AMERICAN KENNEL CLUB CANINE HEALTH FOUNDATION
PREVENT TREAT & CURE®

DISCOVERIES

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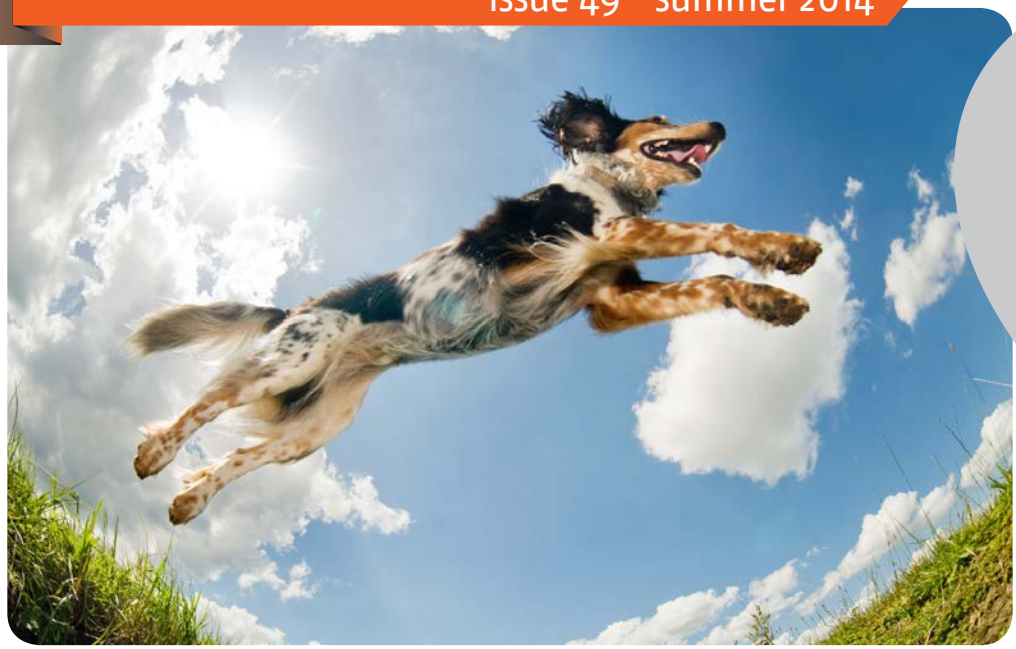

MISSION:
The Foundation is dedicated to advancing the health of all dogs and their owners by funding sound scientific research and supporting the dissemination of health information to prevent, treat and cure canine disease.

FOCUS ON RESEARCH

AKC Canine Health Foundation Funds Landmark Clinical Trial on Regenerative Medicine Treatment for Dogs

The AKC Canine Health Foundation (CHF) is pleased to announce the funding of a landmark clinical trial to establish the evidence-based use of regenerative medicine to treat tendon injury in dogs.

Funded as part of CHF's Canine Athlete Initiative (www.akcchf.org/canineathlete), which seeks to fund research and provide education for dog owners in the rapidly expanding field of canine sports, this newly funded collaborative grant, 02107: Landmark Clinical Trial to Establish the Evidence-Based Use of Regenerative Medicine to Treat Tendon Injury in Dogs, will inform the veterinary community in the use of safe and effective regenerative medicine techniques.

According to Dr. Shila Nordone, CHF chief scientific officer, "Regenerative medicine is a rapidly developing field with the potential to transform the treatment of canine and possibly human disease." Dr. Nordone goes on to say, "Because current regenerative medicine products and techniques vary widely and success stories are anecdotal at best, CHF is committed to funding independent studies that support the evidence-based practice of regenerative medicine."

Principal Investigators Dr. Jennifer Barrett, MS, PhD, DVM, DACVS, DACVSMR; Dr. Sherman Canapp, DVM, MS, CCRT, DACVS, DACVSMR; and Dr. Victor M. Ibrahim, MD, FAAPMR,will conduct the first blinded, placebo-controlled clinical trial evaluating the effectiveness of platelet-rich plasma and stem cells on the most common sporting injury in dogs: supraspinatus tendonopathy, a shoulder injury that is similar to rotator cuff injury in humans.

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THIS ISSUE AT A GLANCE

New Donor Matching Program
AKC will match donations from new & lapsed individuals or business donors in 2014!
(See back for how you can help.)

