



**2022**

**Center for Companion Animal Health**

# **Annual Report**



**UCDAVIS**

**VETERINARY MEDICINE**

*Center for Companion Animal Health*



**Expect Greater**

*From UC Davis. For the World.*

# From Our Director



Hello, friends –

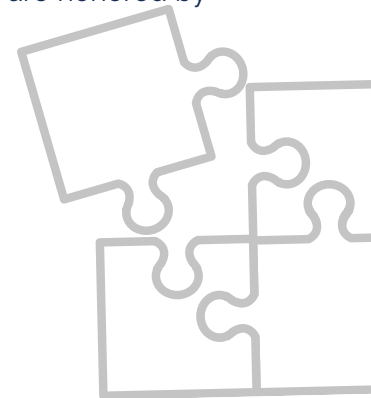
As I sit down to write this letter for our annual report, a few things come to mind. We started creating these reports four years ago, and I now wonder why we did not start these earlier. They are a huge amount of work (especially for Nancy, who does the heavy lifting) but worth it for so many reasons. First, we put this report together because we owe it to you – our friends and donors who provide all the support for us to carry out the great things we do. While we have newsletters throughout the year, we can't give you an idea of the depth and breadth of our research and programs and the impact they have without this report. If we continue to rely on you for support, which we do, we owe it to you to not just do the work, but also to tell you about it. Next, the report allows me to take stock each year of what our faculty and residents are working on and where the center needs to head to provide them with the resources needed to make the biggest improvements in animal health. It is so easy in the day-to-day work to lose sight of the overall picture, and writing the report allows us at the center to really look at what everyone has accomplished and celebrate the impact of these accomplishments.

Working in the clinic allows me to see firsthand why we need to carry out research that benefits companion animals. Over the 23 years I have been at the clinic, I have seen so many advances in so many areas that really show how far we have come. I have seen so many animals cured of disease, and countless others who have had their quality and quantity of life boosted and extended. But there is still much to do – the clinic shows this to me too. The cases we can't save, the diseases we have not made progress on – this is what inspires me to keep working to find better ways to diagnose and treat cancer. I know this is the same for our researchers and clinicians in every area of their work and in every species they care for. I know each of you has been touched by the lives of animals in our society, and we are honored by your support of the work we do to make their lives better, healthier and longer.

Thank you for helping us care for the animals we serve.

My best,

Michael S. Kent, MAS, DVM, DACVIM, DACVR, ECVDI (RO - Add on)  
Director, Center for Companion Animal Health  
UC Davis, School of Veterinary Medicine





Chamomile Jauregui  
Cardiac Genetics Lab  
Photo credit: Ryan Fitch

**Our mission** is to improve the health of companion animals by encouraging and supporting academic studies and clinical research into diseases affecting dogs, cats and other small pets. We are committed to developing and supporting programs that benefit pets and their owners. By doing this, we directly impact animal health.

"The CCAH Mission Statement says it all...the CCAH wants to improve the health of companion animals, and they believe that this can be done through a robust research program that is focused on solving issues that impact animal health. I have seen this firsthand, and I have witnessed the impact that support from the CCAH can have on conducting research and changing what we can offer our veterinary patients."

**William T. N. Culp, VMD, DACVS**  
Professor - Surgery

## How your support makes a difference:

### **Faculty Research Grants:**

CCAH provides competitive grant funding to our faculty in order to advance veterinary practices and innovative research in dogs, cats, and other companion animals.

### **Resident Research Grants:**

CCAH supports residents research projects which allow our residents the opportunity to engage in impactful research that will make a lasting impact on animal health in future generations.

### **Research Equipment Grants:**

CCAH funds research equipment grants in order for our faculty to be able to purchase new equipment to advance animal health research, as well as replace and repair old equipment so that can continue to be used.

Thanks to the support of our generous donors, the CCAH is able to annually support one faculty research call, four intern/resident/fellow research calls, and one research equipment call, as well as provide our faculty with matching grants in order to secure extramural research funding.

## CCAH Leadership & Administrative Team



**Michael S. Kent, MAS, DVM, DACVIM, DACVR**

Director - CCAH

Dr. Kent is a radiation oncologist whose main research interest is in radioimmunotherapy, specifically combining radiation along with immunotherapy to treat cancer. His clinical interests include advanced radiation techniques to improve clinical outcomes. He has a dog named Danson who is a career-change service dog, a rescue Burmese cat, seahorses, and fish.



**Rob Rebhun, DVM, PhD, Dip. ACVIM (Oncology)**

Associate Director - Cancer

Dr. Rebhun's main research is on comparative and translational oncology, bridging cancer knowledge from bench-to-bedside. His clinical interests center on cancer with a direct focus on osteosarcoma and metastasis. He and his family have a dog, cats, a guinea pig, rats, a rabbit, and a very interesting cockatiel.



**Kate F. Hurley, DVM, MPVM, Dip. ABVP (Shelter Medicine)**

Associate Director - Shelter Medicine

Dr. Hurley's main research interest focuses on the relationship between environment, health, and reducing shelter euthanasia, as well as effective strategies to manage community cats. Her clinical focus is collaborating with shelters to improve conditions for the animals and staff, as well as reducing the number of animals euthanized and increasing the number of animals safe in their homes. She has a one-eyed orange cat who believes he's a pirate.



**Danika Bannasch, DVM, PhD**

Associate Director - Genetics

Dr. Bannasch's main research focus is on dog inherited diseases. Her clinical interest includes veterinary genetics. She currently has two Nova Scotia duck tolling retrievers named Pint (retired UC Davis Aggie Tee dog) and Ritz, as well as two Danish-Swedish farmdogs named Cricket and Juice.



**Nancy Bei**

Center Manager



**Lyra Pineda-Nelson**

Account Manager



**Ryan Fitch**

Redwood SEED Scholar Student



### Meet Ryan - Our newest CCAH employee

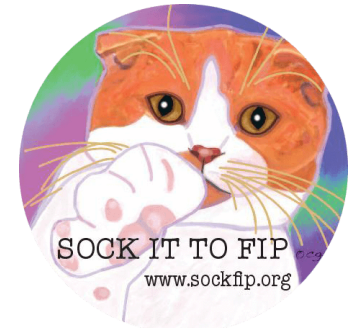


We are pleased to announce that Ryan Fitch recently joined our team here at the CCAH. Ryan is in the first class of Redwood SEED (Supported Education to Elevate Diversity) Scholars students attending UC Davis. This is a unique program that aims to advance the lives of students with intellectual disabilities. This is a full-time non-degree program for these amazing students, who are supported with peer mentors in academics, social inclusion, health and wellness, residential living and employment. Redwood SEED Scholars take part in internships both on and off campus with the goal of competitive, integrated employment. They live alongside other UC Davis students in on-campus housing and participate in campus clubs and organizations. Self-determination and choice are the seeds that are planted at the beginning of the program and what will guide them for the full four years.

Ryan comes from Santa Barbara and has a strong interest in photography and loves animals. He has been putting his skills to work taking pictures, which you will see throughout this report, and helping with the layout as well. We are so glad he could join our team and happy to have him contribute to our cause of improving animal health!

For more information on the Redwood SEED Scholars Program:  
[redwoodseed.ucdavis.edu](http://redwoodseed.ucdavis.edu)

### Meet SOCK FIP



Save Our Cats and Kittens from Feline Infectious Peritonitis (SOCK FIP) is a volunteer non-profit organization dedicated to eliminating Feline Infectious Peritonitis (FIP) through advocacy and community education and funds FIP research through the CCAH. The support of SOCK FIP is instrumental as we work on new preventions and treatments for this deadly disease. The "bracketing the cat" approach (i.e. developing a vaccine to protect cats from getting FIP as well as discovering affordable drug treatments) may finally end this fatal disease.

For more information on SOCK FIP please visit their website:  
[www.sockfip.org](http://www.sockfip.org)

*Thank you!*



## CCAH Scientific Advisory Committee



**William T. N. Culp, VMD, DACVS**

Dr. Culp's primary research and clinical focus includes Surgical Oncology, as well as Interventional Radiology. He currently has two dogs named Louie and Lucas, two cats named Orrie and Butters, two guinea pigs named Lettuce and Cilantro, and many fish.



**Denis Marcellin-Little, DEDV**

Dr. Marcellin-Little's main clinical focus is on small animal orthopedic surgery, specifically the management of joint diseases and limb deformities. His clinical research includes the pathophysiology, impact, and management of chronic pain and the use of digital tools, such as 3D printing and CAD software, to manage complex orthopedic problems. He has a dog and a cat.



**Peter Dickinson, BVSc, PhD, Dip. ACVIM (Neurology)**

Dr. Dickinson's main clinical interest is focused on Neurooncology, and his priority research includes Neurooncology, as well as genetics of heritable neurological diseases. He currently owns three badly behaved goats, one very badly behaved dog, and one well behaved chicken.



**Bruno Pypendop, DrMedVet, DrVetSci, DACVAA**

Dr. Pypendop's main clinical focus includes anesthesia and pain management. His core research interest consists of the clinical pharmacology of anesthetic and analgesic drugs, particularly in cats. His pets include three dogs, four cats, three horses, one donkey, eight chickens, two guinea pigs, and several freshwater fish.



**David J. Maggs, BVSc (Hons), DACVO**

Dr. Maggs' main clinical focus is on ocular surface diseases of dogs and cats. His priority research includes herpetic ocular disease as well as dry eye disease. While he considers himself more of a dog person, he finds that cats are more interesting patients, as they are more difficult to diagnose, and he is always up for that challenge.



**Jodi Westropp, DVM, PhD, DACVIM**

Dr. Westropp's research includes urinary tract infections, specifically novel therapies and promoting antimicrobial stewardship. In addition, she studies urolithiasis, specifically the pathophysiology of canine and feline urinary stone disease, as well as feline interstitial cystitis. Her clinical interests include canine and feline lower urinary tract disorders. She has a dog named Clarence and three Nigerian Dwarf Goats named Meg, Lois, and Audrey.



