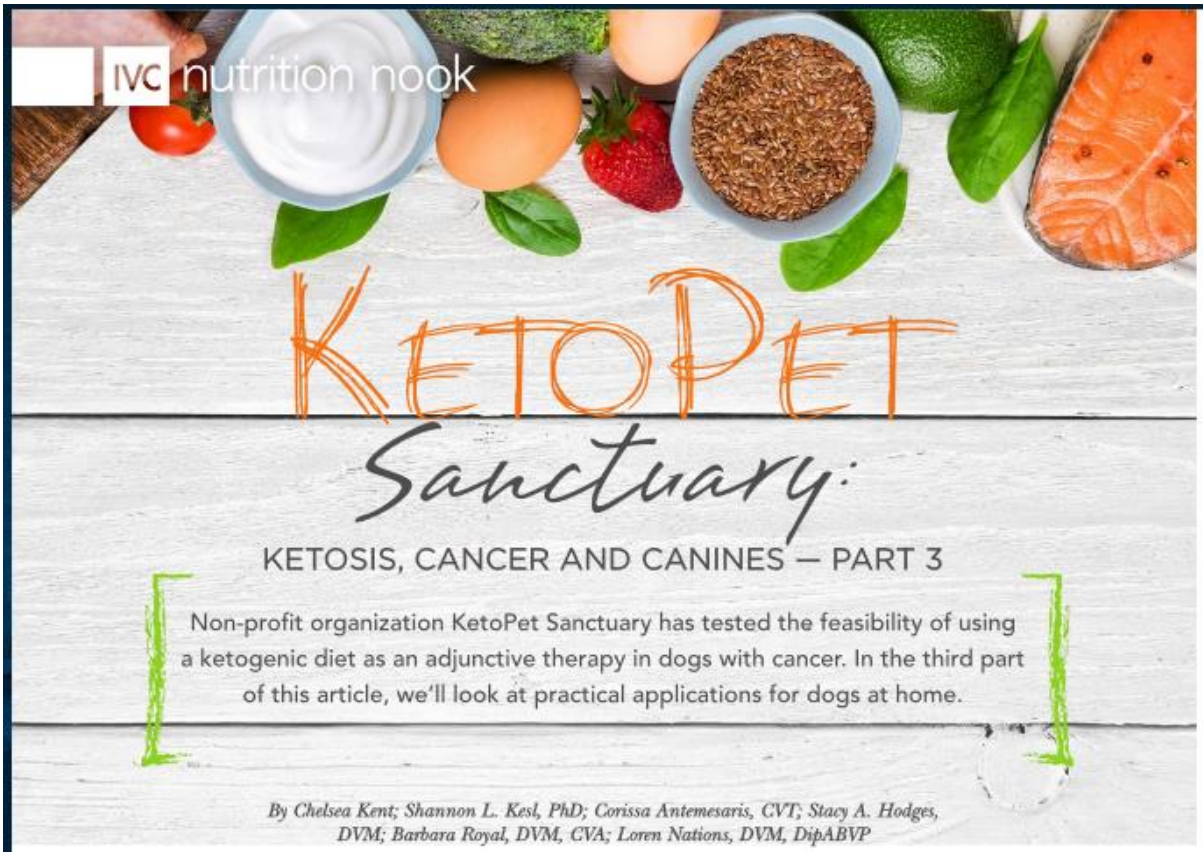

KetoPet Sanctuary:

KETOSIS, CANCER AND CANINES — PART 3

Non-profit organization KetoPet Sanctuary has tested the feasibility of using a ketogenic diet as an adjunctive therapy in dogs with cancer. In the third part of this article, we'll look at practical applications for dogs at home.

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KetoPet Sanctuary (KPS) has demonstrated the utility of a canine diet that induces a state of nutritional ketosis. When strictly adhered to and monitored, a ketogenic diet (KetoDiet) has been shown to increase the efficacy of standard of care and adjunctive treatments, thus prolonging survival and quality of life in canine cancer patients. While the stringently-controlled conditions at KPS cannot be replicated in a home environment, nutritional ketosis can be achieved and monitored by committed dog owners. In combination with integrative therapies, results that align with those at KPS can often be achieved.

EMPOWERING THE DOG PARENT

Ketosis is a nutritionally-induced metabolic state in which the body preferentially uses ketone bodies as energy. Ketosis is achieved by fasting, caloric control, and/or control of macronutrient ratios (high fat/adequate protein/low carbohydrate). In the overwhelming fight for survival during cancer, diet is an accessible tool available to all pet owners. No one can fully control the cause or outcome, but dog parents can control what they put in their pets' mouths, which can provide them with a sense of empowerment in the care of their canines.

