

Progress in Canine Lymphoma Research

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Canine lymphoma is cancer of the immune cells. It is the most common canine cancer and resembles what we call non-Hodgkin lymphoma in people. Lymphoma is usually multicentric, meaning that multiple lymph nodes and organs are affected at the time of diagnosis. If immune cells in the bone marrow or bloodstream are affected, it is called leukemia. While lymphoma has been considered a single disease state, with advancing technology and increased understanding, we now recognize more than thirty different lymphoma sub-types.



Lymphoma is classified based on whether it affects B cells or T cells (two types of immune cells with different jobs) plus other molecular characteristics. Since each lymphoma sub-type is influenced by its unique genetic characteristics and molecular pathways, it makes sense that there is wide variation in the way dogs with lymphoma respond to treatment. Only once we understand the particular features of each lymphoma sub-type can we develop and implement targeted treatments with a better chance for success. Since its founding in 1995, the AKC Canine Health Foundation (CHF) and its donors have been at the forefront of canine lymphoma research, investing over \$2.6 million in 45 canine health research studies resulting in more than 35 peer-reviewed scientific publications on this disease.

CHF-funded researchers at North Carolina State University greatly improved our understanding of the genetic characteristics of canine lymphoma by studying copy number changes. Normal dog cells have two copies of each gene. However, cancerous cells can have zero to numerous copies of various genes - known as copy number aberrations. Researchers identified specific patterns of copy number aberrations in canine lymphoma that not only correlate with sub-type, but also response to treatment.

At the University of Missouri, Columbia, researchers described the epigenetic characteristics of canine lymphoma in Golden Retrievers. Epigenetics is the study of biochemical processes that alter gene expression without changing the underlying genetic code, such as the addition of methyl groups in a process known as methylation. They identified a methylation pattern unique to diffuse large B cell lymphoma in this breed which can be used to diagnose the disease and predict a dog's risk of developing disease.

CHF-funded researchers have also studied numerous new ways to treat canine lymphoma. Lymphoma stem cells, or tumor-initiating cells, have been described and treatments that kill these cells could prolong remission times or even cure lymphoma. Another promising treatment strategy under investigation for canine and human cancer is adoptive cell therapy. This involves extracting T cells from a patient's blood or tumor tissue, growing large numbers of the T cells in a laboratory (sometimes the T cells are altered to make them more potent or more targeted for a specific type of cancer), and finally injecting them back into the cancer patient.

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CALENDAR OF EVENTS

UPCOMING WEBINARS

Register at akcCHF.org/vetvine.

On Demand - Summer 2020

Canine Chagas Disease - Studies of Naturally Infected Dogs and Kissing Bug Vectors
 Presented by: Sarah Hamer, MS, DVM, PhD, DACVPM (Epidemiology)

On Demand - Fall 2020

Management of Canine Pyometra
 Presented by: Karen Von Dollen, MS, DVM, DACT

It's Our Anniversary!

In 2020, CHF is celebrating its 25th anniversary. Learn more about CHF milestones and achievements at akcCHF.org/25years.

Progress in Canine Lymphoma Research

continued

CHF-funded researchers demonstrated that adoptive cell therapy prolonged survival time in dogs with lymphoma when given in addition to standard chemotherapy and continue to refine the targeting capabilities of these expanded T cells.

Additional treatment targets studied include:

- enzymes that are more numerous inside cancerous lymph nodes compared to healthy lymph nodes,
- aurora kinase – a protein that regulates cell reproduction,
- micro RNA (miRNA) – small pieces of RNA not involved in protein creation that may be unique to the different lymphoma sub-types,
- survivin – a protein in cancer cells that makes them resistant to chemotherapy,
- and signaling pathways that cancer cells use to evade the immune system.

Altering any of these molecules or pathways could slow or stop the growth of cancer cells and lead to remission.

CHF and its donors will continue to find and fund high quality studies that advance our understanding of canine lymphoma and lead to new and better treatments. As we learn more about the similarities between canine and human lymphoma, discoveries made studying one species may benefit both. Learn more and support canine lymphoma research at akcchf.org/lymphomaRPA. 🐾



Check out our Portfolio!

View all of CHF's currently funded canine health research and educational grants in our updated Research Grants Portfolio at akcchf.org/portfolio.