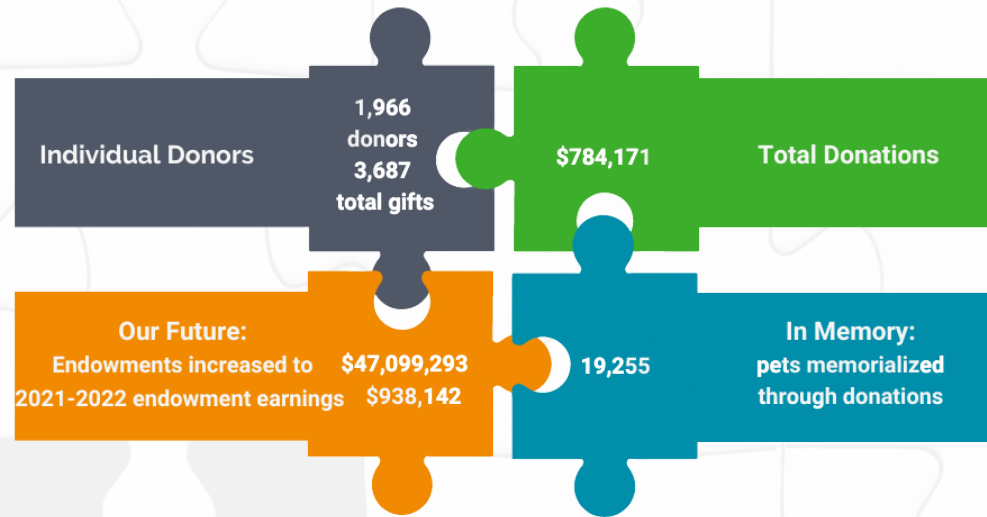
**Natalia Vapniarsky, DVM, PhD, DACVP**

Dr. Vapniarsky's primary research focus is on immunology of regenerative medicine. Her clinical interests include pathology, reproduction, and regenerative medicine, such as stem cell therapies. Dogs are her favorite animal and she owns a small terrier mix whose name is Daisy, as well as a German Shepard whose name is Ragnar.

The CCAH is grateful for our dedicated committee members who volunteer their time to review each grant proposal submitted by our faculty, residents, fellows and interns. Each proposal is assessed for scientific merit by our committee, who then competitively decide which studies will make the biggest advances in companion animal health, welfare, and quality of medicine. Our committee members serve a five-year renewable term.

How  
**YOUR**  
support  
fits into  
the puzzle!

## 2021-2022 Support



### CCAH Funding

(July 1, 2021 June 30, 2022)

Faculty Research Support	\$883,746
Equipment Support	\$207,580
Resident/Fellow Support	\$61,788
Postdoctoral Fellow Support	\$50,000
Program Support	\$56,276
Student Research Support	\$13,176
Laboratory / Building Maintenance	\$13,290

Nearly **\$29** million in companion animal research studies funded since 1991.

**\$441,271**  
received in extramural research grants leveraging CCAH matching funds

# Companion Animal Memorial Fund

**Thank you to our veterinary partners** for honoring the memory of beloved pets and making an impact on animal health. We are pleased to recognize the more than 220 veterinarians and clinics who supported this program in 2021, raising over \$180,000.

A Gentle Rest  
Acorn Hills Animal Center  
Acorn Veterinary Clinic, Inc.  
Adobe Veterinary Centers, LP  
Advanced Veterinary Specialists  
Aggie Animal Dental Center  
Agoura Animal Clinic, Inc.  
Alfred V. Atkinson, DVM, ABVP  
All Creatures Animal Hospital & Bird Clinic  
All Creatures Veterinary Hospital  
Allison S. Tashnek, DVM  
Amador Valley Veterinary Center, Inc.  
Andrew C. Klotz, DVM  
Animal & Bird Clinic of Mission Viejo, Inc.  
Animal Clinic at Lake of the Pines, Inc.  
Animal Clinic of Encino  
Animal Doctors  
Animal Hospital of Cloverdale  
Animal Hospital of Sebastopol  
Animal Medical Center  
Anza Animal Clinic, Inc.  
Aragon Veterinary Clinic, Inc.  
Armstrong Pet Hospital  
B & B Veterinary Hospital, Inc.  
Balboa Pet Hospital  
Banderas Pet Hospital, Inc.  
Bay Area Animal Eye Care  
Bear Valley Animal Clinic  
Bel Marin Animal Hospital  
Belmont Pet Hospital, Inc.  
Benicia Cat Clinic  
Bird & Pet Clinic of Roseville  
Bishop Ranch Veterinary Center  
Bishop Veterinary Hospital, Inc.  
Blue Cross Pet Hospital  
Blue Cross Veterinary Hospital  
Blue Cross Veterinary Hospital, Inc.  
Blue Oak Veterinary Hospital  
Brandner Veterinary Hospital, Inc.  
Brentwood Family Pet Care  
Broadway Pet Hospital, Inc.  
Callie Meeder, DVM  
Camarosa Veterinary Clinic  
Cambria Veterinary Clinic  
Camino Real Pet Clinic, Inc.  
Canyon Hills Animal Clinic, Inc.  
Care Veterinary Hospital  
Carlsen Animal Hospital, Inc.  
Cat and Bird Clinic  
Cat Clinic  
Cats Only Veterinary Hospital, Inc.  
Cedar Veterinary Hospital  
Central Coast Veterinary Acupuncture  
Ceres Veterinary Clinic, Inc.  
Chabot Veterinary Clinic  
Chad S. Alves, DVM  
Chico Animal Hospital  
Christine E. Sellers, DVM

Cirby Ridge Animal Hospital  
Coastside Veterinary Clinic, Inc.  
Codornices Veterinary Clinic, Inc.  
Coffee Road Veterinary Clinic  
Colusa Veterinary Hospital  
Companion Pet Clinic - Aloha  
Companions A. H., Inc.  
Compassionate Care Cat Hospice, Inc.  
Concord Adobe Animal Hospital  
County Line Animal Hospital, Inc.  
Cross Street Small Animal  
Veterinary Hospital  
Crystal Springs Pet Hospital, Inc.  
Cuyamaca Animal Hospital, Inc.  
Cynthia D. Massey, DVM  
Daniela P. Gestine, DVM  
Debra K. Melcon, DVM  
Del Mar Pet Hospital  
Dentistry for Animals  
Diablo View Veterinary Medical  
Hospital, Inc.  
Discovery Bay Veterinary Clinic  
Doctor's Office for Pets  
Doctors Pet Clinic  
Donner-Truckee Veterinary Hospital  
Dr. Inez Del Pino  
East Bay Veterinary Services, Inc.  
East San Rafael Veterinary Clinic  
East West Fusion  
Edgewood Veterinary Clinic, Inc.  
Edward L. Jackson, DVM  
El Camino Veterinary Hospital  
El Cerrito Veterinary Hospital  
Emergency Pet Clinic of Temecula  
Evergreen Animal Clinic, Inc.  
Evergreen Veterinary Clinic  
Evers Veterinary Clinic, Inc.  
Exeter Veterinary Hospital  
Four-Legged Friends Animal Hospital, Inc.  
Gilbert Teamvet, Inc.  
Global Veterinary Services, PLLC  
Grantline Veterinary Hospital, Inc.  
Halcyon Veterinary Corporation  
High Valley Veterinary Hospital  
Hillcrest Veterinary Hospital  
Howard Veterinary Consultation & Research  
Ilsi V. Medearis, DVM  
Indian Creek Veterinary Clinic, Inc.  
Irving Pet Hospital of San Francisco  
Jennifer M. Rau, DVM, Inc.  
John B. Elliott, DVM  
Keely A. Commins, DVM  
King City Veterinary Hospital  
Kittel Family Veterinary Practice, Inc.  
La Cumbre Animal Hospital, Inc.  
Ladera Ranch Animal Hospital, Inc.  
Laguna Veterinary Hospital  
Larkspur Landing Veterinary Hospital, Inc.

Laura T. Watkins, DVM  
Lifetime Animal Care Center, Inc.  
Lipman Veterinary Relief Services  
Little Cottonwood Animal Hospital, Inc.  
Livermore Veterinary Hospital  
Los Alamitos Animal Hospital, Inc.  
Los Osos Pet Hospital  
Manteca Veterinary Hospital  
Marina Hills Animal Hospital, Inc.  
Mary Press, DVM  
Matilija Veterinary Hospital, Inc.  
McKenzie Animal Clinic, Inc.  
Michael Gadd, DVM  
Michele C. Chin, DVM  
Midtown Animal Hospital  
Mid-Valley Veterinary Hospital  
Miramonte Veterinary Hospital  
Mobile Paws Veterinary Services  
Mono Way Veterinary Hospital, Inc.  
Monte Vista Animal Hospital  
Montecito Animal Clinic  
Moore Veterinary Care  
Moraga Veterinary Hospital  
Morro Bay Veterinary Clinic  
Mountainview Small Animal Hospital  
MSSAH, Inc.  
Muir Oaks Veterinary Hospital  
Murphy Avenue Veterinary, Inc.  
Napa Valley Veterinary Hospital, Inc.  
Newbury Park Veterinary Clinic  
Newport Hills Animal Hospital, Inc.  
Northgate Veterinary Hospital  
Northtown Guardian Vet Hospital Corp.  
Oak Park Veterinary Clinic  
Oakland Veterinary Hospital  
Oakridge Veterinary Clinic, Inc.  
Occidental Veterinary Hospital  
Ocean Beach Veterinary Clinic  
Old Towne Animal Hospital  
Orange Canyon Pet Clinic  
Oxnard Veterinary Hospital  
Park Centre Animal Hospital, Inc.  
Patrice K. Boroughs, DVM  
Patricia L. Foley, DVM  
Pet Vets of Folsom, Inc.  
Petaluma Central Animal Hospital, Inc.  
PetVet Care Centers Mgmt., LLC  
Point Reyes Animal Hospital, Inc.  
Rancho Bernardo Pet Hospital  
Rancho San Carlos Pet Clinic  
Rancho Viejo Animal Hospital  
Red Rabbit Veterinary Hospital, Inc.  
Redlands Animal Hospital, Inc.  
Redwood Veterinary Hospital, Vallejo  
Redwood Veterinary Hospital, Visalia  
Reedley Veterinary Hospital  
Richmond Veterinary Hospital  
River Oak Veterinary Hospital, Inc.