New Grants

New research grants are detailed here. For more information about any of these studies, including ways to provide financial support, visit us at www.akcchf.org.

Dermatology and Allergic Disease Research Program Area

02111-A: Evaluating the Contribution of Fungal Infection to the Pathogenesis of Atopic Dermatitis: Putting Evidence under the Use of Antifungal Medication
Principal Investigator: Dr. Jan S. Suchodolski, DVM, PhD; Texas A&M University
Total Grant Amount: $12,960
Grant Period: 6/1/2014 – 5/31/2015

Project Abstract: Fungi are established agents of disease in dogs and are thought to exacerbate inflammatory and allergic diseases such as atopic dermatitis (environmental allergies). In order to fully understand the role of fungi in these diseases, we must first have a comprehensive picture of the commensal fungi living on the skin of dogs and then begin to decipher how these communities change when disease is present. DNA sequencing technologies can provide a more accurate status of commensal fungi residing on canine skin than what has been previously shown with traditional culture based methods. Dr. Suchodolski proposes to use next-generation DNA sequencing to investigate the fungal microbiome, or mycobiome, of healthy canine skin. They will then compare the mycobiome of healthy canine skin to that of dogs with allergic skin disease. This will provide insight into the involvement of fungi in atopic dermatitis as well as reveal fungal genera that may serve as opportunistic pathogens and potential targets for therapeutics in this chronic skin disease that affects both the canine pets who suffer from severe pruritus (itch) and their owners who must provide long-term and costly care.

02116-A: Establishing Best Practices in the Treatment of Atopic Dermatitis to Prevent Antimicrobial Resistance
Principal Investigator: Dr. Shelley Rankin, PhD; University of Pennsylvania
Total Grant Amount: $12,312
Grant Period: 6/1/2014 – 1/31/2015

Project Abstract: Atopic dermatitis (AD/allergic skin disease) is a common condition affecting approximately 10% of the canine population, with strong breed predilections. Affected dogs often succumb to recurrent bacterial skin infections, namely by staphylococcus species. As in human medicine, one of the major obstacles in treating these infections is combating antimicrobial resistance. Frequently, multidrug-resistant (MDR) bacteria are encountered, and limited treatment options are available. These resistant bacteria can also be transferred between pets and their owners. Though a common clinical threat, knowledge of how resistance is acquired by bacteria warrants further investigation. Are MDR bacteria present on the skin at the onset of infection or do they evolve with the selective pressure of treatment?

Current technologies provide sensitive means of detection of mechanisms of resistance, but this has yet to translate into tools for clinical practice. Dr. Shelly Rankin, head of diagnostic services and chief of clinical microbiology at the University of Pennsylvania, will perform genomic

analysis of bacterial swabs acquired from dogs with AD and concurrent skin infections, and from normal dogs. She will also be performing currrent laboratory culture techniques. Sampling dogs before, during and after treatment will allow Dr. Rankin and her team to predict the effect of treatment on bacterial acquisition of antimicrobial resistance. This study will provide a framework for implementation of new technologies in clinical practice, and give insight into how antimicrobial resistance develops over time.

Reproductive Conditions and Disease Program Area

CHF is committed to funding research that will help breeders produce healthy puppies. While the prospect


Photo courtesy of AKC

of welcoming a litter of puppies into the world is always very exciting, we still have many gaps in our understanding of canine reproduction and fertility. To address these concerns, CHF recently funded three reproductive grants that will seek to define the underlying cause of genetic infertility that affects 28 different breeds, to identify the characteristics of sperm that lead to enhanced fertility in stud dogs, and finally, to identify the mechanism of bacterial adherence to the endometrial lining that causes the devastating effects of pyometra. Through targeted research funding, CHF strives to support the needs of our breed clubs and breeders.

02118-A: Targeting the Mechanism of Bacterial Adherence during Pyometra to Develop an Effective, Noninvasive Treatment for Disease
Principal Investigator: Dr. Cordula Bartel, PhD; University of Veterinary Medicine, Vienna
Total Grant Amount: $10,368
Grant Period: 7/1/2014 – 11/30/2015

