



UCDAVIS

VETERINARY MEDICINE

Center for Companion Animal Health

CCAH UPDATE

SPRING 2023

Uncovering Secrets to Feline Longevity

Contrary to the proverb that cats have nine lives, our feline companions only have one. So, it's important to understand what drives longevity, disease and death so that we can help provide as many quality years as possible.

UC Davis veterinary researchers, led by CCAH Director and radiation oncologist Dr. Michael Kent, embarked on a multi-year investigation through the school's extensive electronic medical record system to find answers. Their study, published in the scientific journal *PLoS One*, examined the cases of more than 3,100 client-owned cats (85% of them mixed breed) who underwent a necropsy – or post-mortem examination – at the UC Davis veterinary hospital between 1989 and 2019.

They examined demographic and environmental factors, age, cause of death and spay/neuter status – information that wouldn't normally appear on a pathology report that may provide additional insight.

See Feline Longevity on page 4

Photos: Margaret Graham



From the Director

Welcome to spring and another CCAH Update. In this issue we bring you exciting news on the work we are doing with your help and support. I hope this issue demonstrates how we are putting your donations to good use toward advancing the health of all animals.

Investing in people and programs creates a ripple effect for years to come. For example, the years of work and dedication shown by our [Koret Shelter Medicine program](#) led the state to choose us to spearhead the 50-million-dollar grants program to improve animal shelters across California.

In addition to funding individual studies, your gifts support faculty as they mentor DVM students through their first research projects to help launch their careers. When it comes to mentoring the next generation, we have two examples in this newsletter. The first is our cover story. As a DVM student, Sophie Karchemskiy approached me about conducting research. A group of us had just decided to analyze 30 years of post-mortem examinations of cats from our hospital to identify determinants of health and longevity. Dr. Karchemskiy, as she is now known, was instrumental in carrying out this study, and in the process, we were able to help train her in doing this type of research. She is currently doing an internship in New York City.

The second example is Dr. Sarah Michalak, who is currently a [small animal internal medicine](#) resident. As a student she was mentored by Dr. Sara Thomasy in ophthalmology to help run a clinical trial of a drug to treat primary corneal endothelial degeneration in dogs, which turned out to be successful. Not only do we gain more information and help develop new treatments when we train the next generation in research, but we inspire them to advance their careers and continue to push the boundaries throughout their careers so we can better fight disease and improve health.

The stories we tell you here are just a portion of what is happening through the center. It is an honor and a pleasure to serve as the CCAH director where I get to witness first-hand the ideas being generated, the next generation being trained and the studies being carried out and finished—these all lead to better health.

None of this would be possible without you, so please accept my thank you on behalf of all of us and the animals whose lives we impact.

My best,



Michael Kent, DVM, DACIMV (Oncology),
DACVR (Radiation Oncology)
Director, CCAH



Photo: Ryan Fitch

Optimizing PATIENT CARE

When a clinical trial takes place to test drug efficacy, there is much more to the study than simply assessing whether a drug works. Associate Professor Luke Wittenburg's research in pharmacokinetics – what the body does to a drug – plays an important role in this discovery process.

When a drug is administered, pharmacokinetics looks at four stages: how it is absorbed, where the drug is distributed in the body, how the body metabolizes it, and how the drug is excreted. All those components can vary between and within species, making drug dosing complicated.

In veterinary oncology, for example, some drug dosing is built from studies on humans. In recent research published in *Veterinary and Comparative Oncology*, Wittenburg and other UC Davis veterinarians showed how this is not always ideal. Their research demonstrated that the common chemotherapy drug cyclophosphamide is metabolized differently in humans and dogs. The oral drug can be given all at once or as three daily fractions. When given for three days in humans, increased exposure to the active metabolite makes the drug increasingly stronger. The same does not hold true for canine patients.

“This is why we need to understand how drugs react specifically to dogs, cats, and other animals, then build dosing regimens tailored for each species,” said Wittenburg. “There are even specific populations within a species that may need a more refined dosing, such as cancer patients with kidney impairments compared to ones with normal functioning kidneys.”

“We need to understand how drugs react specifically to dogs, cats, and other animals, then build dosing regimens tailored for each species.”

– Luke Wittenburg

This optimization of drug dosing is Wittenburg's focus as director of a new CCAH Core laboratory that will help clinician scientists with specific aspects of clinical trials.

