

AKC CANINE HEALTH FOUNDATION CELEBRATES 25 YEARS

PHOTO: NOLAN CONLEY



Carillon Bedlington Terrier breeder Lucy Heyman

Celebrating its 25-year anniversary, the AKC Canine Health Foundation stands proudly today as a radiant leader of canine health research. This nonprofit organization holds tenure as the largest funder in the world of health research exclusively for dogs. Its pioneering spirit is alive today, and the future promises good things are coming.

When Carillon Bedlington Terrier breeder Lucy Heyman bred her first litter of the rare lamblike breed in 1981, copper toxicosis affected 75 percent of the breed. The fatal inherited disease was a thorn in her side that ignited her passion and led her to build her breeding program on health advocacy.

"I endured my share of losses due to copper toxicosis," says Heyman, an AKC Platinum Breeder of Merit and AKC delegate for the Bedlington Terrier Club of America.

Copper concentrations in affected Bedlingtons could be more than 15 times the normal amount, resulting in severe liver disease. Without treatment, most dogs died at 3 to 7 years of age. When geneticists at Michigan State University and the University of Michigan began studying

copper toxicosis in Bedlingtons in 1989, Heyman gathered blood samples and pedigree information from anyone who would contribute to the cause.

Using DNA markers generated by sequencing many parts of the canine genome in a first-of-its-kind study, the researchers identified a genetic marker linked closely to the mutation. The discovery led to a linked marker test for the autosomal recessive disorder. Vilma Yuzbasiyan-Gurkan, PhD, now professor of microbiology and molecular genetics and small animal clinical sciences at Michigan State, initiated the study with geneticist George Brewer, MD, of the University of Michigan.

The test empowered breeders to identify unaffected, affected and carrier dogs. They could selectively breed away from producing affected dogs. Importantly, they could breed quality carriers to non-carrier dogs and then replace the carrier parent with a quality non-carrier offspring in one or two generations. This breeding strategy maintained breed quality without producing affected dogs and helped to promote genetic diversity by reducing the risk of a genetic bottleneck and the proliferation of deleterious genes caused by a reduction in breed population size.

In 1995, Carillon produced the first Bedlington Terrier identified as a non-carrier of copper toxicosis. CH Carillon Fuzzy



The AKC Canine Health Foundation aims to advance the health of all dogs and their owners.

Logic came from a selective breeding in which Heyman used the linked marker test.

At the inaugural AKC Canine Health Foundation National Parent Club Canine Health Conference in 1997 in St. Louis, Heyman met the lead investigators, including Dr. Yuzbasiyan-Gurkan, with whom she had corresponded frequently over the years. "It was wonderful to talk with them in person after many phone calls," Heyman says.

In 2006, a direct DNA test became available for copper toxicosis in Bedlington Terriers. Funded by the AKC Canine Health Foundation (CHF), researchers at the Animal Health Trust in the United Kingdom identified a deletion mutation eliminating a major section of the copper metabolism gene, *COMMD1*.

Today, fewer than 5 percent of Bedlington Terriers are affected by copper toxicosis, Heyman estimates. Copper toxicosis in Bedlingtons is a success story as told by the dramatic reduction in dogs dying early from liver disease.

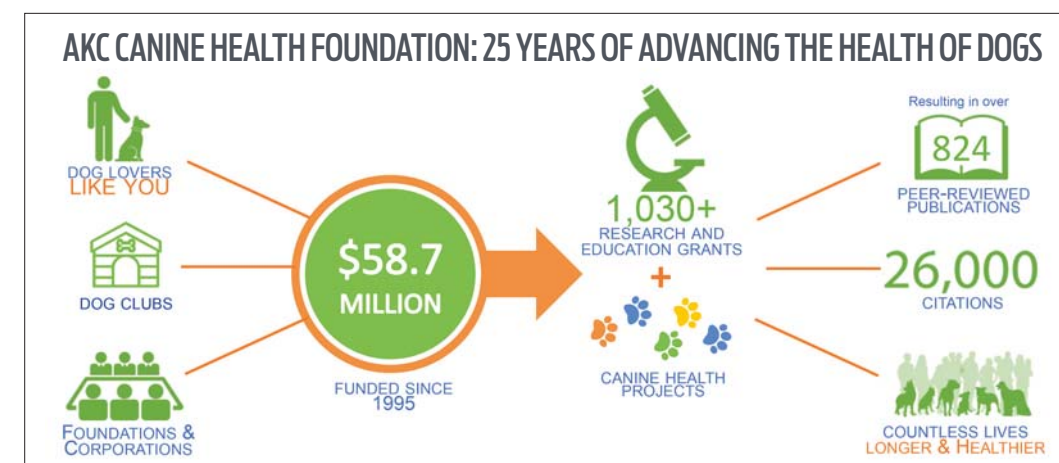
Founded by the American Kennel Club in 1995 with a \$1 million grant, the AKC Canine Health Foundation in 2020 is providing \$3.29 million in funding. This supports 23 program areas, ranging from blood disorders, dermatology and allergic diseases to infectious diseases, oncology and ophthalmology.