Ross Valley Veterinary Hospital  
Rural Animal Clinic, P.C.  
Sage Rock Veterinary Services, P.C.  
Samantha K. Hunt, DVM  
San Carlos Animal Hospital  
San Francisco Pet Behavior Consulting  
San Joaquin Veterinary Hospital  
San Juan Veterinary Hospital  
Scotts Valley Veterinary Clinic, Inc.  
Seven Hills Veterinary Hospital, Inc.  
Shane L. Stiver, DVM  
Sheryl Eckstein, DVM  
Slate Creek Animal Hospital  
Sonali Veterinary Corporation, APC  
South Auburn Veterinary Hospital  
South County Animal Hospital  
South Novato Animal Hospital  
Spring Valley Animal Medical  
Hospital, Inc.  
Steele Canyon Veterinary Clinic, APC  
Sunnyvale Veterinary Clinic, Inc.  
Susan Chew, DVM  
Susan B. Murphy, DVM  
Tarzana Pet Clinic, Inc.  
Tassajara Veterinary Clinic  
Terra Linda Veterinary Hospital, Inc.  
The Ark Pet Hospital, Inc.  
Timothy K. Haevernick, DVM  
Town & Country Animal Hospital  
Turquoise Animal Hospital  
University Veterinary Hospital  
Valley Veterinary Clinic RB, Inc.  
VCA Albany Animal Hospital  
VCA All Our Pets Veterinary Hospital  
VCA Cottage Animal Hospital  
VCA Loomis Basin Veterinary Clinic  
VCA Madera Pet Hospital, Inc.  
VCA McClave Veterinary Hospital, Inc.  
VCA Mueller Pet Medical Center  
VCA Pet Medical Center  
Veterinary Medical Center of  
Turlock, Inc.  
Veterinary Medical Center, Inc.  
Village Oak Veterinary Hospital  
Village Square Veterinary Hospital  
Village Square Woodside  
Veterinary Hospital  
Village Veterinary Clinic, Lompoc  
Village Veterinary Clinic, Stockton  
Village Veterinary Hospital  
Walker Street Dog & Cat Hospital  
Walnut Creek Veterinary Hospital  
Washington Square Veterinary Clinic  
Waterhouse Animal Hospital, Inc.  
Wikiup Veterinary Hospital  
Willow Rock Pet Hospital, Inc.  
Woodside Veterinary Clinic  
Yuba Sutter Vet Hospital, Inc.



Kaia Colosi  
Oncology



# Friends of Companion Animal Honor Roll

**Thank you to our friends** for making a difference in the lives of beloved animal companions! Each discovery we make, each grant we fund, every piece of equipment we provide, and every resident we help train is made possible by all of our generous donors. We are pleased to recognize those who contributed \$1,000 or more to the Center for Companion Animal Health from July 2021 to June 2022.

Anonymous  
 Don & Elizabeth Abbott  
 Kristi Abrams & David Rubcic  
 Stacey Baba & James Vokac Charitable Foundation  
 Mercedes Barris  
 Kay Bartlett  
 Harriet Benson  
 Eric M. Berg Charitable Fund  
 Black Butte Bison Ranch  
 Grace Blair  
 Nanette Blair  
 Michael Borck & Kathleen Brannan  
 Douglas A. Butler (estate)  
 Robert Camm  
 Michael Carney  
 Glen & Angela Charles Family Foundation  
 Sharon Clevesy  
 Janet & John Collins  
 Nancy & Christopher Connery  
 Victoria Corrales  
 Marcia Cox  
 Alan Defever (estate)  
 Noel Dybdal & Paul Lutes  
 Marlene Ehresman  
 James & Sharon Ellisor  
 Mildred G. Federico Charitable Foundation  
 Edwin & Patricia Fichtner  
 Geoffrey and Barbara Fong  
 David Fradin  
 Christine & Greg Freeman  
 Lawrence Goland  
 Anne Gray  
 Barbara Greenstein  
 GVV Capital  
 Colleen & Robert Haas  
 Kristi Haddock  
 Marianne & Raymond Hammerschmidt  
 Roy E. Hanson Jr. Manufacturing  
 Linda Hat  
 Suzanne Hill  
 Karen Hooper  
 Carol Horace  
 Weslee Howell  
 Thomas & Karen Jefferson

Linda Jensen  
 Steven Jensen & Mark Grace  
 John T. & Jane A. Wiederhold Foundation  
 Teresa Kaneko  
 Michael Kent & Karl Jandrey  
 Barbara Kerr  
 Jody Kinner  
 Susan Koret  
 Krane Family Charitable Gift Fund  
 JoAnn & Stan Kromfols  
 William & Mabel Labiak  
 Gail Lawrence  
 John & Pamela Leggett  
 Paul & Lea Levine Foundation  
 Holly & Ryan Lindsay  
 Christina & Chee Louie  
 Christine Lynch & William Tanner  
 Maddie's Fund  
 Marit Marino  
 Pat Marsh  
 Beverly & Fritz Maytag  
 Barbara McCoy  
 Joan & Hans Mehn  
 Ana Mendez & Rajeev Jayavant  
 Andrew Merenbach & Elizabeth Cheney  
 William Miklos and Susan Rinne-Miklos  
 George & Phyllis Miller Feline Health Center Fund  
 Mark Miller  
 Diana Muller  
 Gary A. Munoz  
 Dr. Pauline Mysliwiec & Dr. John Yao  
 Charles & Phyllis Newman  
 Joanne Nicholson  
 John Noll & Kathrin Stamp  
 Norcal Golden Retriever Club  
 Helen North-Root  
 Jean Nunes  
 John Olson & Tom Kim  
 Muriel H. C. Ong  
 Kim Ooi & Paul Neumeyer  
 Jerry Pacheco  
 Michael & Ann Parker  
 Jerold Pearson  
 Laurel Place

Bill Porter & Kirsten Greene  
 Bob & Lori Pryt  
 Janet Radford-Harris  
 Kevin Ray & Ronald Caple  
 Martha Reese  
 Joan Reynertson (estate)  
 Jeffrey Rich & Jan Miller  
 Deanna Marie Roth  
 Rebecca Rowland Mosley  
 Shirley Ruxton Soper  
 Elyse Salven-Blatt  
 Bille Sarzin  
 Diana Schlesinger  
 Cheryl Sedestrom  
 Shirley Sichel (estate)  
 Kenneth Smith & Lucia Christopher  
 SOCK FIP  
 William Sommers & Sandra Black  
 Gary & Cathy Spratling  
 Roberta & Donald Stanisich  
 James Steele  
 James Stimson & Sandra Uratsu

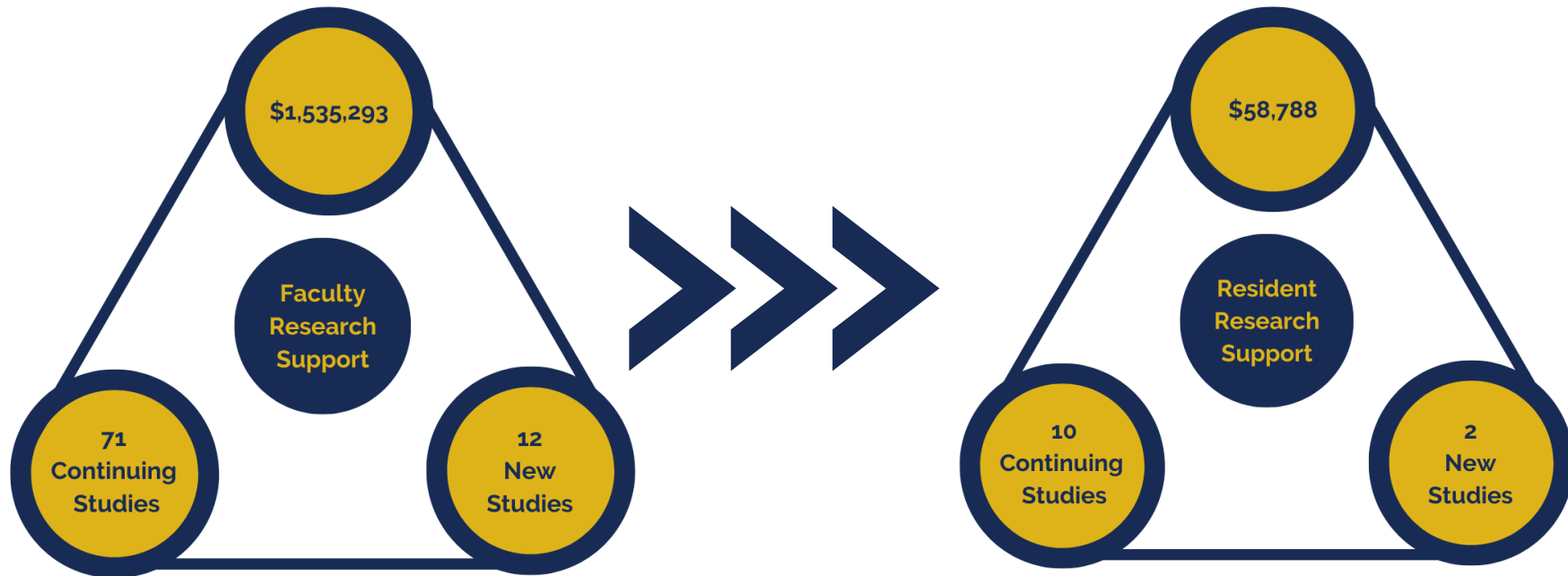
Joan & William Strohauser  
 Mariko Sugiyama  
 Marcia Syufy  
 Maureen Tolson  
 Michael Tracy & Debra Lelek  
 Timothy Trucano  
 Wallace & Sylvia Tsang  
 Katharine Tyson  
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 Lin Zucconi

"The CCAH is essential because it provides necessary funding for studies that become the foundation for larger clinically relevant trials and research, provides resources to train future clinician scientists as well an avenue for donors to help make a positive impact on the future of veterinary medicine."

