



School of Veterinary Medicine Agriculture and Natural Resources Updates and Impacts October 2016

NEW LEADERS

Dr. Pamela Hullinger has just been appointed Director of the [California Animal Health and Food Safety Laboratory System](#). Hullinger is a board certified specialist in veterinary preventive medicine (2001), and graduated with a DVM (1990) and MPVM (2001) from UC Davis. After working in private large animal practice, she completed a residency in equine medicine at UC Davis in 1996. Subsequently Dr. Hullinger worked as a veterinary medical officer for the California Department of Food and Agriculture and as Chief Veterinary Officer - Food and Agricultural Security Program, Global Security Directorate of Lawrence Livermore National Laboratory (LLNL), US Department of Energy – a position she still holds with active grant support related to transboundary animal disease. As Director, Hullinger is responsible for all aspects of CAHFS operations and administrative matters, ensuring the complete and timely diagnostic services related to food safety and security, animal health emergency management and equine health and performance. CAHFS is expected to provide support to agencies involved in the control of transboundary animal disease and other diseases that threaten the viability of California livestock and poultry industries.



Dr. Woutrina Smith has been named one of the leaders of the UC Global Health Institute's new [Center of Expertise on Planetary Health](#). The center has two co-directors: Smith, associate professor of infectious disease epidemiology in the School of Veterinary Medicine, and David Lopez-Carr, professor of geography and director of the Human-Environment Dynamics Lab at UC Santa Barbara. The institute's centers of excellence are charged with developing and leading UC-wide education programs, targeted multi-campus research endeavors, and sustainable international partnerships for implementing programs and interventions to improve health globally and in California.

CURRENT FACULTY RECRUITMENTS

- Professor of Arboviral Epidemiologist
- Professor (50%)/Professor In-Residence (50%) of Infectious Disease
- Professor (50%)/Professor In-Residence (50%) of Respiratory Biology or Toxicology
- Specialist in Cooperative Extension-Beef Cattle Herd Health and Production
- Specialist in Cooperative Extension-Dairy Cattle Production Health Management

MOSQUITO PREFERENCE FOR HUMAN VS. ANIMAL BITING HAS GENETIC BASIS



Mosquitoes are more likely to feed on cattle than on humans if they carry a specific chromosomal rearrangement in their genome. This reduces their odds of transmitting the malaria parasite, according to a University of California, Davis study published Sept. 15 in the journal *PLOS Genetics*.

Rates of malaria transmission depend on whether mosquitoes bite humans or animals, and whether they rest after that meal in an area where they will encounter pesticides.

Bradley Main, a researcher in the Vector Genetics Lab at the UC Davis School of Veterinary Medicine, and his colleagues investigated whether there is a genetic basis to host choice and resting behavior in *Anopheles arabiensis*. That species of mosquito has become the primary vector of malaria in east Africa due to its broader host range and the frequent use of pesticide-treated bed nets, which kill other species that live closely with humans.

"Whether there is a genetic basis to feeding preferences in mosquitoes has long been debated," Main said. "Using a population genomics approach, we have established an association between human feeding and a specific chromosomal rearrangement in the major east African malaria vector. This work paves the way for identifying specific genes that affect this critically important trait."

Using genetics to better understand and track mosquito behavior can improve local control strategies. This knowledge may also open novel avenues for stopping malaria's spread, such as genetically modifying mosquitoes to prefer cattle over people. While the findings provide strong support that the inversion in *An. arabiensis* is linked to cattle feeding, researchers need to test a larger geographic area to confirm the connection. The study was funded by the National Institutes of Health.

BREAKING THE CHAIN OF FOOD-BORNE ILLNESSES THROUGH EDUCATION

The CDC reports there are 3,000 deaths in the U.S. each year due to food-borne illness. The symptoms of food-borne illness are often misdiagnosed as flu. For those cases that do get reported, it's estimated that 48 million illnesses occur each year in the U.S. The World Health Organization reports that 1 in 10 people worldwide get sick each year from eating contaminated food and as a result 420,000 die. Children account for one-third of those deaths.

The [Western Institute for Food Safety and Security](#) (WIFSS), is educating and training the workforce that will improve global food safety and defense in all sectors of the food system continuum, from environment to consumer.