Altogether, the AKC Canine Health Foundation has provided over \$58.7 million in support of more than 1,030 research and educational grants. Over \$25 million has come from AKC donations. CHF aims to advance the health of all dogs and their owners, a mission that resonates universally with dog lovers and aids fundraising efforts. The mantra is to prevent, treat and cure canine diseases.

"The AKC Canine Health Foundation has been integral to the evolution of canine health, including mapping the canine genome and developments in canine cancer, tick-borne diseases and many other ailments that affect our dogs," says Dennis B. Sprung, President and CEO of the American Kennel Club. "This research has led to important developments that contribute to the health and well-being of dogs everywhere."

Purina has supported the AKC Canine Health Foundation as a corporate partner since 1997, investing more than \$14 million in canine health research to benefit all dogs. Purina also is a charter sponsor of the biennial AKC Canine Health Foundation National Parent Club Canine Health Conference.

"Our shared mission to advance canine health research and education is truly making a difference for all dogs," says Ann Viklund, Purina Director of Conformation and member of the CHF Board of Directors. "We are partners in helping to educate dog owners about canine diseases and increase awareness about



the outcomes of funded studies. Our passion is to help dogs live long, healthy lives."

The broad scope of the work of CHF impacts many groups. "The AKC Canine Health Foundation works closely with breed clubs, breeders, veterinarians, and leading canine experts to find and fund research studies with real potential to improve the health of all dogs, purebreds and mixed breeds," says Calvin B. Carpenter, DVM, MBA, DACLAM, CHF Executive Director. "Thanks to 25 years of donor support and our longtime partnership with Purina, we continue to fund humane research that addresses the diverse health needs of dogs across their entire lifetime. CHF also invests in the future with opportunities to train veterinary researchers and reproduction specialists through our educational grants."

Susan LaCroix Hamil, one of the longest-serving members of the CHF Board of Directors and chair of the AKC Delegates Canine Health Committee, says, "The AKC had a great vision for the Canine Health Foundation to advance the health of all dogs. The success of the Foundation has been in supporting top scientists, setting the standard high and having a clear vision about its goals. Importantly, the Foundation gives dog breeders valuable hands-on information."

An early CHF-funded scientist, Elaine Ostrander, PhD, now Chief and Distinguished Investigator of the Cancer Genetics and Comparative Genomics Branch of the National Human Genome Research Institute (NHGRI) of the National Institutes of Health (NIH), wrote the white paper that resulted in the dog being chosen for genome sequencing in 2003.

"The AKC Canine Health Foundation can be proud that they led the way, displaying remarkable vision, as much of the preliminary data that convinced NIH to sequence the dog resulted from grants funded by the Foundation," Dr. Ostrander says. "The Foundation helped dog breeders and owners understand that genomics would be good for canine health. They helped parent clubs understand that the more samples they provided from dogs of specific breeds, the more likely it was that the genetic results would improve the health of their dogs."

A Boxer named “Tasha” was chosen for the canine genome sequence, which was completed in 2005. The advantage of using this particular Boxer was that she had reduced amounts of variation across her genome. The genome sequence determined the 2.4 billion letters that make up the blueprint for how a dog is formed and functions, essential information for geneticists trying to find genes responsible for canine diseases.

The dog sequence also provided an important tool to help advance One Health collaborative studies in which information from canine health is used for studies in human health and biology, and vice versa. The AKC Canine Health Foundation funds a plethora of One Health research, with 37 percent of the grants awarded in 2020 having a One Health application.