**Jodi Westropp, DVM, PhD, DACVIM**  
 Professor - Internal Medicine



Clarence Westropp  
 Internal Medicine



## Newly Funded Research Studies for FY 2022-2023

### Cancer

#### Uncovering the mechanism(s) of olfactomedin-like-induced malignancy in canine glioma

Canine gliomas are a common and lethal brain tumor. Tumor progression is the result of a confluence of factors, including the cancer cell's ability to migrate and invade through brain tissue. This ability to invade also underlies treatment resistance. Therefore, development of novel therapies to mitigate or abolish this feature of cancer cells could substantially improve response to therapy and patient survival. Our laboratory has demonstrated that olfactomedin-like 3 (OLFML3), a protein secreted from brain immune cells, increases migration and invasion capacity in rodent glioma cell lines. Therefore, we have proposed this study to determine if OLFML3 also promotes canine glioma cell migration and invasion. Moreover, we seek to define which pathways are altered in canine glioma cells following OLFML3 treatment.

#### The aryl hydrocarbon receptor regulates canine osteosarcoma immune evasion

The aryl hydrocarbon receptor (AHR) is a protein that can bind to specific DNA sequences and alter the activity of nearby genes. AHR is known to be very active in human and canine cancers, including osteosarcoma. Increased activity of AHR in tumors can result in increased activity of PDL1, a protein that prevents immune cells from recognizing them as harmful. PDL1, along with its partner PD1, is a promising target for cancer immunotherapy, including in dogs, with many clinical trials focused on inhibiting PD1-PDL1 activity. However, many patients do not respond to treatment, and we need to better understand why some respond, while many do not. This study aims to evaluate how AHR activity may prevent canine osteosarcomas from being recognized and destroyed by the canine patient's immune system.

Moxie Larsen  
Nutrition





Harper McInnis  
Ophthalmology

## Cancer

### **Characterization of reduced olfactomedin-like 3 mRNA expression to determine suitability for orthotopic glioma preclinical study**

Canine gliomas are a common and lethal brain tumor. We have demonstrated that olfactomedin-like 3 (OLFML3), a protein secreted from brain immune cells, may contribute to glioma. Rodent models are vital to uncover the mechanisms by which a molecule may promote tumor growth and facilitate development of anti-tumor therapies. We have been working with the UC Davis Mouse Biology Program to develop a mouse model that would delete *Olfml3* gene expression only in microglial cells, and only once mice reached adulthood. However, the genetic modification disrupted how *Olfml3* was regulated, which resulted in loss of gene function in all cells from conception. Complete loss of *Olfml3* caused severe developmental defects, resulting in death of the embryos prior to birth. However, animals with one functional copy of *Olfml3* survive gestation and are grossly normal in the neonatal period. As these animals with one copy of *Olfml3* have reduced overall mRNA levels of *Olfml3*, they may be adequate to perform our studies as we originally intended. This study will characterize these mice through behavioral phenotyping and molecular analysis to validate that this model is appropriate for preclinical testing. We will utilize this rodent model to explore OLFML3 as an alternative therapeutic target and develop appropriate therapeutic paradigms to improve dog brain tumor treatment options.

### **The role of the TAp73gamma in canine tumorigenesis**

TP73 is a gene that is often changed in human cancer, and the protein it makes can take on multiple forms. Some of the proteins it makes can suppress tumor growth, while others promote tumor formation and growth. We have shown that dogs also make multiple forms of the TP73 protein, but we do not yet know the effect that these different cancer proteins have on cancer in the dog. We plan to look at one of these proteins, called TAp73gamma, in dog osteosarcoma and lymphoma cell lines which we think promotes tumor cell growth, determine the mechanisms by which it does this, and see if targeting this could be a potential treatment.

### **Investigation of a drug interaction between omeprazole and vinblastine in dogs with mast cell tumors**

Drug interactions are a potential cause of poor treatment outcomes in canine cancer patients, either through increased toxicity following chemotherapy or through reduced efficacy of anticancer drugs. Often during cancer treatment, canine patients are prescribed supportive care medications intended to reduce negative side effects of chemotherapy. Omeprazole, an antacid drug, is one such medication often prescribed to dogs with mast cell tumors that are treated with the chemotherapy drug vinblastine. In humans, omeprazole has been identified to alter the metabolism of some co-administered drugs by enhancing their metabolism which causes faster drug elimination which has the potential to reduce the efficacy of a drug. Increased drug metabolism caused by omeprazole has not been reported in dogs previously. Recently, we measured vinblastine in dogs with cancer and identified lower chemotherapy exposure in a group of dogs on omeprazole. This study will aim to further study this finding and identify the effect of omeprazole on vinblastine metabolizing enzymes using dog liver cells grown in the lab. The results of this study may provide important information that helps guide veterinarians in their choice of drugs used for supportive care in these patients.

### **Evaluation of NETs in cancer-bearing dogs compared to controls and the impact of HDAC inhibition on NETosis**

The immune system plays an important role only in fighting infections, and in either promoting or minimizing cancer progression. One example is a specific type of white blood cell called neutrophils. When neutrophils encounter microbes, they excrete their DNA, known as neutrophil extracellular traps or NETs, to capture and kill microbes. However, exuberant amounts of NETs can be harmful to the body. NETs have been found in people and other species to increase cancer progression and its spread. For this reason, ways to switch off NETs formation could benefit cancer patients. A new anti-cancer drug class called histone deacetylase (HDAC) inhibitors have been found to have this effect in human neutrophils. It is not known whether this is also seen in dogs. We will assess how this medication can change the fate of neutrophils. If HDAC inhibitors are successful at reducing NETs, HDAC inhibitors may be an effective treatment to stop cancer progression in dogs.

## Cardiology (resident)

### **Echocardiographic effects of oral gabapentin on left ventricular function in healthy dogs**

Veterinary visits can be stressful for many dogs, which can make it challenging to perform examinations and tests to provide the best care. Sedatives administered prior to veterinary visits can help reduce patient stress. Gabapentin is an oral medication which is well-tolerated and may reduce stress. Some medications may affect the heart making the results of these diagnostics difficult to interpret. Therefore, it is necessary to assess the effects of gabapentin on standard cardiac diagnostic testing prior to its routine use. We will evaluate whether gabapentin causes changes in heart size and function, decreases signs of stress, and evaluate if it causes changes in blood pressure or heart rhythm.

## Dentistry

### **Analysis of immune cells within the healthy oral mucosa of dogs**

The oral mucosa, the lining tissue of the oral cavity, is a gateway to the body and offers first-line protection against environmental foes using mechanical and cell-mediated mechanisms. This study will establish the immune cell composition of oral mucosa in healthy dogs. With the knowledge of baseline immune cell composition and distribution, processes occurring in disease states can be better understood. Furthermore, this information will contribute to developing targeted therapies and the provision of more suitable oral health care for dogs.

## Diagnostic Imaging

### **Dual-tracer PET/CT imaging of the canine shoulder: Exploratory study in 6 dogs**

Shoulder injuries are common in dogs and usually cause severe pain and can be debilitating. It is very important to get a precise diagnosis in order to select the proper treatment and plan rehabilitation. Radiographs and ultrasound are the two most commonly used imaging tools to evaluate the dog's shoulder. They provide useful information but may not be sufficient to understand complex cases. Positron Emission Tomography (PET), is becoming increasingly available in dogs. PET has the potential to detect all changes and indicate if injuries are active or not. In this study, we propose to image with PET dogs with shoulder issues. We will investigate how much more information is gained with PET and how it improves making decisions for treatment and rehabilitation.

## Genetics

### **Development of tools for evaluation of canine LINE-1 (Long Interspersed Nuclear Element 1) activity**

More than a third of DNA in dogs and humans is composed of transposable elements (jumping DNA). The largest class of transposable elements are called LINES with tens of thousands of copies of LINES in the dog genome, with only a couple hundred remaining active. When LINES move, they can cause diseases. While humans have evolved complex mechanisms to suppress LINE activity, its activity is high in cancer, aging, and neurodegeneration. Dogs are predicted to have three times as many active LINE elements as humans, but the differences in LINE activity between individuals and breeds or with disease state has not yet been explored. We propose to develop important basic tools to study LINE activity in dogs.

## Ophthalmology

### **Rapid, accurate, and reproducible screening of endothelial cell morphology in dogs with AI**

The corneal endothelium is a monolayer of cells at the posterior aspect of the cornea responsible for keeping it dehydrated and thus transparent. When corneal endothelial cells (CEC) degenerate with disease or age, they increase in size. Eventually, a critically low number of cells is reached, and decompensation occurs, resulting in corneal swelling, ulceration, and decreased vision. These patients are at increased risk of corneal infection and perforation, which can result in blindness. We are working on novel treatments to regenerate the CEC in canine patients with early disease. The purpose of this study is to create and utilize a machine-learning algorithm to accurately determine CEC density and morphology.



Danson Kent-Jandrey  
Oncology & ER/ICU

## Pathology

### **Characterization of ductular reactions in canine biliary diseases**

Increased bile ducts can occur in the liver in response to a variety of liver injuries. This process is called ductular reaction and can be observed in liver biopsy specimens. The causes and morphologic features of ductular reaction in dogs are not well known. Furthermore, it is unknown which areas of the liver and which immunohistochemical stains help detect ductular reaction most readily. In this study, we will characterize ductular reaction in different liver lobes in dogs with and without extrahepatic biliary duct obstruction +/- bacterial infection to better understand how the liver responds to bile duct injury. This will aid clinicians and pathologists in diagnostic interpretation and guide surgeons taking biopsy samples.

