# CCAH Update

UC DAVIS SCHOOL OF VETERINARY MEDICINE

FALL 2018



## Million Cat Challenge 2.0

Cat lovers have a lot to celebrate with the early success of the Million Cat Challenge—1,148,128 lives to be exact. This partnership of the Koret Shelter Medicine Program at the Center for Companion Animal Health (CCAH) and Maddie's Shelter Medicine Program at the University of Florida launched in 2014 with the goal of saving a million cats from euthanasia within five years. In just four years, the challenge organizers collaborated with more than 1,000 North American animal shelters and exceeded their goal—while making permanent changes to shelter operations.

When the final tally was announced in May, supporters celebrating in the Grand Ballroom at the Kansas City Convention Center cheered under a shower of rainbow confetti.

"It's a moment that will be forever frozen in my mind's eye," recalled Dr. Julie Levy, co-founder of the challenge who leads a shelter medicine program in Florida and is also a UC Davis veterinary school alumna. "Looking out over that crowd, I saw pure joy, tears and relief. Most of all, I saw hope. It's everything we ever wanted for the challenge."

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***"What we ultimately want is the right outcome for every cat that comes to a shelter."***

– Dr. Kate Hurley

UCDAVIS VETERINARY MEDICINE
*Center for Companion Animal Health*

Dedicated to improving the health of companion animals

# A Message from the Director

This fall marks five years of serving as Director of the CCAH. I'm constantly amazed at the depth and breadth of the research that takes place here—and inspired by the commitment of everyone to advance animal and human health. That includes you who support the center and our work.

The center tackles health problems and diseases that face small companion animals, including dogs, cats, rabbits, and birds to name a few. We do this by funding the best research proposals that address the causes, prevention and treatment of disease. Our grants program funds faculty research, resident research (mentored by faculty who train the next generation of researchers) and equipment that allows researchers to carry out their important and vital studies.

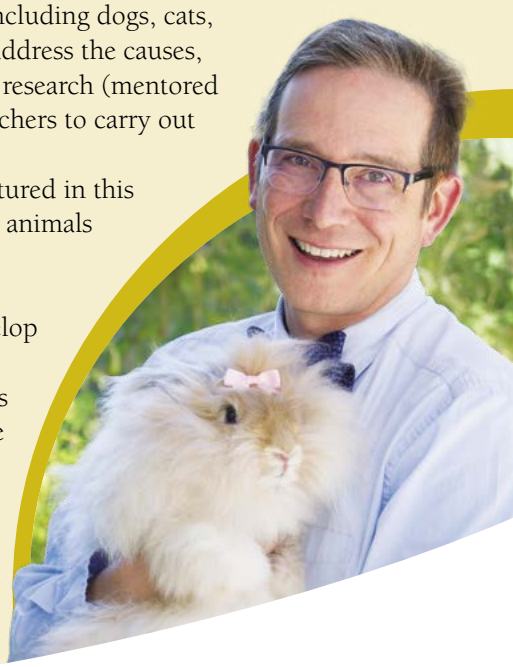
The center also helps build programs, such as the Koret Shelter Medicine Program featured in this issue, which has been truly transformative in its work to end suffering and euthanasia for animals surrendered to shelters.

In this issue, you will learn about recent advances in new minimally invasive surgical procedures, the next steps for the hugely successful Million Cat Challenge, efforts to develop a new toxoplasmosis vaccine, and how our resident grant program ensures the future.

I look forward to seeing the advances we will make in the next five years. The center is entirely funded by our generous and committed donors; none of this work could be done without you. Thank you for entrusting us with your support.

My best,

Michael S. Kent, MAS, DVM, DACVIM, DACVR
Director, Center for Companion Animal Health



## New Procedure Treats Dog Liver Shunts

Canine patients with poor liver function due to intrahepatic portosystemic shunts (IHPSS), now have access to a new treatment option pioneered at UC Davis. Dr. Bill Culp, chief of the Soft Tissue Surgery Service, showed percutaneous transvenous coil embolization (PTCE) to be effective in 92 percent of patients in a recently published clinical trial. It is now offered as standard treatment for affected dogs.

