Nutritional Support of Pets with Cancer (Abridged)

Cancer is common in pets and may result in metabolic changes that can lead to malnutrition (Saker 2010). As cancer progresses, signs may include decreased appetite, lethargy and weight loss, and in advanced stages, there can be a loss of body fat and lean muscle mass. Recovery or remission is associated with improved clinical status; however, metabolic alterations may persist. The metabolic changes and accompanying malnutrition can decrease quality of life and impair response to treatment.

Food Acceptance

The 2016 AAHA Oncology Guidelines for Dogs and Cats state that "the most important dietary consideration for canine and feline oncology patients is that the ration is palatable and eaten, otherwise it has no benefit" (AAHA 2016). For pet parents, seeing a decreased appetite can indicate a poor quality of life, and they may choose to have their pets euthanized at this point.

Nutritional Considerations

Food acceptance by pets is driven by the sensory properties of food such as aroma, texture and flavor. Pets may be initially attracted to a food primarily based on its scent; however, texture plays as crucial a role as ingredients regarding influence on taste perception. Most palatability research is proprietary; however, there is an extensive body of work evaluating factors that influence acceptance of foods by pets. Shape, texture, density, aroma, taste enhancers, processing techniques and other technical aspects of producing food can be used to develop and manufacture highly palatable foods.

Energy Balance (Caloric Intake)

In adult dogs and cats, the prominent clinical feature of cachexia is weight loss, which is associated with decreased quality of life and poor prognosis (Saker 2021). Studies have shown that weight loss and being underweight negatively affects survival in dogs and cats with cancer (Michel 2004, Baez 2007, Romano 2016). The cause of weight loss may be multifaceted, ranging from inappetence, increased metabolic rate attributable to cancer burden, changes in taste preference, negative effects of cancer treatment or alterations in host metabolism that impair utilization of key nutrients.

Nutritional Considerations

It is vitally important to maintain a positive energy balance via adequate caloric intake in pets with cancer so they do not begin to utilize glycogen stores, adipose tissue and dietary protein to compensate. The simplest way to increase the energy density of the food, and thus calories, is to add fat. It has been suggested that fat be 25-40% of the dry matter content of the food in pets with cancer (Saker 2010). An exception is pets with known fat sensitivities, such as pancreatitis or hyperlipidemia, who should be managed with lower-fat foods.

Protein and L-Carnitine

Because cats and dogs do not have storage reserves of protein, any physiological state that results in a negative nitrogen balance causes a loss of normal functions performed by protein. Protein malnutrition may negatively affect the immune system, gastrointestinal (GI) function and other protein-dependent processes. Loss of lean mass, a late sign of protein malnutrition, usually is attributed to increased turnover of protein induced by cancer cells. However, other nutrient deficiencies can contribute to decreased muscle mass. One such nutrient is carnitine, which has been shown to be deficient in people with advanced cancer (Cruciani 2007).

Nutritional Considerations

Offering food with increased amounts of highly digestible protein is a logical choice for pets with cancer (Wakshlag 2019). This provides amino acids that may be utilized to help blunt nitrogen losses attributable to metabolism changes induced by cancer and its management. Recommended levels of protein in pets with cancer are 30-45% (dry matter) for dogs and 35-45% (dry matter) for cats, except for pets with kidney disease and some liver diseases (Saker 2014). In addition to the absolute amount of amino acids available in the food, the correct balance is also needed to promote efficient protein synthesis. Other nutrients, such as l-carnitine, may help to spare lean muscle mass by promoting fat metabolism and reducing protein turnover (Varney 2020). Finally, in order for adequate amounts of high-quality protein and balanced amino acids to support muscle mass, a positive energy balance must be maintained. Therefore, ensuring adequate caloric intake is still the most important aspect of nutritional support for pets with cancer.

Carbohydrates

Because of metabolic alterations in cancer patients (e.g., increased lactate, insulin resistance), it has been suggested that foods for pets with cancer should contain less than 25% digestible carbohydrates (Saker 2010, 2014). This is based on data from dogs with specific cancers and treatment regimens, and the assumption that the Warburg Effect (where cancer cells consume glucose and produce lactate) is present, which is not true for all tumor types (Potter 2016). Furthermore, it has been difficult to prove that limiting dietary carbohydrates slows tumor growth even in those cancers that display the Warburg Effect.

Nutritional Considerations

Because no ideal carbohydrate level has been established, and the potential for insulin resistance exists, it seems reasonable that a moderate level of carbohydrates (20-30% of dry matter for cats, 25-35% of dry matter for dogs) would be acceptable in a food supporting pets with cancer. Because pets with cancer may have difficulty digesting key nutrients (due to cancer or cancer treatments), providing foods with highly digestible macronutrients (including carbohydrates) may be helpful.