## Regenerative Medicine

### **Tissue engineering of immuno-universal cartilage for dogs**

Osteochondritis dissecans (OCD) and other conditions culminating in the loss of cartilage significantly impair dogs' quality of life. Our recent work showed that a large quantity of new cartilage tissue could be manufactured from a small number of chondrocytes isolated from surgically removed, detached cartilage OCD fragments or healthy articular cartilage cells. However, before we can successfully implant tissues engineered from cells other than 'self,' the issue of immune rejection needs to be addressed. Major histocompatibility complex (MHC) molecule incompatibility is considered one of the most important factors in recognizing cells as not-self by the recipient. Traditionally this problem is overcome by detecting a suitable (MHC-matching) donor. Regrettably, it may take a while before suitable donor tissue is available. In this study, we suggest eliminating MHC expression from the surface of canine cartilage cells and using already established cartilage tissue engineering methods to generate immuno-universal cartilage implants. If successful, this strategy will allow dog patients needing cartilage replacement to benefit from off-the-shelf cartilage tissue upon demand.

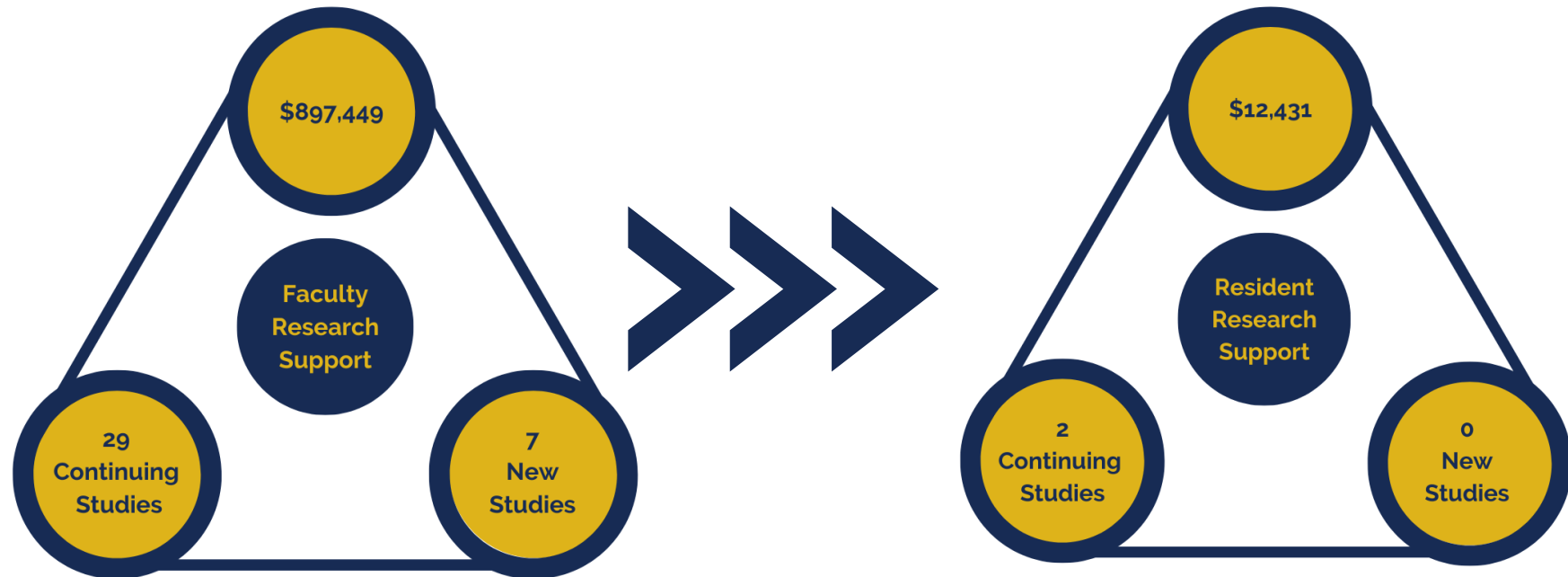
Sadie & Samantha Stetter  
SVM Dean

## Surgery (resident)

### **Impact of erector spinae plane block on opioid consumption in dogs undergoing hemilaminectomy**

Intervertebral disc disease (IVDD) is one of the most common neurological problems in dogs. The abnormal intervertebral disc bulges and compresses the spinal cord causing pain, possible nerve damage and even paralysis. This condition is most commonly seen in Beagles, Dachshunds, Pekingese, Shih Tzus, Basset hounds, and American cocker spaniels but may occur in any breed. It is common for IVDD to occur in the mid to lower back (thoracolumbar region) in dogs and treatment often involves a surgical procedure in which the spinal cord is decompressed by removing the extruded disc material around the spinal cord. Pain management in these patients can be challenging and uses drugs like opioids and NSAIDs, which can have side effects like vomiting, nausea, decreased gut motility, excessive sedation, and negative impact on appetite. A local nerve block called the erector spinae plane block has proven to be very effective at pain control in humans undergoing spinal surgeries. Presently there is no prospective study in dogs evaluating the efficacy of erector spinae plane block in dogs undergoing thoracolumbar hemilaminectomy. This study will examine whether this block will decrease the need for opioids and decrease the pain after surgery.





## Newly Funded Research Studies for FY 2022-2023

### Anesthesia

#### Comparison of cardiac output measurement techniques in anesthetized cats

Cats differ from other species in that they often have low blood pressure when anesthesia is at a level allowing surgery, which may result in complications. The complications are likely related to low blood flow, resulting in low blood pressure. Several studies conducted have been aimed at finding drug combinations causing less alterations in blood flow than the drugs currently used. Measurement of blood flow (cardiac output) is obviously critical for such studies. Until recently, we have relied on a technique called thermodilution, which requires the placement of a specialized catheter in the heart and pulmonary artery. Unfortunately, the only company that manufactured the specialized catheter of optimal size for cats discontinued this product. The proposed study would evaluate alternative techniques. We aim to identify techniques that can accurately measure cardiac output, regardless of the size of the cat, in order to improve anesthetic safety.

#### Pilot study: Strategies to reduce central catecholamine effects of fentanyl in anesthetized cats

Cats have a much higher incidence of death associated with anesthesia compared to dogs. In part, this may be because many anesthetics cause much more cardiovascular depression and low blood pressure in cats than many other species. Although co-administration of analgesics with fewer effects on blood pressure—such as fentanyl—is a common method to reduce the dose required of the primary anesthetic and preserve cardiovascular function in many species, fentanyl does not reduce anesthetic requirements in cats. This is because fentanyl stimulates excitatory neurons in the brain that prevent it from exerting a general anesthetic effect. There are several types of drugs that can prevent this. This study will screen six of these drugs for their ability to allow fentanyl to decrease requirement of the inhaled anesthetics in cats. This work will help us develop new cat-specific anesthetic protocols that help preserve blood pressure during anesthesia and improve anesthetic safety.



Lizard Phenix  
Clinical Trials



## Cancer

### **Feline oral squamous cell carcinoma: tumor and blood T cell and monocyte profiles**

Feline oral squamous cell carcinoma (OSCC), the most common oral tumor in cats, is highly aggressive and responds poorly to current treatments. It also bears many similarities to human head and neck cancers that suppress patient's immune system. Our previous work showed that feline oral cancers are inflammatory with around 50% showing immunosuppressive immune cells. Our preliminary findings for feline OSCC are important, given recent successes in people using new drugs that target abnormal immune cells. We are expanding our evaluation of immune markers associated with feline OSCC testing for additional types of abnormal immune cells to identify immune markers that predict disease outcome to determine immune targets that will help design new therapies for this feline cancer.

## Dentistry

### **Optimization and isolation of feline exosomes from the placenta and adipose tissues MSCs for therapy**

Feline chronic gingivostomatitis (FCGS) is a chronic inflammation of oral mucosa. Promising findings of systemic mesenchymal stem cells (MSCs) treatment resulted in clinical improvement of ~60% of FCGS-affected cats that failed other treatments. MSCs-based therapy is still in need of considerable refinement to achieve optimal effects. This project will find the best MSCs cells for the isolation of large-scale and highly functional exosomes carrying immunomodulatory and anti-inflammatory factors.

### **Peripheral mononuclear cells isolation and preservation for feline research needs**

In order to study stomatitis, a severe oral problem, we routinely use cats' immune cells (leukocytes). Due to the success of our treatment for stomatitis with patients at UC Davis, we now have cats across the nation that are interested in receiving this therapy. Immune cells need to be recovered from blood. With cats at UC Davis, immune cells are recovered the same day. This is not possible with cats from other places and a delay in immune cell recovery may affect how the immune cells behave. Furthermore, we often need to freeze the immune cells to study them at a later time point which currently results in a large loss of cells. To predict how the cats will respond to stomatitis therapy, we are studying how the immune cells behave with delayed recovery and are developing improved methods of freezing these cells.

## Gastrointestinal

### **Identifying unconventional T cells in cats using single cell sequencing**

Inflammatory bowel disease (IBD) is a common condition of older cats that is characterized by vomiting, diarrhea, and weight loss. A major hurdle in diagnosing, preventing or effectively treating this condition is that its cause and progression are poorly understood. Lymphocytes, a type of immune cell, that is normally present in the intestine of cats, are believed to play a key role in driving this condition. However, lymphocytes are not a uniform cell type but rather a complex mix of cells with varying functions and effects. Consequently, a better understanding of IBD will require the dissection of T cell subsets and their complex web of interactions. Until recently, this task has been hampered by the lack of available reagents for cats. However, a novel method known as 'single cell RNA sequencing' (scRNAseq) is applicable to any species and facilitates the dissection of lymphocyte subsets at an unprecedented resolution. This study will characterize lymphocyte subsets in cats using scRNAseq.

