amount of taurine needed (Bacus et al, 1998; Park et al, 1999). It is also possible that bacteria in the [. . . food . . .] or in the intestine of the cats broke down some of the taurine. [. . .] Vitamin E levels in our raw diet were low and this can cause the meat to lose taurine as it is processed and ground (Lamber et al, 2001). (from Glasgow et. al., 2002)

The nutritional requirements of cats are more complicated than those of dogs, and nutritional deficiencies in cats can be lethal. In formulating home-made recipes for cats, it is important to understand that a cat's taurine requirement is influenced by the composition of the recipe and that processing practices, such as grinding and freezing, can result in taurine losses.

7.3d

Protein Digestibility of Raw Meats

Many people believe that raw meats are more digestible than cooked meats when in fact, the opposite is true. Consider how much work is involved in chewing a piece of raw steak, and how long that meat would

sit in your stomach slowly being broken down by stomach acid. Lightly cooking (especially with water or steam) contributes to food digestion in much the same way that stomach acid does. By opening up the coiled and folded structures of proteins, cooking allows digestive enzymes easier access to their interiors, facilitating digestion.

Richard Wrangham discusses the role of cooking in human evolution in his book "Catching Fire: How Cooking Made Us Human". Wrangham explains that cooking greatly increased the digestibility of our foods and postulates that this improved digestibility allowed our digestive tracts to shrink and our brains to expand. Wrangham describes a study involving healthy humans and ileostomy patients (people who are missing part of their small intestines) who were fed 25g of protein, as either raw or cooked egg. When the egg was cooked, protein digestibility ranged from 91-94% in both groups. When the egg was raw, the protein digestibility was 65% in the healthy volunteers and 51% in ileostomy patents. Wrangham says, "The gastroenterologists noted that heat predictably denatures proteins, and that denatured proteins are more digestible because their open structure exposes them to the actions of digestive enzymes" (2009, p.64-65). Cooking provided a 30-40% improvement in protein digestibility in this study. Since meats are the most expensive component of any recipe, it makes sense to maximize their nutritional value by lightly cooking them.

There are obviously significant differences in the digestive physiology of a cat and a human. In fact, it could be argued that cats are closer to the ileostomy patients in this study since they have much shorter digestive tracts than healthy humans. Regardless, the basic premise holds. Proteins must be "denatured" and broken down into amino acids which can be absorbed into a cat's body. Stomach acid denatures protein, as do digestive enzymes produced by a cat's pancreas and intestinal cells. Light cooking also denatures protein and contributes to the digestive process allowing a cat to get maximum value from the fresh meats in her diet.

7.3e

Deficiencies and Imbalances Due to Badly Formulated Raw Recipes

There are no government regulations overseeing the production or sale of pet foods in Canada. A person with no education in pet nutrition, no experience in food handling, no expertise in product testing can make pet food in a garage and sell it to unsuspecting pet owners. Companies can make false claims on their labels and even if someone notices and reports this fraud to the Competition Bureau, they are still likely to get away with

it. Many all-raw companies have never tested their products. These companies have no idea how much zinc or iodine or vitamin B12 is in their food, because they've never sent it to a laboratory to have it tested. Many all-raw pet food companies make statements such as "balanced naturally" or "balanced as nature intended", which generally means that the food hasn't been tested and isn't balanced at all. I have purchased more than a dozen commercial raw pet foods and sent them to an independent laboratory to be analyzed for 9 essential nutrients (a small subset of the 40 essential nutrients for cats). Not one of the products I tested met AAFCO guidelines for all 9 nutrients.

Raw pet food companies sometimes claim that animals in the wild don't eat complete and balanced foods so your pet shouldn't either. Animals in the wild don't live long and healthy lives. Animals in the wild don't receive medical care and they don't benefit from our advanced knowledge of how optimal nutrition can prevent or treat many serious diseases. NRC and AAFCO guidelines are not based on someone's opinion. These guidelines are based on clinical research that shows that pets fed diets that contain less than the recommended minimums develop symptoms of deficiency, and pets fed diets that contain more than the recommended maximums develop symptoms of toxicity. Deficiency and toxicity symptoms don't develop overnight, and they often aren't attributed to malnutrition. By the time nutritional deficiencies or toxicities are detected in blood tests or by symptoms such as hypothyroidism (iodine deficiency), bone fractures (calcium deficiency) or liver failure (vitamin A toxicosis), it is often too late to correct the problem.

If a recipe based on human food ingredients does not include a vitamin-mineral supplement, it is not complete and balanced. Human foods alone cannot supply all essential nutrients within the calorie content required by a domestic cat. While marginal deficiencies may not cause visible symptoms in the short term, they will cause health issues in the long term. Consider the recent men's health study (Gaziano et. al., 2012) that tracked more than 14,000 male physicians for 13 years. This study found that men who consumed a multivitamin/mineral supplement every day had an eight percent lower risk of cancer than men who did not consume a daily multivitamin. Physicians are well educated and are more likely to lead a healthy lifestyle than the general population, and yet without a daily multivitamin, physicians were at increased risk of cancer. A marginal deficiency in any essential nutrient prevents cells from performing optimally. Stressed cells are more susceptible to damage from environmental carcinogens and less able to repair themselves. Over time, marginal deficiencies can lead to serious diseases including cancer.

Raw pet food companies may have the best of intentions. They may believe they are selling healthy products. However, if they don't understand the importance of complete and balanced nutrition, if they lack the expertise to properly formulate balanced recipes, if they don't understand the need for, or are unwilling to spend money on laboratory nutritional analyses, if they don't have adequate training in safe food handling, then their products are not safe and they are putting pets at risk. Unfortunately, there are no government regulations preventing companies from selling unsafe, unbalanced foods to pet owners.

7.4

Complete and Balanced Home-made Meals: The Ultimate in Healthy Nutrition

Owners sometimes ask me how they can evaluate the quality of a commercial pet food (raw or kibble). Unfortunately owners have no way of assessing a pet food's quality. A label says nothing about the quality of the ingredients used in a pet food. There is no way of knowing whether the poultry meal in a kibble is sourced from fresh chickens or rancid chickens. An owner has no way of evaluating the quality assurance protocols or product testing procedures that happen behind the scenes at a pet food manufacturing facility. To put it bluntly, the words "melamine", "salmonella" and "mycotoxin" have never appeared on a pet food label.

When I worked as a pet nutrition consultant, I was sometimes hired to do quality audits for pet food companies. I would arrive unannounced at the plant and spend a day watching the pet food being made, taking samples of ingredients and the finished kibble, reviewing the company's quality assurance protocols, assessing their employee training programs, checking their equipment maintenance logs. Not once did I use labels, brochures or website information to assess the quality of a pet food product. The information published by a pet food company provides no information about the quality parameters that really count. That is as true for commercial raw pet foods as it is for commercial kibble.

The greatest advantage of home-cooking is that cat owners are selecting their own ingredients and controlling the "manufacturing process". By preparing fresh wholesome human-grade foods according to recipes formulated by a qualified pet nutritionist, owners can feel confident that they are providing the very best nutrition for their cats.