Omega-3 Fatty Acids

Potential beneficial effects of long-chain omega-3 fatty acids such as eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) in pets with cancer include preserving lean muscle and helping decrease inflammation that occurs as part of the pathogenesis of cancer (Saker 2010, Tanner 2008). The limited studies in pets with cancer suggest a positive benefit to feeding long-chain omega-3 fatty acids.

Nutritional Considerations

Based on available information, it seems reasonable to include omega-3 fatty acids (EPA, DHA) in foods for pets with cancer. This can be accomplished by using marine oils and other ingredients at a moderate ratio of omega-6 to omega-3 (ranging from 3:1 to 5:1).

Prebiotics

Pets with cancer may develop GI signs (e.g., diarrhea or constipation) that result from the cancer, its treatment or the lack of appropriate nutrient support for the microbes in the lower GI tract. Cancer treatment in people has been shown to cause gut dysbiosis (Deleemans 2021). Similarly, dogs with lymphoma have been shown to have alterations in fecal microbiota as a result of cancer (Gavazza 2018).

Nutritional Considerations

While there are no consensus recommendations for the amount or type of prebiotic fibers to provide to pets with cancer, recent research has identified prebiotics that are beneficial and can help manage diarrhea in pets (Jackson 2019). For cancer, it seems reasonable that a mix of soluble (fermentable) and insoluble (non-fermentable)

fibers in moderate levels may provide the necessary variety needed by the complex ecosystem within the GI tract to help promote a healthy microflora and optimize stool quality.

Evaluation of Cancer Patients

A nutritional assessment should be performed as a baseline at the initial diagnosis of cancer and at each visit to detect changes in the pet's condition and the need for adjustments in the nutritional plan. The whole process can be done very quickly, and much of the information can be collected by the veterinary technician or nurse prior to evaluation by the veterinarian. Engaging with pet parents about nutrition helps build relationships between them and the veterinary healthcare team. There are excellent online resources that include descriptions of a nutritional assessment **(Box 1)**, practical tips and checklists for having nutritional conversations with pet parents, and how to make a specific nutritional recommendation (AAHA 2021, WSAVA 2022).

Providing Nutritional Guidance for Pet Parents

People with pets who have cancer are usually engaged and motivated to do what's best for their pet. Even though they often consult many resources to learn and understand the options for their pet, they highly value advice and guidance from the veterinary healthcare team. In one survey of people whose pets had cancer, 96% said they trusted their veterinarian's advice regarding their pet's healthcare and 79% indicated the same trust regarding nutritional advice (Rajagopaul 2016). In the same survey, 100% believed nutrition played an important role in their pet's health and 85% said they would purchase a conventional pet food that met their pet's medical needs (Rajagopaul 2016).

Because of the interest of pet parents and the importance of proper nutrition for pets with cancer, the veterinary healthcare team is in an ideal position to proactively engage in a nutrition conversation with pet parents at the time of a cancer diagnosis. This is an opportunity to discuss/understand their goals (which almost always relate to quality and length of life), answer their questions, inform them about credible online sources of information and make a specific nutritional recommendation. Each nutrition support plan should be developed with specific goals in mind and tailored to meet the needs of each pet. General nutritional goals for pets with cancer include preserving lean muscle, minimizing metabolic and GI intolerance to food, and optimizing quality of life (Saker 2014). It is recommended to begin nutritional support at the time of a cancer diagnosis and continue past remission for at least 6 to 9 months or longer (Saker 2014). The reasoning is that residual alterations in nutrient metabolism associated with the presence of cancer cells persist for a varying period past treatment.

Conclusions

To increase the likelihood of food acceptance and long-term consumption, it is important to recommend a complete and balanced food with exceptional taste that meets the nutritional needs of each pet with cancer. Veterinary therapeutic foods have been recommended for pets with cancer instead of over-the-counter foods because therapeutic foods have more accessible nutrient information for the veterinary healthcare team, the digestibility of key nutrients is usually higher, they may be appropriate for GI issues resulting from cancer treatment or concurrent diseases, and some contain specific nutrients or functional ingredients that may be beneficial, such as EPA, DHA and fiber (Raditic 2021).