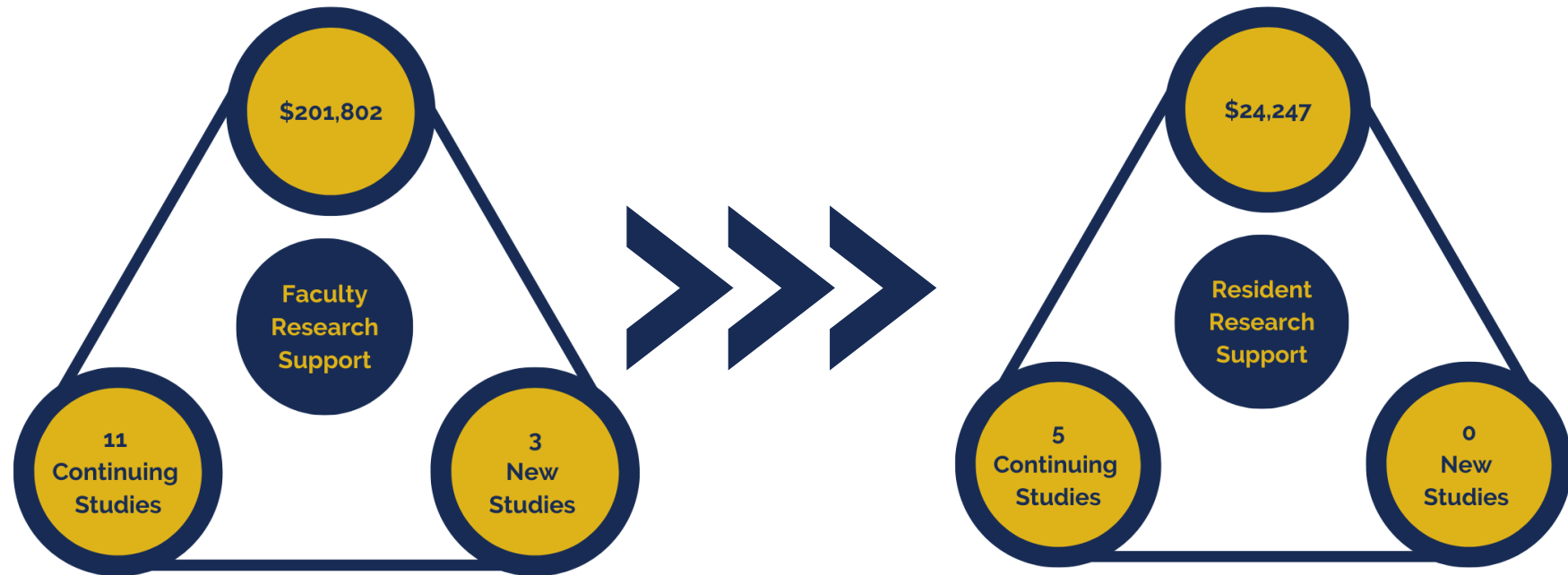
## Infectious Disease

### **What can the coronaviral serology of cats with FIP teach us? Leveraging discovery from antiviral clinical trials**

Multiple antiviral compounds have recently been identified that safely and effectively block replication of feline infectious peritonitis virus (FIPv). As a direct result, four antiviral clinical trials involving client-owned cats with naturally occurring FIP have recently been funded. Although translational advances in effective treatment strategies offer hope for an eventual therapeutic cure, some treated cats fail to improve and the complex pathogenesis of FIP remains incompletely understood, hindering progress towards more effective long-term prevention strategies like vaccination. These clinical trials create an ethical avenue for recruiting naturally-infected cats as a method of studying FIP pathogenesis. Through the use of cutting-edge techniques and strategic research collaborations, we will dissect the antibody response in cats with FIP and determine if this can be used as a tool to predict disease outcome.

"Research is moving medicine forward."

**Natalia Vapniarsky, DVM, PhD, DACVP**  
Assistant Professor - Pathology



## Newly Funded Research Studies for FY 2022-2023

### Internal Medicine

#### **Continuous glucose monitoring in normoglycemic, hypoglycemic, and hyperglycemic goats and calves**

Continuous glucose monitoring system (CGMS) device use has become important for knowing a patient's blood glucose levels. These CGMS devices are attached under the skin and measure minute-to-minute glucose concentrations. Calves and goats are frequently diagnosed with diseases that require this, including diarrhea and pregnancy toxemia. Currently, no studies are available evaluating the accuracy of CGMS for monitoring glucose concentrations in calves and goats, which is what this study will do, increasing the tools we have to treat pets goats and cows.

#### **Effects of plasma and hetastarch on colloid oncotic pressure and total solids in calves and goats**

Pet calves and goats are commonly admitted to veterinary hospitals when young with diseases such as compromised immune function and severe

bacterial infections. The most common disease observed in goat kids and calves is diarrhea which results in loss of protein and is treated with plasma or hetastarch. Disadvantages of plasma include the requirement for collection from a donor animal and increased risk for transfusion reactions. Hetastarch is a synthetic colloid fluid that is readily available, but its effectiveness and potential adverse events in goats and calves have not been widely explored, which this study will do.

### Infectious Disease

#### **Development of recombinant protein vaccine and serological diagnostic assay for koi herpesvirus**

Koi herpesvirus (KHV) disease is an infectious disease associated with mass mortalities in fish worldwide. KHV has been spread by the movement of infected fish. Currently, there are no treatments or vaccines available for KHV infections. Diagnosis of KHV is challenging. We are developing a KHV-specific ELISA. Additionally, we will compare if immunogenic proteins are present in the different KHV genotypes in the USA, and if they can be used as vaccines to immunize koi.



Elio Winn  
Neurology/Neurosurgery

Without equipment, no research can happen – here is how you are helping!

## **Epithelial Volt/Ohm (TEER) Meter 3 - EVOM3**

**Principal Investigator: Amir Kol**

The EVOM3 is a trans-epithelial electrical resistance (TEER) meter used to determine the functional permeability of intestinal and other tissues, allowing researchers to study the impact of inflammatory, metabolic, and infectious changes on the intestinal barrier which is critical to the uptake of nutrients and immune sensing by the gastrointestinal tract in animals.

## **Benchling Electronic Laboratory Notebook**

**Principal Investigator: Brian Leonard**

This is a cloud-based platform that allows researchers and collaborators to record and share experimental data securely rather than relying on physical notebooks or personal computers when tracking lab data.

## **Fisherbrand Isotemp Flammable Material Storage Refrigerator/Freezer**

**Principal Investigator: Daniel York**

This flammable material refrigerator and freezer is for use by all CCAH research labs to safely and properly store flammable chemicals.

## **Lab Refrigerator**

**Principal Investigator: Danika Bannasch**

Equipment replacement of 15-year-old, unrepairable unit supporting the canine genetics program.

## **SterilGARD Class II Type A2 BioSafety Cabinet**

**Principal Investigator: Jin Zhang**

Replacement of the biosafety cabinet in an oncology lab. A biological safety cabinet is used to protect personnel against biohazardous or infectious agents and to help maintain quality control of the material being worked with as it filters both the inflow and exhaust air.

## **Barometric Whole-Body Plethysmography, WBP, Chamber**

**Principal Investigator: Joao Soares**

WBP is a way to measure respiratory function in animals (or people) without the use of anesthesia or restraint, which provides data as close as possible to what the patient is experiencing. Applications include identifying obstructed airways or the use of protective ventilation for respiratory disease.

## **Compos X Jet Ventilator**

**Principal Investigator: Katherine Hansen**

This unit controls a patient's breathing when under anesthesia, allowing for minimal motion. This jet ventilator will expand our ability to report on stereotactic radiotherapy outcomes and ventilator use in veterinary radiotherapy.

## **Farm Cluster Computer Server**

**Principal Investigator: Krystal Reagan**

This computing cluster will be utilized by members of the Artificial Intelligence (AI) in Veterinary Medicine Interest Group for machine learning and AI analysis of clinical data. High-performance computing power is critical in the management of large data sets that include 3D radiologic images, digital histologic images, clinicopathologic data, and free text from medical records. Additionally, generated AI clinical decision support tools will be integrated into patient care workflows to enhance patient care directly.

## **Oxford Nanopore MinION**

**Principal Investigator: Maria Soltero-Rivera**

This powerful, portable, real-time DNA and RNA sequencing device will allow for bedside clinical research and training residents for management of infectious, chronic inflammatory and neoplastic oral diseases. There are significant advantages to acquiring and analyzing DNA or RNA sequences in a few hours or less.

## **Endocare Percryo CRYO-28 Cryoblation System**

**Principal Investigator: Michelle Steffey**

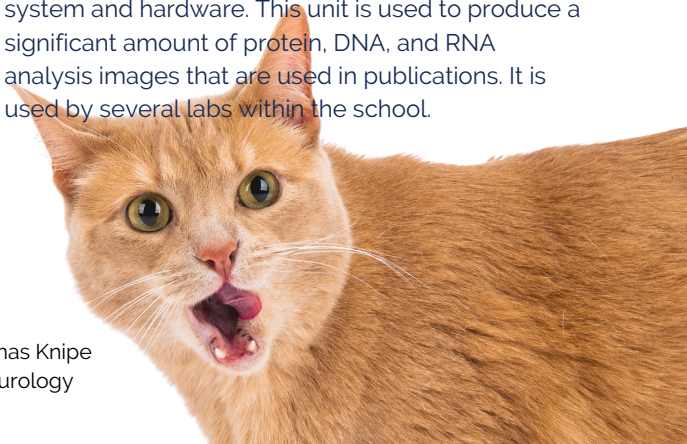
Percutaneous cryoablation offers an alternative treatment to traditional cancer therapies, such as surgery for certain tumors deep in tissue and body cavities. UC Davis is on the forefront of research in this area, with the successful development of minimally invasive cryoablation procedures for nasal tumors, adrenal tumors, and others. Use of this equipment will allow us to continue to learn how best to apply this technology to benefit companion animals requiring treatment for cancer.

## **Repair of the Protein Simple Imaging Camera**

**Principal Investigator: Robert Rebhun**

Protein Simple is an imaging system within the comparative oncology laboratory that images protein analyses. This system is 10 years old and needs a new camera, which includes a new cooling system and hardware. This unit is used to produce a significant amount of protein, DNA, and RNA analysis images that are used in publications. It is used by several labs within the school.

Thomas Knipe  
Neurology



## **Thermo Scientific TSG Series General Purpose Chromatography Refrigerator**

**Principal Investigator: Ryan Toedebusch**

This refrigerator will replace the 20+ year-old unit that is no longer functioning to store canine cancer research samples. It is needed for the lab to remain productive and continue to advance research on canine brain tumors and immunotherapy opportunities.

## **Gilson Platemaster P220**

**Principal Investigator: Stefan Keller**

The Gilson Platemaster is an easy-to-use, accurate solution for high-throughput manual pipetting of 96-well microplates. This increases efficiency and accuracy compared to manual options and is an optimal solution for this task, as it offers the precision of an automated liquid handler at a fraction of the cost of other solutions.