Epilepsy Research Finds MCT Oil May Help Dogs with Hard-To-Treat Cases

By Barbara Fawver

Manager of Pet Influential Communications, Purina

Epilepsy is the most commonly diagnosed chronic neurological disorder in dogs. The cause is idiopathic, or unknown, in nearly 1 of 111 dogs.^{1,2} While some breeds may be predisposed, any breed of dog and mixed breeds may be affected by idiopathic epilepsy, compromising the quality of life for dogs and their owners.³ Sadly, one-third of dogs with epilepsy do not respond adequately to standard anti-seizure drugs and are classified as drug-resistant.³

Investigators at the University of Veterinary Medicine Hanover in Germany and at the Royal Veterinary College of the University of London have been studying dietary therapy supplemented with medium-chain triglyceride (MCT) vegetable oil like Purina Pro Plan Veterinary Diets NC NeuroCare Canine Formula or a commercial MCT oil added to a standard dry kibble diet. The goal has been to learn if MCT oil offers an effective management option for dogs with hard-to-treat epilepsy to reduce the number of seizures and its behavioral comorbidities and to improve the quality of life for affected dogs and their owners.

“Although diet has not traditionally been considered an important part of epilepsy management, these results combined with other findings show that nutrition may play an important role in seizure control,” says Holger Volk, DVM, PHD, PGCAP, DECVN, FHEA, MRCVS, professor of small animal diseases and head of the Department of Small Animal Medicine and Surgery at the University of Veterinary Medicine Hanover. “We are finding that MCT oil offers a promising addition to the epilepsy management tool kit.”

Previous work by the research team had shown that MCT oil can have significant beneficial effects in about half of dogs with drug-resistant epilepsy when included with a dry kibble diet.⁴ They also showed that certain behavioral comorbidities, such as anxiety and attention-deficit/hyperactivity disorder (ADHD)-type clinical signs, improved⁵ on the MCT-enriched diet.

In research funded by the AKC Canine Health Foundation (Grant #02252), the investigators sought to learn if MCT oil added as a supplement to a dog's existing diet could provide similar benefits. A rigorous randomized, double-blinded clinical trial was conducted in which 28 dogs received the MCT oil for three months and a placebo oil for three months. Overall, dogs had significantly fewer seizures during the MCT phase compared to the placebo phase and an improved owner-reported quality of life.⁶

“New therapies are urgently needed to improve the quality of life of dogs affected by epilepsy and their owners, and the results of this study offer a promising addition to other methods commonly used to treat

canine epilepsy,” Dr. Volk says. “This AKC Canine Health Foundation-funded research has also provided new insights to the positive effects of MCT on cognition in dogs with epilepsy.”

¹ Kearsley-Fleet L, O’Neill DG, Volk HA, et al. Prevalence and Risk Factors for Canine Epilepsy of Unknown Origin in the U.K. *Veterinary Record*. 2013;172(13):338.

² Heske L, Nødtvedt A, Jäderlund KH, et al. A Cohort Study of Epilepsy Among 665,000 Insured Dogs: Incidence, Mortality and Survival After Diagnosis. *Veterinary Journal*. 2014;202(3):471-476.

³ Wessman A, Volk HA, Packer RMA, et al. Quality-of-Life Aspects in Idiopathic Epilepsy in Dogs. *Veterinary Record*. 2016.

⁴ Law TH, Davies ESS, Pan Y, et al. A Randomized Trial of a Medium-Chain TAG Diet as Treatment for Dogs with Idiopathic Epilepsy. *British Journal of Nutrition*. 2015;114(09):1438-1447.

⁵ Packer RMA, Law TH, Davies E, et al. Effects of a Ketogenic Diet on ADHD-Like Behavior in Dogs with Idiopathic Epilepsy. *Epilepsy & Behavior*. 2016;55:62-68. ⁶

Berk BA, Law TH, Packer RMA, et al. A Multicenter Randomized Controlled Trial of Medium-Chain Triglyceride Dietary Supplement of Epilepsy in Dogs. *Journal of Veterinary Internal Medicine*. April 2020. 🐾

Keep up with us!

Stay up to date with the latest canine health information and research. Sign up for our monthly e-newsletter at akcCHF.org/registration.