Project Abstract: Pyometra is the most common uterine disease in intact bitches leading to potentially life-threatening complications due to the systemic inflammation that occurs as a result of infection. We know that E. coli bacteria are the most abundant infectious agents associated with pyometra in bitches, but how and why these bacteria are able to colonize the endometrium and cause disease is unclear. In a previous study, Dr. Bartel's research group characterized a unique epithelial cell type known as "foam cells" on the canine endometrial surface. Foam cells occur most often during diestrus (also called metestrus), the cyclic stage most commonly associated with the occurrence of pyometra. Foam cell formation appears to be part of the normal physiological process of preparation of an embryo for implantation. From other species, we know that the foamy appearance of the epithelial cells is caused by lipid droplet accumulation and that the uptake of lipids from the blood is accomplished via special lipid receptors on these cells known as SR-B1. Interestingly, SR-B1 is a strong binding partner for bacteria and Dr. Bartel's lab hypothesizes that this receptor is a major

Story continued on next page

contributor to the development of pyometra. They also believe selective blocking of this receptor will lead to a reduction of clinical signs of inflammation and decreased convalesce-time and tissue damage during pyometra. The first step to testing this hypothesis is to detect SR-B1 in the canine endometrial epithelial cells and to elucidate its role in lipid accumulation in endometrial epithelial cells during pyometra development. In this pilot project, these researchers will evaluate SR-B1 mRNA and protein in the canine endometrium with the goal of ultimately establishing a new, noninvasive pyometra treatment that impairs bacterial adhesion to the endometrial wall.

02123-A: Identifying the Gene Responsible for Inherited Infertility and Sterility in 28 Breeds
Principal Investigator: Dr. Vicki Meyers-Wallen; Cornell University
Total Grant Amount: $12,960
Grant Period: 7/1/2014 - 6/30/2015

Project Abstract: In a previous study, Dr. Meyers-Wallen demonstrated that canine XX disorder of sexual development (DSD) is a sex-limited autosomal recessive trait. Affected dogs develop testes or ovotestes and are masculinized in proportion to the amount of testis. Those having bilateral testes are sterile. Dogs with ovotestes range from sterile to fertile, with most developing female genitalia. Fertile affected dogs transmit the mutation to all their offspring. Carrier sires are fertile, and by founder effect, have increased mutation frequency in some breeds. Elimination of this mutation would reduce inherited female sterility and infertility in 28 breeds.

To this end, Dr. Meyers-Wallen hypothesizes that the XX DSD mutation is ancient, and therefore identical in most breeds. This predicts an identical XX DSD mutation in most, if not all breeds. In previous genomic studies, her research group identified a chromosomal region containing more than 16 fold enrichment for DNA sequence variants associated with XX DSD in the study pedigree. Using a custom designed array of 80 priority SNPs located in that region, they will now genotype affected dogs of 22 breeds and controls to identify variants that are identical in affected dogs. At the study conclusion, researchers are hopeful they will have an identical mutation candidate and be poised to develop a single DNA test for affected and carrier dogs in all breeds having this mutation.

*Breeds include: Afghan Hound, American Cocker Spaniel, American Pit Bull Terrier, American Staffordshire Terrier, Australian Shepherd, Basset Hound, Beagle, Bernese Mountain Dog, Border Collie, Brussels Griffon, Doberman Pinscher, English Cocker Spaniel, French Bull Dog, German Pinscher, German Shepherd Dog, German Shorthaired Pointer, Golden Retriever, Jack Russell Terrier, Kerry Blue Terrier, Norwegian Elkhound, Podenco Dog, Pug, Soft Coated Wheaten Terrier, Tibetan Terrier, Vizsla, Walker Hound, Weimaraner, Wheaten Terrier

02124-A: Determining the Characteristics of Sperm That Accurately Predict Fertility of Stud Dogs
Principal Investigator: Dr. Stuart Meyers, DVM, PhD; University of California, Davis
Total Grant Amount: $12,960
Grant Period: 7/1/2014 - 6/30/2015

Project Abstract: With the growing use of artificial insemination and frozen semen in dog breeding, the level of predictability and odds of fertile matings for any breed of dogs is currently unknown. The objective of Dr. Meyer's study is to determine the relationship of sperm characteristics to pregnancy outcome in a large population of a single breed of valuable service dogs (Labrador Retrievers) in which semen characteristics and known fertility have been tracked for a number of years.