Through the One Health for Food Safety conferences sponsored by WIFSS, students and faculty from Nanjing Agricultural University (NAU), Jiangsu Agri-Animal Husbandry Vocational College (JSAHVC), and

other vocational colleges throughout China, learn that food safety requires teamwork to identify the channels, such as water, soil and animal handling, in which pathogens and toxins are transmitted to the environment, animals and humans.

Director of Outreach and Training at WIFSS, Dr. Bennie Osburn, feels strongly that, "these students and faculty will make a difference for all of humanity, and are committed to delivering the concept of One Health to address food safety in Asia."



The One Health for Food Safety Conference, held at UC Davis from June 27 through July 22, was an intense 4-week session with lectures and tours of eight laboratories in the [School of Veterinary Medicine](#) and the [College of Agricultural and Environmental Sciences](#), and two community college campuses. The conference seeks to raise awareness, encourage team building, and bring about change through calls to action. Understanding the One Health concept, which is an interdisciplinary approach to solving specific, complex problems that arise at the interface of animals, humans and the environment, is valuable to tackling serious food-borne illness problems affecting the world's population.

CALIFORNIA ANIMAL HEALTH AND FOOD SAFETY LABORATORY SYSTEM



The new branch laboratory of the California Animal Health and Food Safety Laboratory System is set to open October 28, 2016. The lab will provide complex diagnostic procedures to support ongoing food production industries, flock and herd health monitoring, food safety programs, and surveillance for foreign and emerging diseases. Located adjacent to the existing Veterinary Medicine Teaching and Research Center in Tulare County, this \$47.5M state funded project continues the long-term partnership between the university and the California Department of Food and Agriculture (CDFA) in protecting human and animal health.

CAHFS conducts more than 500,000 tests annually to protect against foreign and emerging animal diseases. Highlights from the [October CAHFS Connection](#) e-newsletter include:

Bovine: Bovine viral diarrhea virus hemorrhagic syndrome was diagnosed in a 2-month-old beef calf submitted for necropsy from a herd in which two calves had died over four days.

Small Ruminants: Copper toxicity was identified in three brush control goats submitted for necropsy from a herd of 600 in which 75 goats had died two days after moving from a field with a copper mine.

Porcine: Swine dysentery and *Trichuris suis* co-infection were diagnosed in two pigs from a ranch where 20 animals had died and 47 more were sick out of 390 pigs.

Poultry and Other Avian: An unusual case of fowl cholera was diagnosed in 18-week-old tom turkeys with a history of difficulty walking, recumbency and increased mortality, but no respiratory signs. Typical fowl cholera is a respiratory disease in turkeys, characterized by severe pneumonia.

FUTURE VETERINARY MEDICAL CENTER

For nearly half a century, the veterinary hospital has delivered health care to animals in California and beyond. The current facility, opened in 1970, was designed to serve 3,000 patients each year. Veterinarians and staff now see more than 50,000 patients annually. The available clinical expertise has grown to include 34 specialties, including 24/7 emergency and critical care, cardiology, internal medicine, oncology, ophthalmology, neurology and surgery.

As the world leader in veterinary sciences, the school is committed to improving the health and well-being of animals. This transformational new facility will provide faculty access to the latest technology and provide the infrastructure and efficient services to facilitate translational research that also has implications for improving human health.

The school is in the early stages of developing the physical layout of the center using a phased, sequenced approach that allows for new construction and the ongoing smooth operation of clinical services and patient care. The planning effort—guided by leadership from the hospital as well as faculty, staff and house officers—has identified major areas to be constructed in sequence over the next 10 years. Those include:

- Livestock and Field Service Center
- Equine Performance Center
- All Species Imaging Center
- Small Animal Hospital East Wing
- Small Animal Hospital West Wing
- Community Practice and Surgery
- Equine Surgery and Critical Care Center
- Equine Isolation Unit

Planning for the first phases of the livestock, equine, and laboratory projects is underway.



\$2 MILLION GRANT FUNDS ORGANIC FARMING STUDY OF MANURE AND FOOD SAFETY

Organic farmers who use animal-based manure to improve soil quality and nourish crops are receiving help through a nearly \$2 million grant for a food-safety research project, led by the UC Davis School of Veterinary Medicine and involving a multistate network of collaborators.



The U.S. Department of Agriculture Organic Research and Extension Initiative grant will support studies needed to develop national guidelines and best practices for using raw manure while improving soil health and minimizing food-safety risks in organic crops such as leafy greens, tomatoes and root vegetables.