2020 Theriogenology Residents



AMERICAN
KENNEL CLUB™



theriogenology foundation
The Future of Animal Reproduction

The AKC/AKCCHF/TF Small Animal Theriogenology Residency Program is a collaboration between the American Kennel Club (AKC), the AKC Canine Health Foundation (AKC CHF), and the Theriogenology Foundation (TF) to increase the number of trained practitioners in companion animal theriogenology and clinical genetics. Theriogenology is the branch of veterinary medicine concerned with reproduction, including the physiology and pathology of male and female reproductive systems, and the clinical practice of veterinary obstetrics, gynecology, and andrology. Learn more about this educational grant program at akcCHF.org/therio.



Joanna Koilpillai, BVSc & AH (CHF Grant O2666-E)

Residency Coordinator: Marco A. Coutinho da Silva, DVM, PhD

The Ohio State University

Grant Period: 7/1/2020 – 6/30/2023

Dr. Koilpillai earned her veterinary degree from Madras Veterinary College in Chennai, India. She completed a small animal internship at a private hospital in Florida before starting her residency at The Ohio State University. She has experience working with small animals, cattle, and horses in India and the US. Her interests are small animal medicine and mixed animal reproductive medicine.

Kelsey Martin, DVM (CHF Grant O2668-E)

Residency Coordinator: Fiona Hollinshead, BVSc, PhD, DACT

Colorado State University

Grant Period: 7/1/2020 – 6/30/2023

Dr. Martin completed her veterinary degree at Colorado State University after receiving her Bachelor of Science degree from the University of Louisiana-Lafayette. She grew up surrounded by herding dogs on a Colorado cattle ranch and helped raise and train service dogs in high school. She hopes to work on species conservation, translational medicine, and working dog health and reproduction.



MISSION: The mission of the American Kennel Club Canine Health Foundation, Inc. is to advance the health of all dogs and their owners by funding scientific research and supporting the dissemination of health information to prevent, treat and cure canine disease.

Donor Spotlight

Golden Retriever Foundation

The Golden Retriever Foundation® (GRF) was established as a non-profit organization by the Golden Retriever Club of America in 1997 to fund projects that further the health and welfare of Golden Retrievers. Since then, GRF and its donors have collaborated with CHF to invest over \$2 million in canine health research and educational grants. They have demonstrated a commitment to supporting research for diseases more common in Golden Retrievers, such as pigmentary uveitis and hemangiosarcoma, but also support research into diseases that affect all dogs, such as tick-borne disease, epilepsy, mast cell tumors, and more. GRF's recent sponsorship of the AKC/AKCCHF/TF Small Animal Theriogenology Residency Program shows their dedication to ensuring that trained specialists and researchers are available for the general and reproductive care of current and future generations of dogs.

"The Golden Retriever Foundation® is very grateful for the support and enthusiasm shown by the Golden Retriever community in creating a healthier future for dogs," states John Cotter, GRF President. "We know that working with the AKC Canine Health Foundation allows our investments to have a greater impact on the health of all dogs as the resources of other breed clubs and health foundations are combined with our own. CHF processes ensure that high-quality research is completed with integrity and accountability. We look forward to continuing our collaboration with CHF to improve the health of all dogs."



Recent CHF Grant Highlights

Grant 02723: Scientific and Clinical Assessment of Fecal Microbiota Transplant in Obese Dogs: SLIM Study

Principal Investigator: Jenessa Winston, DVM, PhD; The Ohio State University

A clinical trial to assess if modification of the intestinal microbiome can help treat canine obesity.

Grant 02709: Identification of Genetic Risk Factors Contributing to Gastrointestinal Motility Disorders

Principal Investigator: Leigh Anne Clark, PhD; Clemson University

Continued study of the genes that underlie megaesophagus and bloat may explain the mode of inheritance for these disorders and help create a genetic test to reduce their incidence in dogs.

Grant 02694: Investigation on the Molecular Crosstalk between Canine Atopic Skin and Microbes: Unraveling Potential Pathomechanisms for Chronic Recurrent Skin Infections

Principal Investigator: Domenico Santoro, DVM, MS, DrSc, PhD; University of Florida

Understanding which genes are activated in canine skin cells and the bacteria that stick to them will help design treatments for skin infection in allergic dogs.

See our full research grants portfolio at akcchf.org/research.

Introducing the "Clinical Corner"

CHF understands that veterinary professionals are busy caring for patients and working with clients. To help them stay up to date with the latest CHF-funded research grants and outcomes, CHF will collect and summarize information that is directly applicable to clinical practice in the Clinical Corner. Check it out, plus other resources for veterinary professionals, at akcchf.org/veterinary.



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