Researchers will collect semen samples from 35 Labrador Retriever stud dogs and determine a wide array of semen quality measures. Semen collections will be obtained twice weekly from each of two different males (four dogs per week) at Guide Dogs for the Blind in San Rafael, CA. Semen will be evaluated at UC Davis using computer-assisted semen analysis, flow cytometry and brightfield and fluorescence microscopy. Each ejaculate will be cryopreserved according to standard methods at Guide Dogs for the Blind. Cryopreserved semen will be thawed and evaluated for sperm post-thaw viability, motility, lipid peroxidation, acrosomal integrity, sperm chromatin structure assay, mitochondrial DNA and reactive oxygen species generation (DHE fluorescence). They will evaluate semen parameters and male fertility using a multiple logistic regression model and Bayesian statistics to evaluate the relationship of sperm factors and male age to pregnancy. Successful completion of this project will result in predictability for semen fertility for frozen and fresh sperm from valuable stud dogs.

Immunology and Infectious Diseases

02128-A: Collaborative Project with the Orthopedic Foundation for Animals: Redefining the Recommendations for Prevention of Infectious Disease at Dog Shows and Other Areas Where Dogs Meet and Compete
Principal Investigator: Dr. Jason Stull, VMD, PhD; The Ohio State University
Total Grant Amount: $11,942
Grant Period: 7/1/2014 – 2/29/2016

Project Abstract: CHF and the Orthopedic Foundation for Animals have a long-standing commitment to supporting research that aims to prevent, treat and cure canine disease. As the sport of dogs increases in popularity, we realized that one major gap in our current body of knowledge is how to reduce the risk of infectious disease spread at the intersection of the dog and the environment. Put another way, now that more and more large groups of dogs congregate at dog shows, agility events, field trials, animal shelters and dog parks, where are the risks and how should we manage them? To that end, Dr. Jason Stull and colleagues at The Ohio State University and Ontario Veterinary College will conduct a retrospective analysis of the veterinary infectious disease literature in order to provide updated recommendations for mitigation of risk of contraction of infectious disease at events where dogs congregate. Lead by Dr. Stull, this influential collaborative group of veterinary epidemiologists, infectious disease experts, immunologists and internal medicine specialists will evaluate peer-reviewed studies defining the incidence, clinical presentations and outcomes of diseases; mechanism of infection, replication, spread and/or pathogenesis of diseases; computer modeling of disease transmission; characterization of susceptible cohorts for particular pathogens; and emerging concerns for novel pathogens to assess risk and develop management strategies. They will also include major stakeholders within the dog community in the process, guaranteeing that recommendations made at the outcome of this study will be practical and possible to accomplish in the "real

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CHF Funded Research on the Cutting Edge: Canine Osteosarcoma Patients Find Hope in Viral Therapy Treatment

Engineering viruses to attack tumors is not strictly for human use, it is also being used in dogs. In research funded by CHF, Grant 01806: A Novel Virus-Based Anti-Tumor Treatment for Canine Osteosarcoma, Dr. Bruce Smith, VMD, PhD, of Auburn University uses biotechnology to convert adenovirus, a common human and canine virus, into a treatment for canine osteosarcoma. Dr. Smith's research reprograms a canine adenovirus to attack tumor cells and was funded by CHF in 2012, nearly two years prior to the recent clinical trial at the Mayo Clinic for human myeloma patients using the measles virus.

Patients in Dr. Smith's clinical trial are administered an oncolytic adenovirus specifically engineered to replicate (make copies of itself) in canine osteosarcoma cells. "By engineering a common adenovirus virus to replicate in cancer cells, we can turn that cell into a factory that produces its own destruction," said Dr. Smith. The virus breaks down the cancer cells, reducing or eliminating the metastic lesions and hopefully extending the survival of dogs that receive this treatment. According to Dr. Smith, "Viruses are nature's perfect gene delivery machines. Oncolytic viruses harness this ability to deliver death to cancer cells." The implications for human medicine are profound. Canine osteosarcoma is an aggressive canine bone cancer with poor prognosis and is nearly identical to osteosarcoma in humans.

"CHF strives to fund cutting-edge technology that will prevent, treat and cure canine disease. Novel approaches to treating cancers such as the work done by Dr. Smith move us forward in giant strides rather than incremental steps, and what seems like high-risk science ultimately becomes high reward for dogs and their owners," said Dr. Shila Nordone, CHF chief scientific officer. "Dr. Smith's research also has strong implications for humans. By utilizing naturally occurring disease in dogs, we can move biomedical research forward more quickly and cost effectively for humans as well."

To learn more about Dr. Smith's virus-based, anti-tumor treatment for canine osteosarcoma and to support his research, visit www.akcchf.org.