William I. Christensen, MD, MPH, a member of the CHF Board of Directors and Scientific Review Committee, says, “The research the Foundation funds is chosen to benefit dogs, but this research may also benefit humans. Research of vector-borne illnesses, such as Chagas disease and Lyme disease, are examples. A study evaluating the efficacy of cannabidiol (CBD) oil in treating dogs with drug-resistant epilepsy could potentially translate to helping humans who don’t respond to anti-seizure medications.”

The 2009 discovery of the *SOD1* gene mutation causing the fatal neurological disease degenerative myelopathy (DM) was led by veterinary researchers at the University of Missouri in collaboration with scientists at the Broad Institute of MIT and Harvard. This research found that the mutation responsible for DM in dogs was the same mutation that causes amyotrophic lateral sclerosis, or Lou Gehrig’s disease, in people.

In another study, geneticists at the Broad Institute working with University of Missouri investigators analyzed DNA samples of Tibetan Terriers to identify in 2011 a truncating mutation in the *ATP13A2* gene responsible for neuronal ceroid lipofuscinosis (NCL). The progressive neurodegenerative disease causes loss of brain and nervous function in young adult Tibetan Terriers. Mutations in the human *ATP13A2* gene were known to cause an early-onset form of Parkinson’s disease, Kufor-Rakeb syndrome. The Tibetan Terrier study correctly predicted that human Kufor-Rakeb syndrome was an NCL.

Similarities in canine and human cancers are not surprising considering that both are exposed to the same environmental conditions and often eat the same foods. Of over 77 million owned dogs in the U.S., one-fourth will develop cancer, according to the AKC Canine Health Foundation. Thus, CHF has provided over \$14.7 million, about one-third of its total funding since 1995 to support studies of canine cancer that aim to advance earlier diagnoses and treatment for better outcomes.

CHF RESEARCH INITIATIVES

In 2018, CHF launched the Hemangiosarcoma Initiative to learn more about this aggressive, common canine cancer. Known as the silent killer, hemangiosarcoma (HSA) is often not detectable until a dog suffers internal bleeding or even sudden death. Since 1995, CHF has provided \$4.1 million to support 28 grants focused on HSA. Insightful research at North Carolina State University has found a possible link between the vector-borne *Bartonella* and HSA. As *Bartonella* invades and hides inside the cells of blood vessel walls, it may trigger an infectious state that leads to HSA.

A newly funded HSA grant, known as the Shine On continuation study, will enable researchers at the University of Minnesota to follow 209 Golden Retrievers, Boxers and Portuguese Water Dogs, deemed highly affected breeds, over their lifetime. In the initial Shine On project, they developed a blood test to detect cells associated with HSA in a dog’s circulation and used artificial intelligence (AI) to analyze the results.

In the lifetime study, researchers will use AI to detect early-stage HSA based on the Shine On Suspicion (SOS) blood test. Dogs will be assigned a risk category for developing HSA, and those considered at high risk will be treated with the drug eBAT to strategically prevent tumors before they form. This research may contribute understanding about the rare cancer angiosarcoma in humans.

Novel funding for the first Shine One study involved a three-way funding team comprised of the Golden Retriever Foundation, American Boxer Charitable Foundation and the Portuguese Water Dog Foundation. CHF, which administered the first grant and followed its scientific progress, is helping to fund the new grant.

The Tick-Borne Disease Initiative, launched in 2016, and the Epilepsy Initiative, begun in 2017, have both enjoyed funding boosts with AKC matching gift programs. Studies of tick-borne diseases, including Lyme disease, the most common tick-transmitted disease in the U.S., are closely monitoring the expanding geographical range of tick species and the increased disease incidence among dogs and humans. Co-infections, or simultaneous infection with multiple vector-borne organisms, are being investigated for accurate diagnosis and early and comprehensive treatment. Efforts to understand why some tick-infected dogs remain asymptomatic are also part of this work.

Research addressing epilepsy, the most common neurologic disorder in dogs, is evaluating the effectiveness of dietary supplements in treating affected dogs, as well as the underlying genetics and disease mechanisms. The role of the gastrointestinal tract and the microbiome in the development and subsequent treatment of epilepsy also is being investigated. The knowledge gained from canine epilepsy research, partic-

ularly of dogs that are unresponsive to anti-epileptic drugs, may help researchers better understand human epilepsy.