“We can support an oncology study by measuring drug levels in blood or tissue and apply that to the pharmacokinetics of chemotherapy drugs,” said Wittenburg. “For example, a drug may work in one dog but not another. We can help determine if it was the drug that didn't work or just the concentration of it.”

Wittenburg credits funding from CCAH donors with much of his success at UC Davis. [CCAH grants](#) helped establish his initial research program several years ago, and every pharmacokinetics research project since has been funded by the center. The funding has even snowballed into larger projects—preliminary data collected from CCAH-funded research led to him receiving a National Institutes of Health grant for five years of research funding.



Faculty member Luke Wittenburg with the tandem mass spectrometer, which is used to measure drug concentrations in fluid and tissue samples for pharmacokinetic analysis. Photo: Mike Bannasch

COVER STORY

Feline Longevity from page 1

“We were really surprised to discover that intact cats of both genders had significantly shorter life spans,” said Kent. “That’s a huge finding.”

Overall, the median age of death for intact females was 1.5 years, but that included kittens who may have been born with a congenital disease and didn’t have the chance to be spayed, so the researchers reevaluated the data to remove cats under one year of age. For intact female cats older than 12 months, the median age of death was 4.7 years compared to 10.5 for spayed females. For intact males over the age of one year, the median age of death was 3.7 years compared to 9.8 for their neutered counterparts.

“These are very significantly different median ages of death and also show the high cost of reproduction for females,” Kent said. “We knew that cats get cancer, renal and heart disease, but we wanted a clearer picture of what may impact disease process or contribute to longevity.”

The study revealed that cancer was the cause of death in more than 35% of cases, although it was identified in 41%, so it didn’t cause death in all cats with cancer. Approximately one-third of the cats had one cancerous tumor, 146 had two tumors, and there were a few cases with up to five tumors.

“As an oncologist, the percentage of deaths attributed to cancer didn’t surprise me,” Kent said. “We see a lot of those cases, so we have a bit of a skewed population.”

Perhaps a bit more surprising was the percentage of cases with renal disease.

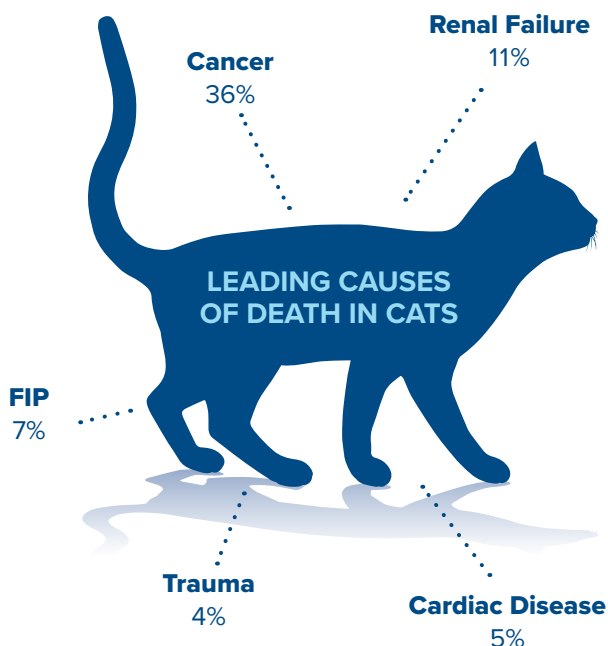
“Kidney abnormalities were present in nearly 63% of cats in the study,” said Dr. Patricia Pesavento, a member of the team. “While primary kidney disease was responsible for killing 13%, co-morbidity [the presence of two or more diseases] could affect the quality of life or increase susceptibility to other diseases in many more cats. The question is what causes renal disease in cats? What can we do about that?” The CCAH is dedicated to answering these questions.