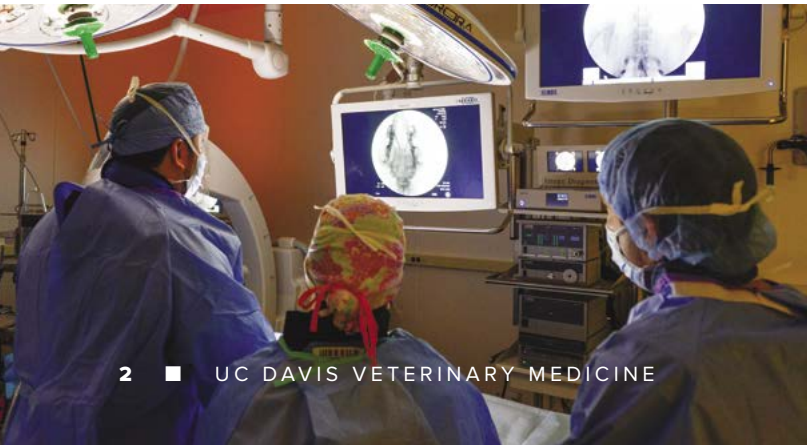
An IHPSS is an abnormal connection between major blood vessels in the abdomen, resulting in blood bypassing the liver and preventing the liver from filtering blood. Clinical signs that may indicate an IHPSS in dogs include: small body size, low energy level, mental dullness and seizures.

PTCE is a minimally invasive procedure using interventional radiology in which coils are placed in the IHPSS to allow the shunt to close down progressively over time. The goal is restore normal liver function by altering the blood flow away from the shunt and toward the liver, increasing perfusion and filtration.

Culp's clinical trial, funded by generous donors to the CCAH, showcased the success of this innovative approach. Twenty-five dogs were treated with PTCE at the UC Davis veterinary hospital for their shunts. Of the 24 that were reevaluated at three months post-surgery (one died of an unrelated accident), 22 showed resolution of all clinical signs. All dogs had improved bloodwork values by at least 50 percent, and hepatic arterial fraction decreased, consistent with increased portal blood flow to the liver.

The study required a 3-day hospitalization following the procedure, but most dogs recovered within 24 hours due to the surgery's minimally invasive nature.

"With this procedure being performed safely with minimal complications, PTCE appears to be a promising treatment for IHPSS," Culp said. "We look forward to future studies that can build on this foundation."



Dr. Bill Culp (left) and the soft tissue surgery team utilize interventional radiology (real-time x-ray) to guide efforts during minimally invasive surgeries.

## An Enduring Tribute to Beloved Canine Companions

Anne and Bob Dreyfuss and their loyal canine companion, Mini, in Edna's Park at the CCAH.

In 2006, Anne and Bob Dreyfuss brought their German shepherd, Shasta, to UC Davis for treatment after she was diagnosed with cancer. On their way to appointments, they walked by the brick pathway located in Edna's Park at the CCAH. Sometimes they sat in the courtyard while awaiting Shasta's treatment and read the brick inscriptions and enduring tributes to beloved pets.

These moving sentiments inspired the Dreyfusses to inscribe bricks honoring their cherished canine companions—initially one for Sascha, Brandy, Misty, Jackie and Shasta—then another for their son's dog Beau, and most recently those for Cinnamon and Diamond, also treated for cancer at UC Davis.

The Dreyfusses have a long-time devotion to the German shepherd breed that began in 1976 when they adopted their first, a homeless dog they named Sascha. Since then, they have adopted only German shepherds—each remembered fondly as their best friend and loyal companion—and rescued more than 30 as members of the German Shepherd Rescue of Northern California.

"These bricks are an enduring tribute to our German shepherds we loved so much," Bob said. "We could not think of a better way to memorialize them. It's also meaningful to know that our gift will support research to help treat cancer and other diseases so that dogs like ours won't have to suffer."

Donations to the Memorial Brick Fund support the team of clinical faculty and research scientists dedicated to generating new knowledge to benefit animals. Through research, the CCAH works to better identify, diagnose, treat and prevent animal diseases and conditions.

Do you have a beloved pet you'd like to memorialize? Please contact a member of our Advancement team at 530-752-7024 or visit give.ucdavis.edu/Go/MemorialBrick.

## Mentored Resident Research Opens Doors

As the daughter of a veterinary oncologist, Dr. Kristen Couto aspired to become a specialist herself. Soon after earning her veterinary degree from The Ohio State University in 2013, she began following in her father's footsteps and entered the oncology residency program at the UC Davis veterinary hospital.