Photo courtesy of Auburn University

Dr. Bruce Smith with Hal

Tangible Outcomes in Canine Oncology Research

Since 1995, CHF has awarded 188 grants in the oncology field and funded nearly $10.7 million in canine cancer research. This would not be possible without your support.

The scientific results that you made possible have helped move veterinary medicine forward, advancing the health of all dogs. While these are just a few of the highlights CHF has been able to deliver through the dedication of our funded researchers, these steps forward show real progress in the understanding and treatment of canine cancer.

Tumor Suppressor Genes

1999 – Scientists knew that there were genes that controlled a cell's ability to replicate by suppressing cell division, and began to suspect that these genes may be altered in cancer. The hypothesis was that loss of function of these "tumor suppressor genes" lead to metastasis in our most insidious forms of cancer, including melanoma, osteosarcoma and hemangiosarcoma.

2014 – Through sponsorship of research into tumor suppressor genes, we now have documented genomic instability in canine tumor suppressor genes and irregularities in gene copy number. These landmark findings may lead us to better drugs to halt the spread of cancer and help us understand the role of genomics in the development of cancer.

Chromosomal Aberrations in Lymphoma

2002 – Abnormalities in chromosomes, those threadlike linear strands of DNA in the nucleus of cells that carry the genes, were known to contribute to cancer in humans. Documentation of chromosomal abnormalities were being used to diagnose, prognose and clinically manage human cancer. Yet we knew nothing about whether canine cancer was defined by similar anomalies.

2013 – CHF-funded research brought molecular cytogenetic technology — the technology needed to document chromosomal anomalies — to the dog. Scientists identified tumor-associated abnormalities in the number of copies of genomic regions and whole chromosome abnormality. For the first time, we have a documented treatment response using molecular cytogenetic techniques in the dog. This "cytogenic remission" ushers in personalized medicine (PMed) in the dog — the ability to determine if a dog will respond to chemotherapy and how well they are responding.

Genetic Lesions in Osteosarcoma

2007 – The search began to identify genetic mutations and their functional consequence in osteosarcoma.

2013 – Genetic lesions upstream of a gene called CDKN2A/B were identified. The functional consequence is the altered regulation of a cell's ability to replicate. Importantly, canine CDKN2A/B is surrounded by genes that are highly similar to human genes, ushering in the potential to use the naturally occurring disease in the dog as a model for human osteosarcoma.

Mast Cell Tumors

2005 – Mast cells are a type of white blood cell that normally reside in the skin, lungs, nose, mouth and gastrointestinal tract. Their primary functions include defense against parasites and allergens, but they also contribute significantly to formation of new blood vessels. When mast cells begin to replicate out of control, they form a particularly aggressive cancer. These mast cell tumors were poorly understood in the dog because we lacked a basic understanding of mast cell biology in the dog. CHF funded the research to start understanding of mast cell biology and function.

2006 – Mast cell function was fully characterized and a mast cell tumor line (CL1) was created and shared with the scientific community. Targeted therapeutics were still unavailable. Work began to establish a test to measure mast cell "mitotic index," which is a measurement of the cell's ability to replicate and is potentially an indication of a mast cell tumor's ability to metastasize.

2014 – Modulation of mast cell-derived prostaglandins and leukotrienes were found to impair mast cell function and a commercially available non-steroidal anti-inflammatory drug (NSAID) called tepoxilan was found to be most effective in halting mast cell tumor progression.

KUDOS – SUMMER 2014

Hats off to the **American Belgian Tervuren Club, Inc.,** for their contribution of $15,000 toward six different research projects!

We are honored to have **Celia Weatherhead** supporting canine health research as our 2015 Champions for Canine Health Calendar cover sponsor!

Naugatuck Valley Kennel Club, Inc., supports three research program areas with their generous gift of $9,000.

Our sincere gratitude to **Carolyn J. Koch** for her donation to further research helping dogs and their owners live longer, healthier lives.

Many thanks to the **Clumber Spaniel Health Foundation** with their $8,000 donation helping fund research in Musculoskeletal and Immunology & Infectious Disease Research program areas!

Kudos to the **Harrisburg Kennel Club, Inc.,** for their gift of $1,500 to help prevent, treat and cure canine disease!

We would like to applaud **Kate D. Romanski** for her support and interest in our Canine Epilepsy Initiative!

A special shout out to **MB-F, Inc.,** and all the Individuals who continue to add $1 onto their show entry fees for CHF. MB-F's Star Dog Program continues to make a huge difference for canine health, one dollar at a time!!