WHITE PAPER ON GENETIC TESTING

The recent release of the “Review of the Current State of Genetic Testing in Dogs,” a project co-funded by the AKC Canine Health Foundation and the Orthopedic Foundation for Animals (OFA), depicts a commitment to help dog breeders, owners and veterinarians interpret and understand genetic test results. Its origin was inspired by William J. Feeney, chair of the 2019 AKC Board of Directors and Vice President of OFA. Intended to be periodically updated, the 30-page white paper offers hands-on understanding about canine genetic testing.

“While scientific advances in canine DNA testing are exciting, they have also led to a desperate need for continued education,” says Eddie Dziuk, OFA Chief Operating Officer and member of the AKC Delegates Canine Health Committee. “The dog community and even veterinary professionals often struggle with questions such as test purpose, accuracy, breed specificity/appropriateness, and interpretation of results. This is a long-awaited and needed resource to address today’s most pressing questions and make better use of these powerful tools to breed healthier dogs.”

Available online via the Foundation’s website, the manuscript was written at the University of California-Davis by Liza Gershony, DVM, PhD, an AKC Canine Health Foundation Clinician-Scientist Fellow and postdoctoral scholar, and her advisor, professor Anita M. Oberbauer, PhD, a CHF-funded researcher and recipient of the 2019 Asa Mays, DVM, Excellence in Canine Health Research Award. Geneticist Leigh Anne Clark, PhD, of Clemson University, also a CHF-funded investigator, contributed editorial input.

“Misapplication of genetic tests in a breeding program can lead to excessive neutering and unnecessary removal of individuals, which causes loss of genetic diversity and a reduced gene pool,” Dr. Oberbauer says. “Panel and diversity genetic testing provide information that thoughtful breeders may want to include in their breeding deliberations if — and only if — the testing data is pertinent to their breed and to their lines while being mindful of the health of the breed as a whole.”

As with copper toxicosis in Bedlington Terriers, the object is to avoid genetic bottlenecks and preserve as much genetic diversity as possible while reducing the frequency of disease alleles. Notably, CHF continues to fund research of copper-associated liver disease in dogs including affected Bedlingtons, as not all affected dogs have the *COMMD1* deletion genotype, meaning *COMMD1* may not be the sole cause of the disease in the breed.

Carillon Bedlington Terrier breeder Heyman made a life-long commitment to help advance the health of her beloved dogs when she began sending blood samples and pedigree information to the researchers studying copper toxicosis.

DOG LOVERS CAN MAKE A DIFFERENCE

As the AKC Canine Health Foundation (CHF) celebrates its 25-year anniversary, here are ways you can support the important work of this nonprofit organization.

- The CHF Board of Directors is matching donations up to \$150,000 from new and lapsed donors in support of the 25th Anniversary Endowment Campaign. Providing financial stability and sustainability for the research mission and organizational needs of the Foundation, the endowment campaign ensures that CHF will continue to positively impact canine health for years to come.
- A planned gift to the Heritage Society helps to secure the future of your beloved dog breed and advance the mission of CHF so that all dogs live long, healthy lives. By including CHF in your estate plans, you can be sure that your legacy honors your best friend.
- Participate in the Purina Parent Club Partnership (PPCP) Program to help your parent club fundraise for canine health studies that support your breed. PPCP provides funding directly to participating parent clubs and to their Donor Advised Fund held at CHF. Funding is based on the annual submission of proofs of purchase of qualifying Purina pet products from parent club members who are members of *Purina Pro Club* and who designate their participating parent club to receive credit for their submissions.



Heyman has attended every AKC Canine Health Foundation National Parent Club Canine Health Conference and frequently volunteers to work at the CHF booth at events. She is a member of the CHF’s Heritage Society, having included a planned gift in her estate.

“I am absolutely passionate about the AKC Canine Health Foundation,” Heyman says. “I love telling people about the good work of the Foundation and encourage them to donate and become members. For me, the joy of breeding healthy dogs that live the best lives possible wouldn’t be possible without the AKC Canine Health Foundation.”

The American Kennel Club provided a straightforward beginning for the AKC Canine Health Foundation with its \$1 million grant and the vision of advancing health for all dogs. Carrying that mission onward, the Foundation has wowed us with its impressive portfolio of work that serves to prevent, treat and cure canine diseases. Congratulations, AKC Canine Health Foundation on 25 years! ■