Under the mentorship of Dr. Katherine Skorupski, Couto was able to participate in research projects during her three-year residency. Thanks to a grant from the CCAH, she led research that characterized small cell, T-cell intestinal lymphoma for the first time in dogs. The research team found that affected dogs have prolonged survival rates compared with dogs affected by high-grade gastrointestinal lymphoma. The team also discovered that survival times were significantly longer for dogs that received oral chemotherapy treatment versus those that did not. These findings confirm that small cell, T-cell intestinal lymphoma is a distinct disease process in dogs.

"I enjoyed the research opportunities that were available during my residency, and honestly wish I could have had more," Couto said. "My projects at UC Davis allowed me to have a better understanding of how to prepare for potential research opportunities in the future, which is something that I am interested in continuing throughout my career."

Following her residency, Couto became a diplomate of the American College of Veterinary Internal Medicine, making her board-certified in the sub-specialty of oncology.

"I felt incredibly prepared for my career at the end of my residency," she said. "The combination of a busy caseload (which translates well to private practice) and more didactic training allowed for a great understanding of cancer biology, chemotherapy drugs, and how they can be used to our advantage as oncologists."

Couto is now in private oncology practice in the Sacramento area.

Dr. Kristen Couto completed her oncology residency at UC Davis in 2017.

## Million Cat Challenge 2.0

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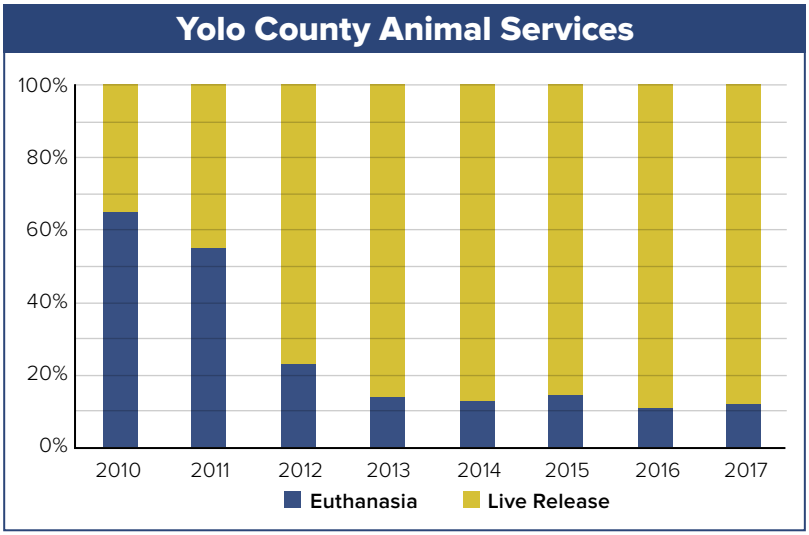



Approximately 860,000 cats are euthanized each year, but that number continues to decrease due to changes in how shelter animals are housed and the approach to medical care and treatment. Today, 45 percent of cats that enter shelters go through Million Cat Challenge partner facilities, resulting in 450,000 fewer cats euthanized last year than in 2013. This progress has informed the next phase of the challenge.

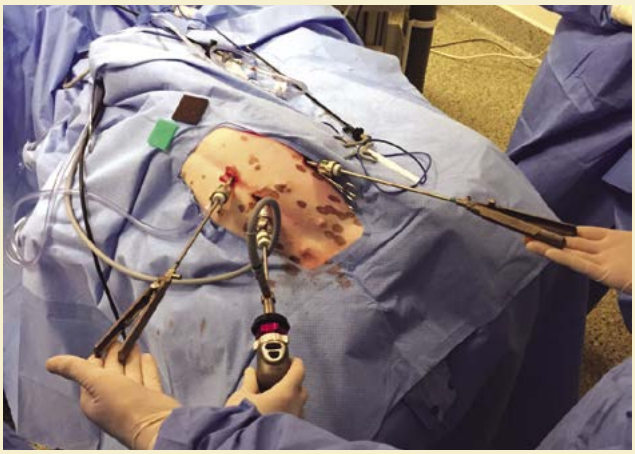
"What we ultimately want is the right outcome for every cat that comes to a shelter," said Dr. Kate Hurley, director of the Koret Shelter Medicine Program at the CCAH and school alumna. "We know the same things that got us here won't necessarily get us there, and we've identified strategies to take us to the next level. Our biggest hurdle is reaching shelters outside of our network."

Levy and Hurley know that to get more of those shelters to partner with the challenge, they need to be creative.