Raw and minimally processed animal manure has been shown to be a rich source of nutrients for improving soil

fertility and quality, offering organic farmers an alternative to chemical fertilizers. But animal-based soil amendments may also contain naturally occurring microbes that can cause food-borne illnesses in people.

"This study is designed to determine how much time should pass between the applications of untreated animal manure in the field and crop harvest, in order to minimize any risks that these microbes might pose to consumer health," said Alda Pires, a veterinarian and UC Cooperative Extension Specialist at the school.

Pires is leading the project with Michele Jay-Russell a veterinary research microbiologist and manager at the Western Center for Food Safety at UC Davis. "This research aligns closely with our center's goal to help farmers achieve compliance with the prevention-oriented activities outlined in FDA's produce safety regulations," said Jay-Russell.

In addition to UC Davis, project collaborators include the University of Minnesota, University of Maine, USDA Agricultural Research Service's Beltsville Agricultural Center, USDA Economic Research Service's Resource and Rural Economics division, Cornell University, and The Organic Center.

VET GRAD SHARES HER EXPERIENCE LEADING ONE HEALTH PROJECTS IN NICARAGUA, SOUTH AFRICA

The importance of teaching global competencies is reflected in the international opportunities at the UC Davis School of Veterinary Medicine, from which Carolina Vicario (second from the left) just graduated. During her time at Davis, Vicario did veterinary work in Nicaragua and South Africa, collaborating closely with the internationally focused [One Health Institute](#). As a leader on the Nicaragua trip, she developed a unique perspective on the educational, professional and personal benefits of traveling abroad.

Vicario joined the [Students for One Health Club](#) after hearing a lunch talk during the first few weeks of veterinary school. Some second-year students were presenting their new student-run interdisciplinary One Health project in Nicaragua. Their guiding principles of cultural sensitivity, information-exchange rather than unidirectional teaching, and sustainability resonated strongly with her. She later became one of the student directors of the Nicaragua project, which is still active today.

To prepare for work in Nicaragua, Vicario reviewed past projects, becoming familiar with the community leaders and what was important to them. She also learned the social norms in order to honor social codes, language, customs, dress, manners and made an effort to learn Spanish.



The trips were emotionally, mentally and physically demanding for everyone, and the preparation throughout the academic year was time intensive. Some students opted not to return for a second trip. Being raised in affluent regions of the U.S., it can and should be difficult to witness hardships that other communities face.



Vicario noted, "At school we get into the details of things like tertiary referral cases, advanced imaging and advanced disease. Then you go to a place where basic vaccines and anti-parasitics would make such a big difference. I just thought I've been over-trained in really fancy stuff and under-trained in how to make things practical."

Traveling has broadened her horizons. Vicario now has a strong interest in wildlife conservation and global health, and as she looks for opportunities, she's open to how that path will unfold. South Africa in particular left her feeling frozen and self-aware on various occasions. "The value was in waking up with a peek into a significant part of the world's rich human history, wildlife biodiversity, endemic diseases and resource management," Vacario said.

PAVING THE WAY FOR PATHOGENS

Coastal waters near heavy human development are more likely to receive land-based "pathogen pollution," which can include viruses, bacteria and parasites, according to a recent study from the University of California, Davis. The study said higher levels of rainfall and development increase the risk of disease-causing organisms flowing to the ocean.



The study, [published recently in *Nature Scientific Reports*](#), adds to years of work by a consortium of researchers led by the [UC Davis School of Veterinary Medicine's Karen C. Drayer Wildlife Health Center](#) and the California Department of Fish and Wildlife. The scientists were called upon to help decipher the mystery in the late 1990s when a parasite hosted by cats, *Toxoplasma gondii*, caused deaths in sea otters along the coast of California.

Wild and domestic cats are the only known hosts of *T. gondii*. The parasite can shed its infective egglike structures, called oocysts, in their feces. In soil, freshwater and seawater, these hardy oocysts can survive for over a year in some cases, infecting animals and people.

The latest study advances earlier work by tracking the parasite to see how human-driven land-use change and rainfall might be impacting pathogen movement from land to sea.