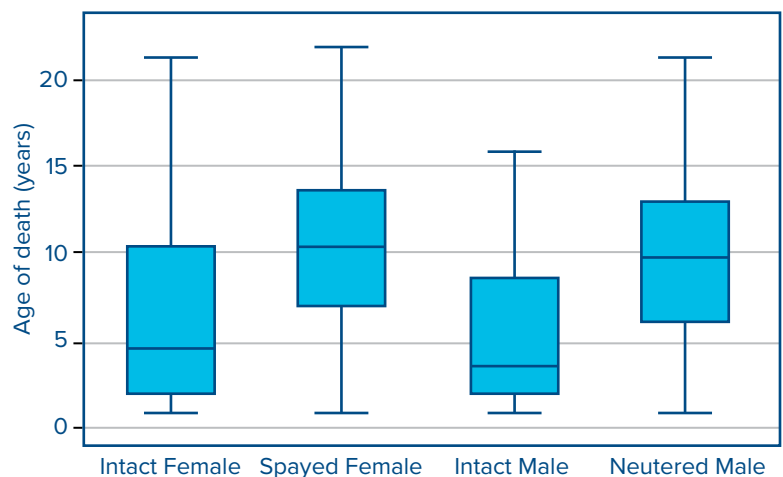
[Feline infectious peritonitis \(FIP\)](#) remains a significant cause of mortality in young cats and was responsible for approximately 1 in 20 deaths in the study. Fortunately, large collaborative teams at UC Davis are on the forefront of curing FIP with two clinical trials currently underway. (See the Fall 2022 issue of [CCA Update](#).) Another interesting finding was that

LONGEVITY AND MORTALITY IN CATS

A single institution necropsy study of 3,108 cases (1989-2019)



Spay and neuter status affects longevity in cats



Box plot showing age at time of death (median and range) for all cats ≥ 1 year where age was known categorized by sex. This shows in general that intact animals live shorter lives than those that have been spayed or neutered.

indoor/outdoor cats did not have a significantly shorter lifespan than indoor-only cats. Outdoor-only cats did have a shorter lifespan.

Generous CCAH donors helped strengthen the electronic medical records database in recent years, making this type of retrospective study possible. Still, poring through three decades of data on more than

3,000 cats is labor intensive. Kent credits the dedication and diligence of the team comprised of Drs. Bill Culp (surgeon), Amandine LeJeune (medical oncologist), Pesavento (pathologist), Christine Toedebusch (neurologist), Rachel Brady and Robert Rebhun (oncologists), as well as veterinary student Sophie Karchemskiy—who is now a DVM intern at The Animal Medical Center in NYC. Participating

in this study under Kent’s mentorship helped Karchemskiy further her research skills.

“Every member of a collaborative team like this plays a significant role,” Kent said. “Time and again, scientific discoveries show that teams work better.”

To [see or download](https://doi.org/10.1371/journal.pone.0278199) the entire article free of charge please go to: <https://doi.org/10.1371/journal.pone.0278199>

Clinical Trials **SAVING KITTENS**

Chunk was a tiny 21-day-old kitten when he first arrived at the Front Street Shelter six months ago, weighing less than one pound. He was covered in ringworm, a fungal infection of the skin, and brought to the [UC Davis veterinary hospital](#) where he was enrolled in a CCAH-funded clinical trial studying various treatments for the disease.

There is little information published on ringworm in kittens, especially the application of certain medications. The disease is highly contagious, and treatment is time consuming. Because of this, many shelters are forced to euthanize kittens with ringworm.

Dr. Karen Vernau, a neurology professor and faculty advisor for the [Orphan Kitten Project](#), directs the study. The relationships she has built with local shelters and rescues have saved hundreds, if not thousands, of kittens over the years and led to important hands-on extra-curricular activities for veterinary students.

“One of the shelters recently told me that whenever they see something concerning in their kittens, they ask if UC Davis has a study on it,” said Vernau. “Thanks to CCAH donors, many kittens are saved because of these clinical trials.”

Chunk’s treatment for ringworm was successful, but his growth was slow. Thanks to attentive care at UC Davis, he was diagnosed with hypothyroidism. Vernau was also conducting a clinical trial on this disorder, which is poorly characterized in kittens. The CCAH-funded study is establishing normal reference intervals for thyroid hormone levels in kittens and is determining treatment guidelines.

Chunk was enrolled in the hypothyroid study and quickly started gaining weight.

“He’s so lucky to have had the ringworm study,” said Lesa Saville, Chuck’s dedicated foster mom. “I truly believe that saved his life because that’s how his hypothyroidism was discovered.”

Thanks to both CCAH donor funded studies, Chunk is now six pounds and has been adopted.



Donor Support Fosters PASSION FOR RESEARCH



Dr. Sarah Michalak's CCAH-funded research, conducted while a student in the STAR program, was recently published. Photo: Mike Bannasch

Early in her veterinary studies, Dr. Sarah Michalak knew that she wanted to pursue research, but she needed a mentor to direct that passion. She found one in Dr. Sara Thomasy, an ophthalmology professor with a long history of mentoring both undergraduate and DVM students. Together, they embarked on a research project through the school's [Students Training in Advanced Research \(STAR\)](#) program, which involved Michalak taking the lead on a CCAH-funded clinical trial testing the efficacy of a topical medication for a canine eye disease.