NUTRITIONAL KETOSIS AND CHRONIC DISEASE

Modern dogs are burdened with a variety of physiological and metabolic challenges due to the dramatic difference between the nutritive profiles of rendered, high glycemic-response kibbles and any possible, accessible nutrient profile found in nature.[1] High-heat processed feeds (kibble and canned) are contaminated with heavy metals,[2] excessive levels of minerals,[3,4] fat soluble vitamins,[5] anti-nutrients,[6] carbohydrate levels that inhibit ketosis,[7] advanced glycation end products (AGEs)[8] and pathogens.[9] A shift to fresh low-carbohydrate food decreases exposure to these toxins and metabolically-damaging macronutrient ratios.

With and without additional therapies, nutritional ketosis has resulted in recovery from chronic skin issues, ear infections, odors (mouth and stool), chronic pancreatitis/hyperlipidemia,

ocular discharge, chronic bladder stones, UTIs, obesity, arthritis and food allergies (as confirmed with allergy testing), as well as increased energy and mobility. Dr. Barbara Royal reports an 80% success rate in many of these conditions. However, treatment plans that depend solely on a metabolic component have not been found to be significantly successful in the treatment of cancer. Rather, ketosis has been shown to improve the efficacy of standard of care and integrative oncology therapies while also providing protective benefits to healthy cells.

Dr. Royal has experienced resolution of recurring mast cell skin tumors, hemangiosarcomas, bladder cancers and osteosarcomas in cancer patients that have dramatically exceeded their expected expiration dates, as well as shrinking and stabilizing of lymphoma (perhaps the most

The importance of TESTING

In order to determine if ketosis has been achieved, it is important to remember that ketone and glucose testing is vital. Successes and failures cannot be fully understood without the data obtained through testing. Most crucially, results acquired from testing allow veterinarians and owners to make educated, not theoretical, decisions on how to modify canine patient diets to attain necessary metabolic changes. Even with veterinary support and education, most pet owners do not test with regularity, if at all. Like all tools, the KetoDiet is only effective when used correctly by applying proper macronutrient ratios in accurate amounts, and then validating results via testing.

PRIVATE PRACTICE CASE #1

Breed: Pitbull

Age: 5

Sex: Male

Diagnosia: Squamous cell carcinoma of the ventral abdomen

Standard of care: Surgery, Palladia, Piroxicam, Metronidazole and Famotidine

Adjuvant therapies: KetoDiet, HBOT, vitamin B12

Additional medical issues: dry eye, treated with Tacrolimus, chronic skin allergies, treated with Atopica

Date of diagnosis	Date of KPS entry	Prognosis	Survival time
Feb 26/16	Apr 21/16	730 days with chemo	834 days; deceased June 8/18

Average blood glucose	Average blood ketone
69 mg/dL	0.65 mM

Case #1 was originally in the KetoPet program but was categorized as "Did Not Complete" due to missing milestones that were necessary in order to complete the program. While in the Ketopet program, the lesions on and around the dog's prepuce reoccurred approximately every three months and were surgically removed with CO2 laser. Surgical standard of care in conjunction with his KD and HBOT kept the lesions under control for 19 months.

In October 2017, due to a reoccurrence of a prepuce lesion (2"x1.7"), Palladia, Piroxicam, Famotidine (2x/day) and vitamin B12 were initiated.

By December 2017, the tumor had decreased in size to 1"x1"; however, the patient experienced a loss of appetite and hemorrhagic gastroenteritis, so the Palladia was discontinued.

He subsequently experienced a recurrence of the mass in the bulbus of the penis and the urethra. In February 2018, he underwent penis amputation and perineal urethrostomy, followed by a regimen of Palladia and Piroxicam until May 2018. That month, the SCC had returned and metastasized to the lymph nodes. On June 8, 2018, the dog was euthanized in the presence of his loving family.