Box 1. **Key Components of a Nutritional Assessment (AAHA 2021)**

- Physical examination and diagnostic testing (as appropriate for the pet's life stage/disease)
- Complete food history, documenting everything the pet eats from the time it wakes up to the time it goes to bed, including any snacks or treats used in training
- Eating enthusiasm or changes in eating habits
- Daily/weekly exercise levels and activities
- Information on home environment factors:
  - How food is provided (meals or free feeding)
  - Form of food (dry, wet or a combination)
  - Possible confounding factors related to other pets or people in the home
- Current body weight, body condition score, muscle condition score and changes over time
- Calculation of a pet's specific maintenance energy requirement (bit.ly/3mgxZVe)

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References

American Animal Hospital Association (AAHA), 2016 AAHA Oncology Guidelines for Dogs and Cats. https://www.aaha.org/aaha-guidelines/oncology-configuration/oncology-guidelines/, accessed July 2022.

American Animal Hospital Association (AAHA), Nutrition is Vital (Elements of a Nutritional Assessment), 2021. https://www.aaha.org/practice-resources/pet-health-resources/nutritional-resources/, accessed July 2022.

Baez, JL, et al. A prospective investigation of the prevalence and prognostic significance of weight loss and changes in body condition in feline cancer patients. J Feline Med Surg 2007;9:411–417.

Cruciani, RA, et al. L-carnitine supplementation in patients with advanced cancer and carnitine deficiency: a double-blind, placebo-controlled study. J Pain Symptom Manage 2009;37(4):622-31.

Deleemans, JM, et al. The use of prebiotic and probiotic interventions for treating gastrointestinal and psychosocial health symptoms in cancer patients and survivors: a systematic review. Integr Cancer Ther 2021. https://doi.org/10.1177/15347354211061733.

Gavazza, A, et al. Faecal microbiota in dogs with multicentric lymphoma. Vet Comp Oncol 2018;16(1):E169-E175.

Jackson, MI and Jewell, DE. Balance of saccharolysis and proteolysis underpins improvements in stool quality induced by adding a fiber bundle containing bound polyphenols to either hydrolyzed meat or grain-rich foods. Gut Microbes 2019;10(3):298-320.

Michel, KE, et al. Evaluation of body condition and weight loss in dogs presented to a veterinary oncology service. J Vet Intern Med 2004;18:692-5.

Potter, M, et al. The Warburg effect: 80 years on. Biochem Soc Trans 2016;44(5):1499-1505.

Raditic, D and Gaylord, L. Nutrition for small animal cancer patients. Today's Veterinary Practice 2021;January-February:16-21. https://todaysveterinarypractice.com/nutrition/nutrition-for-small-animal-cancer-patients/, accessed July 2022.

Rajagopaul, S, et al. Owners' attitudes and practices regarding nutrition of dogs diagnosed with cancer presenting at a referral oncology service in Ontario, Canada. J Sm Anim Pract 2016;57(9):484-9.

Romano, FR, et al. Association between body condition score and cancer prognosis in dogs with lymphoma and osteosarcoma. J Vet Intern Med 2016;30(4):1179-86.

Saker, KE and Selting, KA. Cancer. In: Hand, M. S., et al: Small Animal Clinical Nutrition, 5th ed, 2010:587-607.

Saker, KE. Practical approaches to feeding the cancer patient, Today's Veterinary Practice July/August 2014. https://todaysveterinarypractice.com/nutrition/acvn-nutrition-notes-practical-approaches-to-feeding-the-cancer-patient/, accessed July 2022.

Saker, KE. Nutritional concerns for cancer, cachexia, frailty, and sarcopenia in canine and feline pets. Vet Clin North Am Small Anim Pract 2021;51(3):729-744.

Tanner, AE, et al. Cell proliferation of feline and human breast cancer cell types is inhibited by pomegranate juice. J Anim Physiol Anim Nutr 2008;92(2):221–3.

Varney, JL, et al. L-carnitine metabolism, protein turnover and energy expenditure in supplemented and exercised Labrador Retrievers. J Anim Physiol Anim Nutr (Berl) 2020;104(5):1540-1550.

Wakshlag, J. Supportive care for the patient with cancer. In: Vail, D. M., et al. Withrow and MacEwan's Small Animal Clinical Oncology, 6th ed Elsevier, 2019:286-329.

World Small Animal Veterinary Association (WSAVA), Veterinary Oncology Glossary, 2021. https://wsava.org/wp-content/uploads/2021/11/Glossary-WOW-13.11.2021.pdf, accessed July 2022.

World Small Animal Veterinary Association (WSAVA), Global Nutrition Guidelines, 2022. https://wsava.org/global-guidelines/global-nutrition-guidelines/, accessed July 2022.