Michalak, now a resident with the hospital's Internal Medicine Service, started the project during the summer following her second year of DVM studies. While most STAR projects last for 10 weeks, the ophthalmology clinical trial lasted for a year, so Michalak continued working on the study into her third year of veterinary school. The data collection was completed during her fourth year.

"Dr. Michalak's project was highly ambitious because she demonstrated an incredible aptitude and capacity for research," said Thomasy. "She was essential to structuring the clinical trial in a very organized, intuitive way and she performed all the data analysis for this project."

Following graduation, Michalak completed the manuscript during her one-year rotating internship at Colorado State University. She returned to UC Davis the following year to begin her residency and during her first week, learned the manuscript had been accepted for publication. The research, which demonstrated that the drug Ripasudil was well-tolerated in dogs with primary corneal endothelial degeneration (showing that 62% of eyes treated showed improvement or stability), was published in the journal *Translational Vision Science & Technology*.

"Dr. Thomasy has become one of my greatest role models and has supported me through every step of my career," she said.

Michalak's love of research may translate to a career in academia soon, where she hopes to pay that mentorship forward.

REDWOOD SEED SCHOLARS JOIN THE VETERINARY SCHOOL

If you've visited the CCAH, you may have seen a new face on the team. Ryan Fitch (center) is one of three Redwood SEED (Supported Education to Elevate Diversity) Scholars who have joined the veterinary school as assistants. A collaboration between the UC Davis MIND Institute; the Office of the Vice Chancellor of Diversity, Equity, and Inclusion; and the Division of Continuing and Professional Education, the SEED scholar initiative is a four-year UC Davis residential program for students with intellectual disabilities. Scholars are full-time non-degree students working toward a practical credential and preparing for employment. Ryan has been working in the CCAH office, including taking photos and video for use by the center. Both cover photos for this year's CCAH annual report were taken by him. He has also been able to advance his skills by working with the school's photographers. The goal is to help Ryan flourish in a chosen career path. In addition, Sophie Howarth (left) serves on the Development team and Cristina Riegos assists the client services group at the veterinary hospital. Please say hi if you see them around the school!



Photo: Lyra Pineda-Nelson

Bringing Health, Longevity and Wellness to **COMPANION ANIMALS**

The Dmarlou Foundation helps advance our shared goals of improving animal health and welfare for countless cherished pets through their generosity and long-time partnership. In recognition of that commitment, the foundation received the El Blanco Award in 2018—one of the school's highest honors.

Continuing their support in 2021, the Dmarlou Foundation provided funds for vital pieces of equipment to our hospital's blood bank to process and store life-saving blood for patients needing transfusions.

Most recently, the Dmarlou Foundation contributed a gift to our cardiology group to acquire a Rhythmia HDx Mapping and Navigation System—permitting the use of minimally invasive catheters to find and treat abnormal areas of the heart that are causing arrhythmias, or abnormal heart rhythms.

“We are proud to be trustees of the Dmarlou Foundation, which was founded by Dorothy and Martell J. Kaliski for their love of animals,” said Felipe R. Santiago, Dmarlou Foundation trustee.

The foundation also contributed a gift for multiple anesthesia workstations for the new Advanced Veterinary Surgery Center, a facility that will open later this year and expand the capacity of exceptional care to more patients while breaking new ground in surgical innovation.

“This state-of-the-art facility will greatly impact both the quality and quantity of surgeries to improve animal health that will soon be performed here,” commented Richard Rahl, Dmarlou Foundation trustee.

In addition, the Dmarlou Foundation has been instrumental in the fight against cancer. Thanks to their partnership, the school was able to launch a stereotactic radiosurgery program treating cats and dogs with brain tumors in 2009, and purchase a new linear accelerator in 2012 to implement advanced radiation treatments for cancer patients.

“We are immensely grateful to the Dmarlou Foundation for their sustained generosity and dedication to animal health,” said CCAH Director Michael Kent. “They help us honor our promise of bringing health, longevity and wellness to companion animals.”