PRIVATE PRACTICE CASE #2

Breed: Mixed breed/Rottweiler

Age: 8

Sex: Male

Diagnosis: Atrial hemangiosarcoma

Standard of care: Doxorubicin, Pericardiocentesis, Metronidazole, Cerenia, Mirtazapine, Ciprofloxacin, Rimadyl, Famotidine

Adjuvant therapies: KetoDiet, HBOT, turkey tail mushroom extract, Yunnan Baiyao, mistletoe (*Viscum album*) extract, Carprofen, Dichloroacetate, Poly-MVA

Additional medical issues: Thrombocytopenia

Date of diagnosis	Start of KetoDiet	Prognosis	Survival time
Sept 26/17	Oct 2/17	66 days with chemo	132 days; deceased Feb 5/18

Average blood glucose	Average blood ketone
80 mg/dL	0.03 mM

Case #2 presented to the clinic on September 26, 2017. He was in respiratory distress caused by pericardial effusion. The emergency team performed a pericardiocentesis to stabilize him, at which time an atrial mass was discovered. Yunnan Baiyao was used to control bleeding while he was transferred to the oncology team. Chemotherapy was initiated on September 28 in conjunction with HBOT and mistletoe subcutaneous injections. The patient experienced GI side effects to Doxorubicin, which resolved with supportive care including IV fluid therapy, Metronidazole and Cerenia.

Once side effects resolved, the ketogenic diet was introduced along with I'm-Yunity. The patient was monitored very closely, with frequent cardiac ultrasound imaging. He responded well, although continued to require serial pericardial taps due to spontaneous bleeding and effusion. He received his fifth and final treatment of Doxorubicin on December 28.

The patient presented on January 9, 2018 with lethargy and a painful swelling of the right rear limb. Radiographic and ultrasonic images indicated a fluid-filled mass, which was suspected to be metastasis. Mistletoe IV infusions were introduced, followed by Poly-MVA and DCA infusions. The patient declined in health status on February 2 and was euthanized at home with his family on February 5, 2018.

notably responsive cancer at KPS) with nearly two years of no progression when chemo wasn't tolerated. She has also experienced resolution of severe vaccine-induced intractable seizures (uncontrolled by general practice, critical care and neurology veterinarians) after implementing a KetoDiet.

DISCUSSION

When properly executed and monitored, inducing metabolic ketosis and applying adjunctive integrative therapies with standard of care treatments can result in increased longevity and quality of life when compared to standard of care alone. The positive clinical responses veterinarians have seen, and the intriguing research on ketogenic diets for cancer in human literature, warrant additional investigation into this non-toxic and relatively inexpensive holistic therapy for canine cancer patients.

In addition, open-minded veterinarians are trying other adjuvant metabolic therapies (see sidebar on page 54). If you are seeking to incorporate integrative therapies with the metabolic component of nutritional ketosis into your treatment plan, these are the tools to research and consider.

Ultimately, the most important factors for success are knowledge, effort and compliance. As with us, the health of our canine companions can be transformed by the food they are fed. The transition from cereal (kibble) or canned diets to fresh feeding (a KetoDiet) can initially seem daunting. In short order, however, it will become habit and seem simple. The KetoDiet can improve a dog's health on its own, or in conjunction with other therapies, in the treatment of cancer, making the benefits wide-ranging and priceless. Additional resources on how to implement

Continued on page 54.

PRIVATE PRACTICE CASE #3

Breed: German Shepherd

Age: 6

Sex: Female

Diagnosis: High grade lymphoma

Standard of care: CHOP 25-week protocol, Metronidazole, Cerenia, Gabapentin, Tramadol, Dasuquin

Adjuvant therapies: KetoDiet, HBOT, mistletoe (*Viscum album*) extract, Doxycycline

Additional medical issues: Pancreatitis, ruptured cranial cruciate ligament

Date of diagnosis	Start of KetoDiet
Apr 2017	May 2017
Prognosis	**Survival time**
12 months with CHOP	(as of Jul 1/19) 27 months, in remission
Average blood glucose	**Average blood ketone**
58 mg/dL	0.25 mM

Case #3 presented in April 2017 with generalized peripheral lymphadenopathy that had been ongoing for one month. Lymph node aspirates were obtained during a previous visit to her regular vet; the cytology report confirmed high grade lymphoma. The patient was lethargic and hyporexic. HBOT and CHOP were initiated during her first visit. She responded very well to chemotherapy. Her lymph nodes decreased in size, and her appetite returned to normal in the first week, so CHOP was continued.

In June 2017, as she arrived at the oncology department for her scheduled chemotherapy, she vomited in the lobby. She was lethargic, "punky" and dehydrated. The medical workup revealed gastrointestinal inflammation and mild pancreatitis. The clients explained that she was very bored with her bed rest, which was due to a ruptured cranial cruciate ligament. In her frustration, she broke into the pantry and ate an entire bag of cat food. The combination of her KetoDiet plus the large bolus of carbohydrates taxed her pancreas. Her chemotherapy treatment was rescheduled to give her time to recover from the dietary indiscretion.