## **Microcomputed Tomography D3610 40 TB Disk Space**

**Principal Investigator: Susan Stover**

Micro-CT provides high resolution 3D imaging information that can't be obtained by any other non-destructive technology and is used in many types of orthopedic research. The current unit is at capacity, with user wait times up to three months. The disk upgrade is necessary to increase capacity to serve users with minimal wait time.

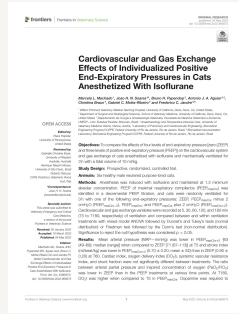


"The CCAH is such a valuable source of smaller grants and funds for internal projects and equipment that not only make a difference themselves, but also are so often the stepping stones to even greater things."

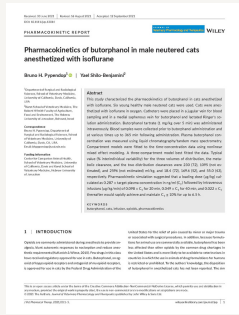
**David J. Maggs. BVSc (Hons), DACVO**  
Professor - Ophthalmology

## Research Publications

### Anesthesia



**Cardiovascular and Gas Exchange Effects of Individualized Positive End-Expiratory Pressures in Cats Anesthetized With Isoflurane**  
Frontiers in Veterinary Science (May 2022)  
Machado ML, Soares JHN, Pypendop BH, Aguiar AJA, Braun C, Motta-Ribeiro GC, Jandre FC



**Pharmacokinetics of butorphanol in male neutered cats anesthetized with isoflurane**  
Journal of Veterinary Pharmacology and Therapeutics (September 2021)  
Pypendop BH, Shilo-Benjamin Y



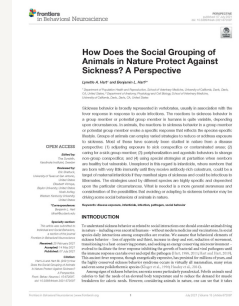
**Pharmacokinetics of grapiprant administered to red-tailed hawks (*Buteo jamaicensis*) after food was withheld for 24 hours**  
American Journal of Veterinary Research (November 2021)  
Rodriguez P, Paul-Murphy JR, Knych HK, Drazenovich TL, Hawkins MG

**Cardiovascular and gas exchange effects of individualized positive end-expiratory pressures in cats anesthetized with isoflurane**  
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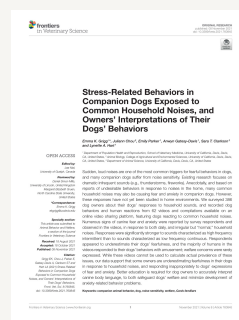
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### Behavior



**How Does the Social Grouping of Animals in Nature Protect Against Sickness? A Perspective**  
Frontiers in Behavioral Neuroscience (July 2021)  
Hart LA, Hart BL



**Stress-Related Behaviors in Companion Dogs Exposed to Common Household Noises, and Owners' Interpretations of their Dogs' Behaviors**  
Frontiers in Veterinary Science (November 2021)  
Grigg EK, Chou J, Parker E, Gatesy-Davis A, Clarkson ST, Hart LA



**Assessing the Relationship between the Emotional States of Dogs and Their Human Handlers, Using Simultaneous Behavioral and Cardiac Measures**  
Frontiers in Veterinary Science (July 2022)  
Grigg EK, Liu S, Dempsey DG, Wong K, Bain M, Sollers JJ, Haddock R, Kogan LR, Barnhard JA, Tringali AA, Thigpen AP, Hart LA



**Companion Animals' Roles for AIDS Survivors, Mostly Aging Males, during HIV/AIDS and COVID-19 Pandemics**  
Animals (June 2022)  
Hart LA, Thigpen AP, Fine AH, Gorczyca K, Willits N, Bernaldo R, Malzyner S, Guillén JH, D'Amato K


**How does the social grouping of animals in nature protect against sickness? A perspective**  
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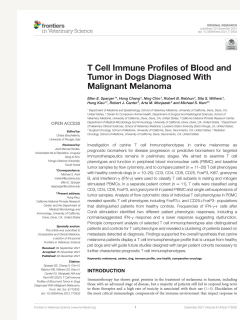
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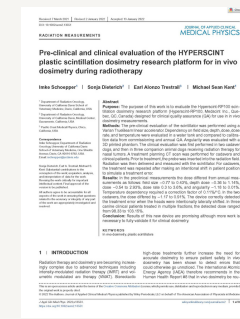
### Cancer



**Novel clonality assays for T cell lymphoma in cats targeting the T cell receptor beta, T cell receptor delta, and T cell receptor gamma loci**  
Journal of Veterinary Internal Medicine (November 2021)  
Radtanakatikanon A, Moore PF, Keller SM, Vernau W



**T Cell Immune Profiles of Blood and Tumor in Dogs Diagnosed With Malignant Melanoma**  
Frontiers in Veterinary Science (December 2021)  
Sparger EE, Hong C, Ning C, Rebhun RB, Withers SS, Kieu H, Canter RJ, Monjzabz AM, Kent MS



**Pre-clinical and clinical evaluation of the HYPERSCINT plastic scintillation dosimetry research platform for in vivo dosimetry during radiotherapy**  
Journal of Applied Clinical Medical Physics (February 2022)  
Schoepper I, Dieterich S, Trestrail EA, Kent MS



**Retrospective immunohistochemical investigation of suspected non-visceral leiomyosarcoma in dogs**  
Journal of Veterinary Diagnostic Investigation (March 2022)  
Brady RV, Rebhun RB, Skorupski KA, Burton JH, Al-Nadaf S, Choi E, Willcox JL

**Novel clonality assays for T cell lymphoma in cats targeting the T cell receptor beta, T cell receptor delta, and T cell receptor gamma loci**  
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# Our Impact

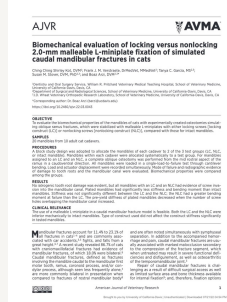
## Dentistry



### Application of Bayesian regression for the identification of a catchment area for cancer cases in dogs and cats

Frontiers in Veterinary Science (July 2022)

Diaz Cao JM, Kent MS, Rupasinghe R, Martinez-López B



### Biomechanical evaluation of locking vs. non-locking 2.0-mm malleable L-miniplate fixation of simulated caudal mandibular fractures in cats

American Journal of Veterinary Research (June 2022)

Kot CCS, Verstraete FJM, Garcia TC, Stover SM, Arzi B

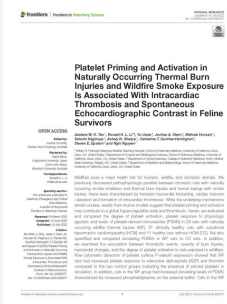


### Recent, full-length gene retrocopies are common in canids

Genome (August 2022)

Batcher K, Varney S, York D, Blacksmith M, Kidd JM, Rebhun R, Dickinson P, Bannasch D

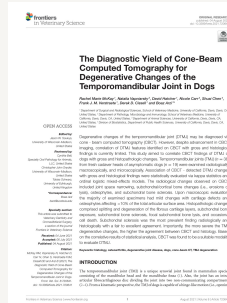
## Cardiology



### Platelet priming and activation in naturally occurring thermal burn injuries and wildfire smoke exposure is associated with intracardiac thrombosis and spontaneous echocardiographic contrast in feline survivors

Frontiers in Veterinary Science (July 2022)

Tan AWK, Li RHL, Ueda Y, Stern JA, Hussain M, Haginoya S, Sharpe AN, Gunther-Harrington CT, Epstein SE, Nguyen N

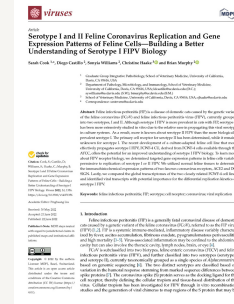


### The diagnostic yield of cone-beam computed tomography for degenerative changes of the temporomandibular joint in dogs

Frontiers in Veterinary Science (August 2021)

McKay RM, Vapniarsky N, Hatcher D, Carr N, Chen S, Verstraete FJM, Cissell DD, Arzi B

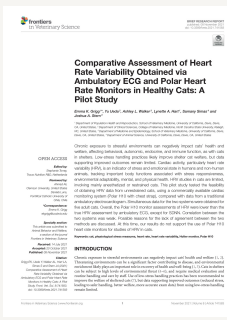
## Infectious Disease



### Serotype I and II feline coronavirus replication and gene expression patterns of feline cells—building a better understanding of serotype I FIPV biology

Viruses (June 2022)

Cook S, Castillo D, Williams S, Haake C, Murphy B

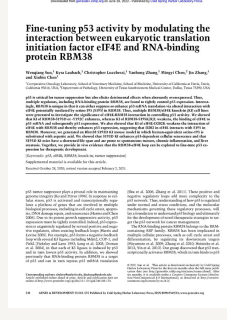


### Comparative assessment of heart rate variability obtained via ambulatory ECG and polar heart rate monitors in healthy cats: A pilot study

Frontiers in Veterinary Science (November 2021)

Grigg EK, Ueda Y, Walker AL, Hart LA, Simas S, Stern JA

## Genetics



### Fine-tuning p53 activity by modulating the interaction between eukaryotic translation initiation factor eIF4E and RNA-binding protein RBM38

Genes & Development (February 2021)

Sun W, Laubach K, Luchessi CL, Zhang Y, Chen M, Zhang J, Chen X



### Pharmacokinetics of isavuconazole in healthy cats after oral and intravenous administration

Journal of Veterinary Internal Medicine (May 2022)

Woerde DJ, Wittenburg LA, Dear JD

"The CCAH has been able to foster research among the faculty and residents by providing small grants that lead to preliminary results for larger grants and sometimes directly to important publications."