New Club Members (as of 6/27/14)

American Manchester Terrier Club
Ann Arbor Dog Training Club
Clumber Spaniel Club of America, Inc.
Furniture City Kennel Club, Inc.
Greater San Diego County Whippet Association

In Memoriam

Dr. William (Bill) R. Newman

In May, CHF lost a tireless supporter of canine health. Dr. William (Bill) R. Newman passed away at the age of 82 at his home in Bedford, PA.

Dr. Newman was a board-certified radiologist and a former board member of both the American Kennel Club and CHF. Dr. Newman was a long-time member of the Mastiff Club of America, serving in various leadership positions, including delegate to the AKC Board. He loved Mastiffs and spent decades championing health testing for the breed.

Dr. Newman was active in the dog show world, judging 17 breeds. He also owned or co-owned many award- winning Mastiffs, including Ch. Reveille's Big Thunder, a three-time national specialty winner and "Tyler," Ch. Nanuke's Take No Prisoners, an Alaskan Malamute that won the Working Group at Westminster in 1998.

As a CHF board member for 10 years, Dr. Newman served on several committees, including grants, major gifts, planning and bylaws. According to Dr. Duane Butherus, CHF's board chairman, "Bill was, for many years, a committed supporter of canine health and of the AKC Canine Health Foundation. We are grateful for his work and dedication on behalf of all dogs."

John Abraham ("Abe") Studebaker

CHF also lost an ardent supporter in June, with the passing of John Abraham ("Abe") Studebaker at the age of 83. Mr. Studebaker's business experience was as president and CEO of multiple agribusinesses that have played a prominent role in the development of hybrid plants and improved food sustainability.

Mr. Studebaker served on the board of the CHF from 1995 to 2007. During his years on the board, he served as vice president from March 1997 to March 2003, when he was elected board president, serving in that capacity until March 2005.

"John's leadership in the early years of the Foundation laid the groundwork for the strides we continue to make in the field of canine health research. He was a tireless supporter of dogs and we are grateful for his commitment," said current CHF Board Chairman Dr. Duane Butherus.

Mr. Studebaker was a Samoyed breeder for 40 years and his kennel, Windy Ridge Samoyeds, produced a large number of champions, including the number one Samoyed in the United States. He was president of the Kalamazoo Kennel Club and served as a delegate to the AKC Committee on Canine Health. Mr. Studebaker was also a dog show judge, judging Samoyeds in the United States, Canada, Taiwan, Spain, Australia and New Zealand.

FOCUS ON RESEARCH

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world." The end result will be a peer-reviewed publication defining an up-to-date risk assessment and management recommendations, and most importantly, a white paper that can be used by dog owners and organizers of canine events and facilities. Finally, the researchers hope to create an open-access website that will be an interactive, living document, helping all those involved with dogs reduce the risk and spread of infectious disease where dogs meet and compete.

Research Team:

Jason W. Stull, VMD, MPVM, PhD, DACVPM
(Public Health, Epidemiology), Principal Investigator

Armando Hoet, DVM, PhD, DACVPM
(Public Health, Epidemiology)

Jeanette O'Quin, DVM, MPH
(Public Health, Epidemiology)

Mary Jo Burkhard, DVM, PhD, DACVP
(Immunology/Infectious Disease, Clinical Pathology)

Michelle Evason, DVM, DACVIM
(Internal Medicine)

J. Scott Weese, DVM, DVSc, DACVIM
(Infectious Disease, Internal Medicine)

OLD DOGS ARE THE BEST DOGS

Do you have a good old dog? Most dog owners will agree, old dogs are the best dogs. Loyal companionship, coupled with bursts of playful puppy energy, older dogs are treasured members of many households.

Thanks to increased veterinary care and advances in medical treatment, more people are enjoying the loyalty of their dogs for a longer period of time. The veterinary community estimates that 50% of canine patients are now senior or geriatric patients. Senior dogs are at least 8 years old. Geriatric dogs are 10 years old, or more.

Coming in September and October, CHF will kick off *Old Dogs are the Best Dogs*, an educational series devoted to the health concerns of senior and geriatric dogs. Articles and podcasts will be released with information to help dog owners provide the best care for their good old dogs.