Dmarlou Foundation trustees Barry T. Joseph (left) and Felipe R. Santiago (center) receiving the El Blanco Award in 2018 from Dean Emeritus Michael Lairmore. Photo: Don Preisler



From left, Dmarlou Foundation trustees Susan and Richard Rahl with CCAH Director Michael Kent as they tour the new Advanced Veterinary Surgery Center under construction. Photo: Mike Bannasch

Keeping People AND PETS TOGETHER

Across the country, animal shelters are struggling as intakes continue to rise and pet euthanasia increases for the first time in five years.

Most animals entering California shelters need sterilization surgery before they can be adopted, so access to spay and neuter services has been the bedrock of successful efforts to reduce euthanasia in those shelters. However, staffing shortages and surgery backlogs nationwide have left many shelters without access to a veterinarian on staff or in the community to keep pace with that need—let alone provide other medical care for the tens of thousands of animals entering shelters in our state. Demand has so far outpaced supply that the most affordable option for these surgeries in some California cities starts at \$600, a price that is out of reach for many Americans.

Mariah and her family lost their home and were faced with the decision of either continuing to live unhoused or losing their beloved dog, Apollo. They spent months on waiting lists before they were able to find assistance through Front Street Animal Shelter's Homeless Outreach and Assistance Program (HOAP). Through the program, Apollo was able to get vaccinated and neutered, along with the other dogs and puppies at their camp.

"There is no way I could have gotten this done without help," said Mariah, "Without this surgery and vaccinations, my housing options are even more limited."

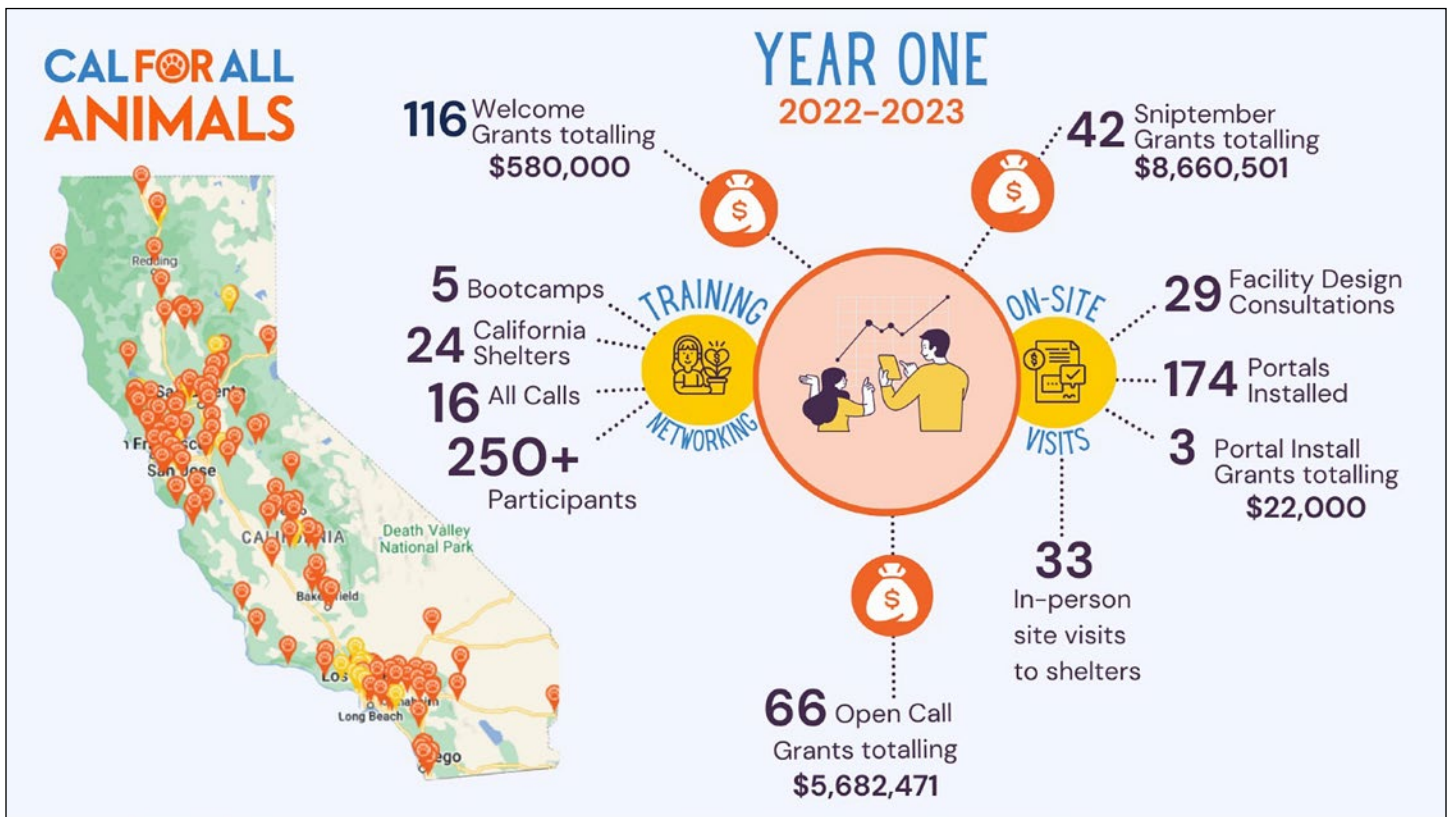
Apollo's surgery funds were made available through a "SnipSeptember" grant awarded to Front Street Animal Shelter through [California for All Animals](#) – one of three programs managed by the UC Davis Koret Shelter Medicine Program (KSMP). The program uses a three-pronged approach to support shelters: student training, comprehensive shelter mentorship (e.g., consultations, expert support, training, and facility design) and grant funding.