"This isn't just about *Toxoplasma*," said lead author Elizabeth VanWormer, a postdoctoral researcher at UC Davis at the time of the study. "Humans, pets, stray animals, livestock and wildlife can all shed pathogens that can be carried from land to sea in runoff after rainstorms. The way we develop our urban and rural coastlines — adding people, domestic animals, and hard surfaces like concrete and asphalt — can increase the flow of these pathogens into estuaries and oceans."

From 1910 to 2010, California's human population, the majority of which resides in coastal counties, expanded from 2.4 million to more than 37 million, with close to 50 million people expected by 2050. The growing human population reshaped large areas of the California coast, converting natural habitat to residential, industrial and agricultural uses.

Natural environments like forests, grasslands and wetlands can help filter out pathogens like *T. gondii* before they reach the sea. However, a paved or tilled landscape promotes the flow of contaminated runoff into waterways, storm drains and, ultimately, the ocean.

Using census and land-use records, the authors estimated that development between 1990 and 2010 increased oocyst delivery from coastal watersheds to the ocean by 44 percent. Climate change may also exacerbate the journey of pathogens to the ocean. Changes in rainfall or in the intensity of storm events can alter the level of contaminated runoff. Oocyst runoff rose by 79 percent between years of low and high precipitation. When increases in development and climate variability are combined, oocyst runoff more than doubles.

"Human-driven changes can increase pathogen runoff, but we also have the power to reduce coastal pathogen pollution through actions like conserving wetlands and riparian areas along waterways, reducing paved surfaces in our developed lands, and reducing the amount of poop left in the environment from pets and free-roaming domestic animals," VanWormer said.

Decades of collaborative research by the California Department of Fish and Wildlife, United States Geological Survey, Monterey Bay Aquarium, the Marine Mammal Center, UC Santa Cruz, and UC Davis, with commitment from the National Science Foundation Ecology and Evolution of Infectious Diseases program, provided the interdisciplinary tools and knowledge necessary to assess the impacts of coastal development and climate variability on coastal pathogen pollution. Co-authors on the study included Karen Shapiro, Wesley Wallender, Patricia Conrad, John Largier and Jonna Mazet, all from UC Davis; Tim Carpenter of Massey University in New Zealand; Purnendu Singh of VNR Vignana Jyothi Institute of Engineering and Technology in India; and Marco Maneta of the University of Montana.

PETS POTENTIALLY MORE AT RISK IF RECREATIONAL MARIJUANA LAW PASSES



On November 8th, Californians will decide whether to legalize marijuana for adult recreational use. But with the latest Field poll showing Proposition 64 ahead by a two-to-one margin, there's a growing concern about an unintended consequence — more cases of dogs digesting cannabis products.

"Dogs can die from this. It is uncommon but it's possible," said Dr. Karl Jandrey, Associate Professor of Clinical Surgical & Radiological Sciences at UC Davis School of Veterinary Medicine. "We probably see one a week but some of my colleagues in private practice in the Bay Area may see more like one or two a day."

The Pet Poison Helpline found that in the past five years, there has been an alarming jump in the number of dogs accidentally poisoned or intoxicated by marijuana — a 330% increase in cases across the

nation. The number one source in dog intoxications are edibles intended for human consumption that are rich in tetrahydrocannabinol (THC), the primary psychoactive cannabinoid in marijuana.

One very potent source of THC used in making baked goods is cannabutter. It's made by steeping marijuana and butter for hours, straining the plant matter from the butter, and then re-solidifying the THC-infused butter. At least two dogs in the U.S. have died in the past year after eating cannabutter, according to the helpline. In addition, some THC-rich cannabis edibles are also made with chocolate, raisins or xylitol, all ingredients that compound the toxicity in dogs.

Dr. Jandrey is getting ready to ramp up triage – and not just for dogs. “I really think that if we do pass proposition 64 we will see more dogs and cats intoxicated,” he said.

DEFINING THE BASIC NEEDS FOR HERD HEALTH

Recently Bret McNabb, Assistant Professor of Clinical Livestock Reproduction at the school provided basic guidance to cattlemen on herd health.

“As producers and veterinarians, we often talk about ensuring good herd health, but its definition can be vague and vary among individuals. Our ultimate goal is to create and maintain an overall healthy, productive and profitable herd of cattle,” McNabb said.