Resources will include:

- What Defines a Senior Dog/What Does Aging Look Like
- Hypertension in Dogs
- Conditioning Older Dogs
- Anesthesia in Older Dogs
- General Nutrition for Senior Dogs
- Rehab for Older Dogs
- Geriatric Health Concerns
- Nutrition for Performance and Longevity
- Age-Related Cardiovascular Disease

Check our website (**www.akcchf.org**) and social media for further information on our geriatric series: *Old Dogs are the Best Dogs.*

Nutrition Can Help Improve the Effect of Cognitive Dysfunction in Older Dogs

Old dogs sleep more than when they were younger. Everyone knows that. But when senior dogs become disoriented in the familiar surroundings of their home or act confused by people who have cared for them their entire lives, it can be unsettling.

Imagine your dog seemingly undergoing a personality change that includes forgetting housetraining skills, being less alert and having a mixed-up sleep-wake pattern. These behavioral changes are attributed to a condition common in older dogs known as cognitive dysfunction syndrome (CDS).

Studies show that 20 to 30 percent of dogs over 7 to 9 years of age show signs of cognitive dysfunction. In dogs over 14 years of age, it increases to 68 percent of dogs.

"Canine aging is known to affect learning and various types of memory," says Karen Overall, VMD, PhD, DACVB. "In dogs, cognitive dysfunction syndrome is usually diagnosed based on a history of disorientation, alterations to social and interactive behaviors, changes in locomotor behavior and sleep-wake cycles, and loss of housetraining. In the beginning, dogs may have only slightly altered sleep cycles and appear anxious. Social-interactive behaviors may first appear as increased neediness but then change to aloof disengagement."

Understanding the cause of CDS involves examining the cognitive and molecular changes that occur in the brains of aging dogs. "The cumulative burden of oxidative stress over time is the most common topic examined in brain aging," Dr. Overall says. "It appears to affect all major classes of molecules involved in neurotransmission."

Among the changes that occur are physical atrophy in certain areas of the brain, increases in oxidative damage and decreases in mitochondrial energy metabolism. Free radicals play an important role in aging, and the brain is particularly susceptible to the effect of free radicals because it has a high rate of oxidative metabolism, a high content of lipids, or fats, and a limited ability to regenerate.

Dietary or supplemental antioxidants are known to decrease the damaging effects of free radicals. Some studies have shown improved memory or cognitive performance in dogs fed antioxidant-enriched diets or supplements combined with behavioral enrichment in senior dogs.

DHA (docosahexaenoic acid), a long-chain polyunsaturated omega-3 fatty acid, plays an important role in normal neural functions. Several studies have shown a decrease of DHA in the aging brain. Supplementation with fish oil results in improved neural development and learning ability in young dogs, but more research is needed to learn whether there is a benefit from DHA in canine cognitive disorders.

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Keeping Pet Food Safe

As you are probably aware, the Food and Drug Administration (FDA) is responsible for protecting and promoting public health through the regulation and supervision of food safety, prescription medications, over-the-counter medications, vaccines and blood transfusions, to name a few. But did you know the FDA also regulates dog and cat food?

According to the FDA website (www.fda.gov), the FDA's regulation of pet food is similar to that for other animal foods. The Federal Food, Drug and Cosmetic Act (FFDCA) requires that all animal foods, like human foods, be safe to eat, produced under sanitary conditions, contain no harmful substances and be truthfully labeled. In addition, canned pet foods must be processed in conformance with the low acid canned food regulations to ensure the pet food is free of viable microorganisms.

Between 2006 and 2008 and in the spring of 2012, there were multiple cases of *Salmonella* poisoning reported in humans due to contaminated pet food. Salmonellosis is an infection with bacteria called *Salmonella*. According to the Centers for Disease Control and Prevention website (www.cdc.gov), most persons infected with *Salmonella* develop diarrhea, fever and abdominal cramps 12 to 72 hours after infection. The illness usually lasts 4 to 7 days, and most persons recover without treatment. People with compromised immune systems are at higher risk of infection when exposed to *Salmonella* and may need medical intervention to recover.

Dogs infected with *Salmonella* present symptoms similar to humans. They may become lethargic and are at risk for dehydration because of vomiting and diarrhea. It is important to seek veterinary care if you suspect your dog has eaten a contaminated product. In addition to commercial pet food, dogs can also contract salmonellosis from eating raw meat or eggs, garbage and dead animals or birds. *Salmonella* is typically not fatal to dogs and they usually recover after veterinary care.