Mariah was able to find housing with her canine companion, Apollo, thanks to a grant supported by the Koret Shelter Medicine Program that provided neutering and vaccination services.
Courtesy image

"There is no way I could have gotten this done without help. Without this surgery and vaccinations, my housing options are even more limited."

– Mariah





The KSMP Student Training Program helps relieve the surgery bottleneck at Yolo County Animal Services shelter through a partnership that allows fourth-year veterinary students to train in spay and neuter, along with other aspects of shelter medicine and surgery. During a two-week clinical rotation, students gain hands-on experience in high-quality, high-volume spay and neuter (HQHVSN) while meeting a core surgery requirement for graduation. The partnership is a win-win for the shelter and the students, but the animals are the ultimate beneficiaries. During the 2021-2022 school year, students performed 1,100 spay/neuter surgeries on cats and dogs waiting for a new home.

“The best part of my job is witnessing how many students are positively impacted by their time at the shelter,” said Dr. Stacy Kraus, DVM, a KSMP clinical instructor. “By the time they’ve completed the rotation they understand the massive impact a shelter veterinarian has in their community.”

Beyond Yolo County, the program is working to expand surgery capacity through California for All Animals funding. Recently, the one-year-old program awarded more than 8 million dollars in grants to promote innovation through shared surgery space, transportation, and HQHVSN training that can help upskill veterinarians and increase performance.

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– Dr. Stacy Kraus, DVM, a KSMP clinical instructor

“Shelters place a big focus on community partnerships – from programming centered on foster care, community cats or community engagement,” said Program Manager Nadia Oseguera. “Sustainable change takes time, but this funding means that shelters can turn their ideas into action.”

One idea already turned to action allowed Mariah and Apollo to secure permanent housing.

“I don’t even have words to express my gratitude,” said Mariah. “Without this program we’d still be in a tent.”

REVOLUTIONIZING Oral Cancer Treatments

For the past five years, new faculty member Dr. Stephanie Goldschmidt was the section chief of the University of Minnesota's Dentistry and Oral Surgery Service. However, as a solo practitioner there, she missed being part of a collaborative group of clinicians and cancer researchers.

Now at UC Davis, she joins a team that is establishing new protocols of care and revolutionizing oral medicine. With her exciting idea to change the surgical approach to tumors, she fits right in with this groundbreaking service.

Tumors that result from melanoma or squamous cell carcinoma – two of the most common oral cancers – can destroy the underlying jaw, making eating and playing difficult or impossible.

Goldschmidt is determined to develop an intraoperative tool to delineate cancerous tissue from healthy tissue in real time. This would allow surgeons to remove all cancerous material without disturbing healthy areas, and decrease the chance of significant functional or cosmetic side effects.

“This tool will give us better diagnostics to guide surgical resection,” said Goldschmidt. “It will allow us to remove all tumor tissue efficiently and stop the spread of cancer, helping our patients gain remission.”

To develop the tool, Goldschmidt is working with the Biomedical Engineering Department to create a machine to study fluorescence imaging and the changes in fluorescence properties in cancerous tissue compared to healthy tissue. Similar work is being done at the UC Davis School of Medicine, and Goldschmidt hopes that data gathered from animals will also help apply this technology for people. She has already applied for a CCAH grant to begin pilot data collection later this year and drive this research toward clinical application.