By August, she was completely transitioned to a strict ketogenic diet. The clients started daily leash walks for metabolic conditioning as they fully committed to the metabolic therapy protocol. In the months that followed, the dog's weight went from 102 pounds (BCS 8/9) to 86 pounds (BCS 5/9). This weight loss helped maintain comfort for her CCL injury. She completed CHOP in October 2017 and initiated mistletoe therapy in January 2018. As of July 2019, she remains in remission.

Continued from page 52.

a KetoDiet for canines can be found in *IVC Journal* (Volume 9, Issues 2 and 3 — Parts 1 and 2 of this article), the KetoPet website, and the KetoPet Group and Ketogenic Dog Group on Facebook.[29, 30]

The authors want to acknowledge the veterinarians, dog parents and advocates who have shared the benefits of KetoDiets for many disease states. To the dog parents of our cases, thank you for sharing your stories.

ADJUVANT THERAPIES TO CONSIDER USING WITH KETODIETS FOR CANINE CANCERS

- Mistletoe extract (VAE)[11]
- 3-Bromopyruvate (3BP)[12]
- Metformin[13]
- Atorvastatin[14]
- Doxycycline[15]
- Mebendazole[16]
- Dichloroacetate (DCA)[17]
- Poly-MVA[18]
- Cox-2 inhibitors[19]
- Berberine, curcumin (turmeric root isolate), resveratrol and nutraceuticals[20]
- Turkey tail mushroom[21]
- Yunnan Baiyao[22]
- EGCG (Epigallocatechin gallate)[23]
- Artesunate/Artemisinin[24]
- CBD/THC[25]
- Hyperbaric oxygen therapy (HBOT)[26]
- High dose IV vitamin C (HD IV VC)[27]infusions
- CO2 laser[28]

PRIVATE PRACTICE CASE #4

Breed: Golden Retriever

Age: 9

Sex: Male

Diagnosis: B-cell splenic lymphoma with mediastinal lymphadenopathy

Standard of care: CHOP 25-week protocol, Metronidazole, Cerenia, Mirtazapine, Famotidine

Adjuvant therapies: KetoDiet, HBOT, IV vitamin C, Metformin, Atorvastatin, Doxycycline, Mebendazole, Carprofen, Novox

Additional medical issues: Atopy

Date of diagnosis	Start of KetoDiet
Feb 2018	Mar 2018
Prognosis	**Survival time**
6 to 8 months with CHOP	(as of Jul 1/19) 17 months, in remission
Average blood glucose	**Average blood ketone**
41 mg/dL	0.25 mM

Case #4 presented in February 2018 with an acute history of lethargy and inappetence. The medical workup revealed diffuse infiltrative splenic lesions. Ultrasound-guided splenic aspirates confirmed a lymphoma diagnosis, and PARR analysis determined B-cell. The client elected CHOP protocol, which was initiated on the day of diagnosis. The ketogenic diet was introduced in March, although the transition was not fully implemented until June due to compliance issues.

The patient experienced a good remission as a result of CHOP, although he did initially experience some gastrointestinal side effects to chemotherapy agents. Chemotherapy doses were lowered, and his family adhered more strictly to the ketogenic diet. Once it was fully implemented, his average blood glucose level decreased from 111 mg/dL to 41 mg/dL; blood ketone measurements remained relatively the same at 0.2 versus 0.25. Mistletoe therapy was initiated two weeks before the last CHOP chemotherapy treatment. The KetoDiet and mistletoe injections were continued after CHOP was finished.

In October (one month after chemotherapy), the dog's submandibular lymph nodes became mildly enlarged; however, he remained asymptomatic and all medical measuring parameters remained normal. The metabolic protocol, inspired by Care Oncology Clinic protocols,[10] was initiated and included Metformin, Mebendazole, Doxycycline, Atorvastatin and Novox. Once the dog was fully adjusted to the metabolic protocol, serial hyperbaric sessions and high dose intravenous vitamin C infusions were initiated.

He remained asymptomatic for several months, but the lymph nodes became further enlarged in February 2019, so rescue chemotherapy was administered. The dog remains in partial remission, enjoying a good quality of life with a combination of chemotherapy and metabolic therapies.

References available online at *IVCJournal.com*