In an effort to better understand the prevalence of *Salmonella* in pet food and to ensure commercially produced food is safe for dogs and cats, the FDA recently launched a study to collect and analyze samples of pet food, pet treats and pet nutritional supplements for *Salmonella*. At this time, the study does not include canned pet foods.

The study aims to collect samples from a wide array of manufacturers, distributors, wholesalers and retailers. The study will be used to determine the serotype, genetic fingerprint and antimicrobial susceptibilities of each isolate of *Salmonella* found in samples and will help facilitate the removal of *Salmonella*-tainted foods from interstate commerce.

According to an FAQ, "Dry Pet Food and *Salmonella*," published by the American Veterinary Medical Association (AVMA), because dry pet food contains animal-origin products, it is at risk for *Salmonella* contamination. While these foods are typically cooked at temperatures high enough to kill any bacteria, if a contaminated additive such as a flavoring is added to the food after cooking, or if the food comes into contact with contaminated materials, the pet food will be contaminated. There are many safeguards in place to minimize the risk of contamination during manufacturing, but it is still best to use caution when handling pet food.

The AVMA recommends the following safeguards when handling pet foods:

- Wash hands thoroughly after handling any pet food or treat and especially before preparing, serving or eating food, drinks or preparing baby bottles.

- Children should not be allowed to handle pet food, or, if they are allowed to handle pet food or treats, make sure they thoroughly wash their hands (under direct adult supervision) afterward.

ADVANCING THE MISSION

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In addition to potential benefits from antioxidants and long-chain omega-3 fatty acids, alternative brain energy sources may help offset cognitive decline. The brain accounts for only 2 to 3 percent of body weight, but uses 25 percent of the body's glucose. Glucose is believed to be the primary energy source of neurons in the brain and central nervous system, though glucose metabolism becomes less efficient with aging. Thus, alternative sources of energy are needed to support the high-energy requirements of the brain.

Lactate and ketones are alternate energy sources that can easily be used by neural tissue. Medium-chain triglycerides (MCTs) stimulate ketone production, which also crosses the blood-brain barrier and provides an energy source for neural tissue.

"The reduction of brain glucose metabolism is a common feature associated with aging, a process that starts around middle age and may be partially responsible for age-dependent cognitive decline," says Purina Research Scientist Yuanlong Pan, PhD, who specializes in studying healthy aging.

In a Purina study, researchers wanted to learn if dietary supplementation with MCTs could improve cognition in aging dogs by providing the brain with ketones as an alternative energy source. Ketone bodies are a natural endogenous energy source mainly produced by the liver from mobilization of endogenous body fat and used by tissues such as the brain, heart, kidney and muscle.

Older dogs were randomly assigned to two groups based on cognitive tests. They were fed a control diet or a diet containing 5.5 percent MCTs for eight months. During the feeding trial, dogs were tested on their learning ability, memory and attention.

"Dogs fed the MCT diet showed significantly better performance on most of the tests than control dogs," Dr. Pan says. "In summary, this study shows that dietary MCT supplementation can significantly increase blood ketone concentrations and improve cognitive function in old, healthy dogs."

Owners of older dogs can take heart in knowing that diets enriched with alternative brain energy sources, such as MCTs, may help offset their dogs' negative behavioral changes. Combined with providing an interactive environment and activities, you may see a return to the behavior of your dog's younger days.

FOCUS ON RESEARCH

(cont. from page 1)

In dogs, tendon injuries often progress undiagnosed and result in chronic lameness and pain. If left untreated, scar tissue may form, reducing the function of the joint and surrounding muscle tissue.

Through this grant, a collaborative group of veterinary sports medicine specialists across multiple disciplines will determine if regenerative medicine therapies promote healing through tissue regeneration and reduced scarring.

TOP DONOR ADVISED FUND RESEARCH SPONSORS (as of 6/13/14)

By sponsoring research, these clubs leverage the full power of their Donor Advised Fund to impact canine health.

Club	Amount of DAF used to support research in 2014
Clumber Spaniel Club of America	100%
Finnish Lapphund Club of America, Inc.	100%
Friends of Norfolk Terrier	100%
Giant Schnauzer Club of America	100%
Miniature Bull Terrier Club of America	100%
Irish Wolfhound Club of America, Inc.	82%
American Black and Tan Coonhound Association	75%
Petit Basset Griffon Vendeen Club of America	70%
Golden Retriever Foundation	63%
American Pointer Club, Inc.	54%
The Keeshond Club of America	46%
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