Not only is Goldschmidt determined to improve surgical tools and techniques, but her laboratory is also focused on

better understanding how cancers grow and how they react to drugs. She is currently working on establishing both feline and canine squamous cell carcinoma cell lines. Her overarching goal is to improve diagnostic and treatment options in companion pets with oral cancers to improve patient specific outcomes.

“The donors to CCAH play such an important role,” said Goldschmidt. “Their generosity helps to incentivize participation in clinical trials, allowing us to recruit more patients. Not only are we helping to improve the lives of more pets, but we are also able to gather more information to prove new techniques and technologies work.”



New faculty member Stephanie Goldschmidt is expanding research to better understand and treat oral cancers.
Photo: Mike Bannasch

THANK YOU!

Companion Animal Memorial Fund Honor Roll



Thank you to our Companion Animal Memorial Fund veterinary partners for making a difference! Through your meaningful tributes, you honored the memory of beloved pets and brought comfort to their caring families. Your donations made a tremendous impact supporting clinical health research to improve treatment for diseases affecting companion animals. We are pleased to recognize veterinarians and clinics who donated to this fund in 2022.

- | | | | |
|---|---|--|---|
| A Gentle Rest | Cheryl M. Ramos, DVM | Laguna Veterinary Hospital | River Oak Veterinary Hospital, Inc. |
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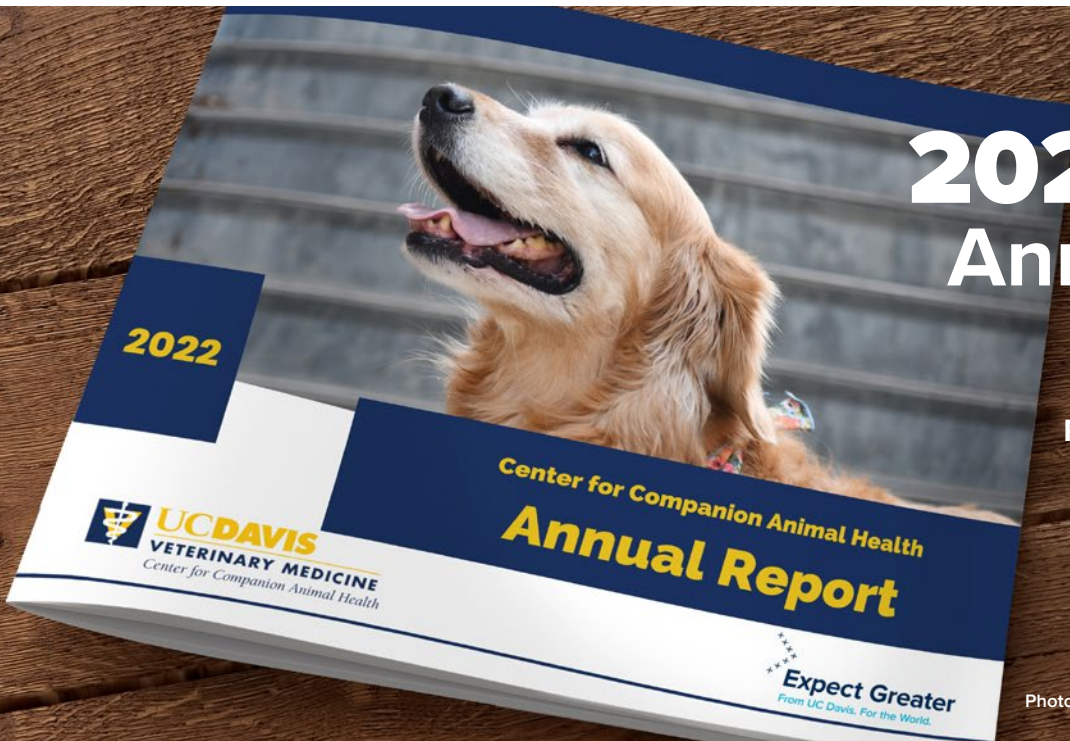
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2022 CCAH Annual Report

Want to learn more about the CCAH? The CCAH Annual Report highlights the activities and impacts of the CCAH on companion animal health.

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Photo: Ryan Fitch, CCAH Redwood SEED Scholar Student

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