"Million Cat shelters are going to have to help us recruit and set us up on blind dates!" Hurley said. "Don't be surprised if you see Julie and me passing you in a cheetah print VW bus one day. We'll go door-to-door on a cross-country road trip if that's what it takes."

## Exploring Treatment Alternatives to Reflux Disorder

Reflux disorders in dogs lead to a constellation of uncomfortable and dangerous symptoms. Conditions such as sliding hiatal hernia (SHH) (abnormal passage of part of the stomach into the chest cavity) and excessive gastroesophageal reflux (GER), may cause regurgitation of food and water, discomfort, esophageal inflammation and aspiration pneumonia.



Laparoscopic surgeries are generally less invasive and lead to faster recoveries.

A collaborative team of veterinary clinicians and researchers at UC Davis are exploring the best treatment alternatives for these conditions, thanks to the generous support of donors to the CCAH. While evaluation of surgical techniques on these conditions in humans has been extensively studied, there is little research in veterinary medicine.

The group—comprised of surgeons, internal medicine specialists and radiologists—first looked at open surgical management of the conditions. Seventeen dogs took part in the study, including bulldogs, terriers, poodles, pointers and mixed breeds. Before surgery, 76 percent of the dogs had a history of regurgitation; 24 percent had radiographic evidence of aspiration pneumonia. Following surgery, regurgitation shortly after eating improved in 80 percent of the dogs with this problem.

"Despite the majority of dog owners reporting lower scores for these clinical signs, not all dogs returned to normal postoperatively," said Dr. Philipp Mayhew, a soft tissue surgeon and lead author of the study. "This is critical information in educating owners regarding the outcomes of this surgical approach for SHH and/or GER, and suggests that alterations in surgical technique should be considered to further improve clinical outcomes."

Dr. Sita Withers and her dog, Pixie.

# Training Veterinarians in Research

One of the goals of the CCAH is to train the next generation of clinician scientists who will tackle the biggest problems facing animal health. We do this by supporting the research of the best and brightest young clinical veterinarians who want to also pursue research.

Dr. Sita Withers discovered an interest in oncology while in veterinary school in Melbourne, Australia. But it wasn't until she came to UC Davis in 2011 for a residency program that she realized a passion for research that she could take from the lab to the clinic, transforming the care she could deliver to her patients.

In fact, her three-year medical oncology residency within the CCAH inspired Withers to pursue a subsequent one-year fellowship, funded by donations to the center, and then a Ph.D. with Dr. Robert Rebhun.

"I've always been interested in cancer immunology—how your body reacts to cancer," Withers said. "In the past 10 years on the human side, there have been a lot of advances in immunotherapy, but not as much on the veterinary side."

During her residency, Withers had the opportunity to spend time in Dr. William Murphy's lab in Sacramento at UC Davis Health. She learned a number of techniques there with human medicine researchers that she could apply to canine research at the CCAH. It also made her realize the gaps in knowledge when it came to understanding the canine immune response to naturally-occurring cancers.

"In dogs, we don't have a way to look at lymphocyte subsets (as they have in humans and mice for decades)," Withers said. "This limits testing for particular biomarkers that could be helpful in understanding if our canine patients are responding to treatment."

The first part of her thesis focused on identifying those lymphocyte subsets, with the hope that information could be applied to clinical trials and in looking at response to treatment for any immune-system study, not just cancer. Additionally, she was able to show that as dogs age, they have fewer naïve t-cells to mount an immune response. That has implications for stratifying patients in future clinical studies by age.

"You can't have your cancer population in a study being on average five years older than your healthy population," she said.

In another parallel discovery between human and canine patients, Withers was able to determine that in a cohort of 25 dogs with osteosarcoma, a type of bone cancer, a higher level of macrophages within the tumor resulted in better outcomes (which is different than in other forms of cancer).

"If more macrophages are a good thing, then drugs that improve their activity may be effective in treating canine osteosarcoma," Withers said.

Withers credits her experience at UC Davis in preparing her well for her next step at Louisiana State University where she will begin as an assistant professor in November.

"Collaboration across departments and with UC Davis Health has been one of the best things about being here," Withers said. "The combination of research and clinical exposure to challenging cases has given me a strong foundation."

Now, the researchers are taking the project a step further by evaluating laparoscopic surgical treatment of SHH and GER. This will be the first characterization of a minimally invasive approach for these disorders in dogs. In human medicine, surgical management of SHH and GER is almost exclusively performed in a minimally invasive fashion, and the researchers hypothesize that canine patients will equally benefit from the procedure.