**Danika Bannasch, DVM, PhD**  
Professor - Genetics

### The effects of FGF4 retrogenes on canine morphology

Genes (February 2022)

Bannasch D, Batcher K, Leuthard F, Bannasch M, Hug P, Marcellin-Little DJ, Dickinson PJ, Drögemüller M, Drögemüller C, Leeb T



Pint Bannasch Genetics

# Our Impact

## Nutrition

### Determination of mammalian deoxyribonucleic acid in commercial canine treats and supplements

Journal of American Animal Hospital Association  
(April 2021)  
Perez Marquez B, Larsen JA, Fascetti AJ

### Determination of mammalian deoxyribonucleic acid in commercial canine treats and supplements

Journal of American Animal Hospital Association  
(April 2021)  
Perez Marquez B, Larsen JA, Fascetti AJ

## Spay / Neuter

### An Ancient Practice but a New Paradigm: Personal Choice for the Age to Spay or Neuter a Dog

Frontiers in Veterinary Science  
(March 2021)  
Hart LA, Hart BL

### An ancient practice but a new paradigm: Personal choice for the age to spay or neuter a dog

Frontiers in Veterinary Science  
(March 2021)  
Hart LA, Hart BL

## Stem Cell

### Panobinostat Effectively Increases Histone Acetylation and Alters Chromatin Accessibility Landscape in Canine Embryonic Fibroblasts but Does Not Enhance Cellular Reprogramming

Frontiers in Veterinary Science  
(September 2021)  
Moshref M, Questa M, Lopez-Cervantes V, Sears TK, Greathouse RL, Crawford CK, Kol A

### Panobinostat effectively increases histone acetylation and alters chromatin accessibility landscape in canine embryonic fibroblasts but does not enhance cellular reprogramming

Frontiers in Veterinary Science  
(September 2021)  
Moshref M, Questa M, Lopez-Cervantes V, Sears TK, Greathouse RL, Crawford CK, Kol A

## Surgery/Orthopedics

### Three Engineering of Canine Cartilage from Surgically Debrided Osteochondritis Dissecans Fragments

Annals of Biomedical Engineering  
(December 2021)  
Vapniarsky N, Moncada L, Garrity C, Wong A, Filliquist B, Chou P, Kapatkin A, Marcelin-Little DJ

### Tissue engineering of canine cartilage from surgically debrided osteochondritis dissecans fragments

Annals of Biomedical Engineering  
(December 2021)  
Vapniarsky N, Moncada L, Garrity C, Wong A, Filliquist B, Chou P, Kapatkin A, Marcelin-Little DJ

### Comparison of 18F-sodium fluoride positron emission tomography and CT: An exploratory study in 12 dogs with elbow pain

American College of Veterinary Radiology  
(January 2021)  
McLarty E, Spriet M, Beylin D, Chou P, Filliquist B, Marcellin-Little DJ, Kapatkin AS

### Comparison of 18F-sodium fluoride positron emission tomography and CT: An exploratory study in 12 dogs with elbow pain

American College of Veterinary Radiology  
(January 2021)  
McLarty E, Spriet M, Beylin D, Chou P, Filliquist B, Marcellin-Little DJ, Kapatkin AS

### Long-Term Assessment of Bone Regeneration in Nonunion Fractures Treated with Compression-Resistant Matrix and Recombinant Human Bone Morphogenetic Protein-2 in Dogs

Veterinary and Comparative Orthopaedics and Traumatology  
(April 2021)  
Castilla A, Filliquist B, Spriet M, Garcia TC, Arzi B, Chou P, Kapatkin AS

### Long-term assessment of bone regeneration in nonunion fractures treated with compression-resistant matrix and recombinant human bone morphogenetic protein-2 in dogs

Veterinary and Comparative Orthopaedics and Traumatology  
(April 2021)  
Castilla A, Filliquist B, Spriet M, Garcia TC, Arzi B, Chou P, Kapatkin AS

### Evaluation of transanal minimally invasive surgery for submucosal rectal resection in cadaveric canine specimens

The American College of Veterinary Surgeons  
(August 2020)  
Mayhew PD, Balsa IM, Guerzon CN, Gibson EA, Keel MK, Brun MV, Araya FJL

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Mayhew PD, Balsa IM, Guerzon CN, Gibson EA, Keel MK, Brun MV, Araya FJL

## Urology

### Presentation Variables Associated With the Development of Severe Post-obstructive Diuresis in Male Cats Following Relief of Urethral Obstruction

Frontiers in Veterinary Science  
(April 2022)  
Muller KM, Burkitt-Creedon JM, Epstein SE

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Frontiers in Veterinary Science  
(April 2022)  
Muller KM, Burkitt-Creedon JM, Epstein SE

# Research

Research is important in making medical advances. Work supported by CCAH often represents a step in exploring new treatments or improvements on existing treatments. Without such research, companion animal medicine would stagnate and we would be unable to keep improving the lives and health of our pets.

**Bruno Pypendop, DrMedVet, DrVetSci, DACVAA**  
Professor - Anesthesiology

# 29

**Publications from CCAH donor-funded studies FY2021-2022**



Widget Young VCCT





Jorge Pires  
Clinical Trials



## All good things must come to *a new beginning*

### Goodbye, Million Cat Challenge. Hello, Maddie's® Million Pet Challenge!

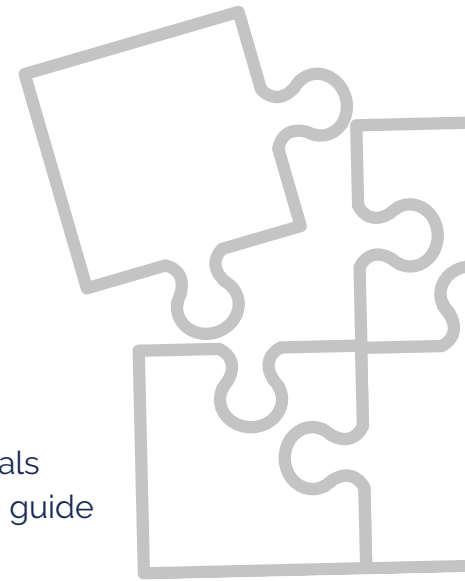
The world's largest feline lifesaving campaign powered by 1,500 North American shelters surpassed its original goal of saving 1M cats and went on to spare the lives of over 3.5M cats that wound up in North American shelters. When the project came to a close at the end of 2021, no one was ready to walk away. Instead, through the continued support of Maddie's Fund®, the program decided it was time to let the dogs in!

### Teaming up for pets and people

In January 2022, the Million Cat Challenge laid down its feline-focus and picked up new partners eager to take the 5 Key Initiatives that powered the Challenge and apply them to the entire sheltering system. Four partners, Maddie's® Shelter Medicine Program at the University of Florida, UC Davis Koret Shelter Medicine Program, Open Door Veterinary Clinic, and Team Shelter USA, have gone all in to double down and bring proven interventions outside shelter walls to address the other piece of the puzzle: homelessness prevention.

The newly named Maddie's® Million Pet Challenge (MMPC) expanded to include access to care clinic consultations to bring affordable care to pet owners. A universe of online learning for shelter professionals hosted on UC Davis Koret Shelter Medicine Program's learning platform, Learniverse, was developed to guide shelters through implementation of community-focused programming.

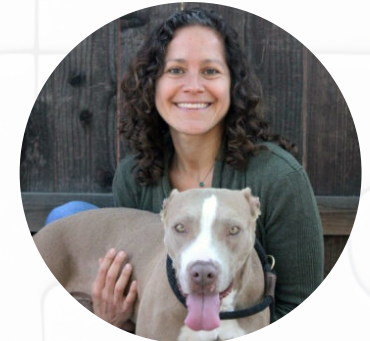
**The Learniverse** offers free access to online courses and shelter medicine experts to over 1,500 shelter workers. From Self-Paced Online Trainings (SPOT mods) to cohort-based, weeks-long Bootcamps, we offer training to meet every learner where they are with exactly what they need.





Launched on Valentine's Day 2022, California for All Animals is a \$50M program led by UC Davis Koret Shelter Medicine Program that exists to unite and amplify the work of California animal shelters to achieve our shared goal of matching every animal in need with the right outcome through the right care, delivered in the right place and at the right time.

Through expert-led trainings, grants and a network of shelter teams passionate about implementing best practices that serve pets and their people, we're creating a humane-hearted California that supports both ends of the leash by moving away from shelter intake as the first or only intervention when an animal is at risk and instead expanding resources and programs that keep pets and people together whenever possible.

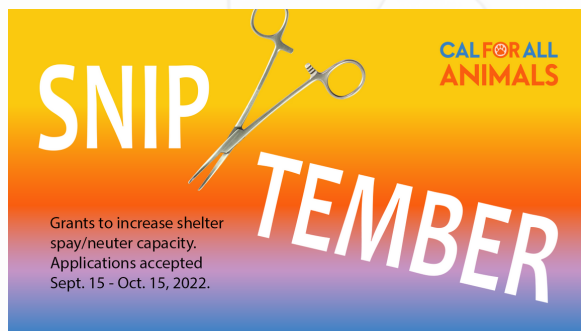


Allison Cardona  
California for All Animals  
State Director

**In just under eight months, over 200 California animal shelters have rallied together to redefine possible by prioritizing preventative support services such as emergency foster, behavior training, and access to care.**

**The program has awarded over 7.5M dollars in funding to expand the safety net that gives animals a second chance right where they are – at home.**

**2023 is all about reducing barriers to positive outcomes. First up: Spay and Neuter**



A recently-published paper by our sister Shelter Medicine program at the University of Florida estimates 2.7M spay and neuter surgeries were suspended and deferred during the height of Covid-19. A grant cycle focused on closing that gap was issued in September 2022. The grant committee is currently reviewing over 101 funding requests to expand the current capacity and bring services to the most underfunded communities.

# Center for Companion Animal Health



Learn more about our programs:  
[CCAH.VETMED.UCDAVIS.EDU](https://ccah.vetmed.ucdavis.edu)

[give.ucdavis.edu/Go/22CCAHannualreport](https://give.ucdavis.edu/Go/22CCAHannualreport)

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