To date, the group has performed 14 minimally invasive procedures. The results of the study will show whether the laparoscopic approach is less effective, as effective, or more effective than traditional open surgery. Other minimally invasive procedures in veterinary medicine already indicate that the surgeries are less painful for the patient, reduce post-operative complications, and have faster recovery times than open surgeries.

The study remains open, and the team is interested in enrolling more cases. For more information, please contact: philmayhew@gmail.com or call 530-752-1393 to make an appointment with Soft Tissue Surgery.

# Developing a Feline Vaccine Against *Toxoplasma*

For a tiny single-celled organism, *Toxoplasma gondii (T. gondii)* can wreak a lot of havoc. While this common parasite can infect all warm-blooded animals, often without obvious symptoms, it is capable of causing serious complications and even death for infants born to mothers infected during pregnancy and for people with weakened immune systems.

*T. gondii* relies on the gut of cats to provide a breeding ground where it produces environmentally resistant egg-like cells, called oocysts, that are spread via cat feces. UC Davis researchers, led by Associate Professor Jeroen Saeij, are conducting the basic science necessary to develop a feline vaccine.

Saeij spent eight years at the Massachusetts Institute of Technology looking at human aspects of toxoplasmosis. He came to UC Davis because of the many faculty studying host-pathogen interactions, his interest in toxoplasmosis as an animal disease, and because he wanted to better understand the sexual cycle of the parasite with the ultimate goal of creating a vaccine. In the past, he explained, there hasn't been much interest by companies to develop a feline vaccine because cats infected with *T. gondii* are often asymptomatic.

He was able to launch the early stages of this research with the help of two grants from the CCAH. This seed funding helped Saeij and David Arranz-Solís, a researcher in his lab, show they could genetically manipulate a cat-compatible *T. gondii* strain. Their preliminary data enabled them to obtain a 2-year, $275,000 National Institutes of Health R21 grant designated for more innovative, risky ideas.

"This NIH grant wouldn't be possible without the CCAH funding to establish proof of concept," Saeij said. "But developing the vaccine is proving to be trickier than we anticipated. It will take a while, but eventually it will work."

Their idea is to use cutting-edge genetic engineering techniques to make an oocyst-based vaccine from a strain that only during cat infection will inactivate specific genes so that it can no longer convert into transmissible forms. Oocysts are the perfect live vaccine because they are extremely stable and generate a strong mucosal and systemic immune response in cats upon oral ingestion.

Saeij said there are a number of misconceptions about toxoplasmosis and cats. In the vast majority of cases, cats shed the *T. gondii* oocysts during one week of their lives and become immune to reinfection and reshedding of the parasite. Outdoor cats are more susceptible because they may be eating infected rodents and birds. Indoor cats are rarely positive for *T. gondii*, but physicians still advise pregnant women not to clean litter boxes.

A cat can produce up to a billion of these oocysts, and even one can infect another animal. They get into the food chain, affecting pigs, sheep, goats and even cattle. People can also pick them up from gardening and eating unwashed vegetables and fruit. Infection with this parasite has also been linked to the deaths of wildlife species such as endangered Hawaiian monk seals and threatened Southern sea otters. In theory, if all cats were vaccinated, the prevalence of toxoplasmosis would drop significantly.

"If we can develop a standard vaccine for cats, we may also be able to decrease the incidence of cats relinquished to shelters due to a woman's pregnancy," he said. "A vaccine would be beneficial for cats, humans, livestock and wildlife."

Dr. Jeroen Saeij in his lab.

# Thank You

## July 1, 2017 to June 30, 2018

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The CCAH is dedicated to advancing studies in veterinary medicine—encompassing new ways to prevent, diagnose and treat diseases including cancers, genetic and immune disorders, infectious diseases, kidney and heart diseases, and nutritional disorders in companion animals. We welcome visitors to come and learn more about our mission and programs. To schedule a visit, please call 530-752-7295.



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# Highlights of Donor Funded CCAH Research Studies

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- Developing a better treatment for canine heart disease
- Improving anesthesia safety for rabbits
- Advancing lymphoma treatment for dogs
- Exploring a new drug to treat feline diabetes

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Honor a loved one by visiting give.ucdavis.edu/Go/care or calling 530-752-7024.