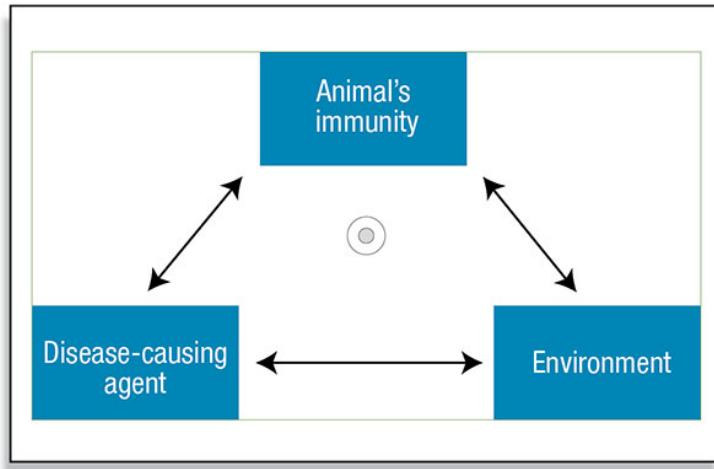
Key components to achieve this goal include: recognizing and treating sick animals, having a perspective on the collective health of the entire herd population, good nutrition and a clean environment. There are two basic strategies that apply to all diseases:

Biosecurity - exclude and prevent the disease from entering the herd. Maintaining a “closed herd” is often thought to be the ideal herd biosecurity model, in which the cattle are essentially isolated from any source of disease, as opposed to an “open herd” in which cattle are regularly exposed to potential threats. However, even if new livestock is not introduced into the existing population, there is always some level of disease risk. The key is to minimize and control these risks as much as possible:

- Know the source and health of new purchases – Purchase animals known to be free from certain diseases (i.e., *Tritrichomonas foetus*, BVD-PI animals, etc.) and vaccinated in a similar manner to your existing animals.
- Quarantine livestock before integrating, or re-integrating after a show, into the herd for 2-4 weeks.

A closed herd does not:
Purchase livestock
Co-mingle stock (i.e., grazing associations)
Have wildlife exposure
Have neighbors with livestock
Have bad fences
Use commercial livestock haulers
Exhibit livestock at fairs or shows

Biocontainment - control and eliminate disease that is already present within a herd. There is a relationship between the individual animal’s immune system, the prevalence of the agent causing disease and the environment--the triad of disease. Improving any of these will help to reduce disease burden and improve overall health.



- Separate sick animals from healthy animals.
- Implement appropriate vaccination strategies.
- Alter the environment - keep it clean, dry and with an appropriate concentration of animals.
- Utilize herd history to guide disease protocols.
- Surveillance – Monitor the herd for further signs of disease or deficiencies. If an animal dies a necropsy should be performed by your veterinarian or the local diagnostic lab.

“The easiest way to control disease in a population is to prevent its entry in the first place. Work with your veterinarian to develop individual animal treatment protocols and vaccination plans appropriate for your production goals. If you have an unusually high number of sick or dead animals in a short period of time, you can work together on sample submissions and diagnostic tests that will lead you to a diagnosis and, hopefully, a starting point to control that disease in the future,” advises McNabb.

NEW DESERT PLAN WILL HELP WILDLIFE ALONG THE AMARGOSA RIVER



Secretary of the Interior Sally Jewell recently announced the finalization of the Desert Renewable Energy and Conservation Plan (DRECP). The result of an unprecedented eight-year collaborative effort, the plan is a sweeping revision of BLM’s management in the California Desert. Attempting to balance renewable energy development with BLM’s conservation mandate, the plan implements the most significant conservation gains for the desert in decades.

Chief among these conservation measures is the establishment of California Desert National Conservation Lands. These lands, some 2.8 million acres across the desert, will offer substantial protections to vast swaths of previously vulnerable public lands. One of the crown jewels of this new system of protected lands is the Amargosa Basin.

The Amargosa Basin is a rugged region of craggy and multihued cliffs, expansive alkali playas, and verdant mashes, all tied together by the green ribbon of abundant life that is the Amargosa River. This

unique and varied landscape provides haven for dozens of rare, endemic, and endangered species, and the DRECP provides permanent protection for them all.

Perhaps the most important protections come at a critical time for the Amargosa vole. The vole is a charming and charismatic little creature which dwells in the lush wetlands surrounding the town of Tecopa, California. It is considered one of the most endangered mammals in North America, as its total population numbers just a few hundred. Up until now, its habitat has been vulnerable to destruction through industrial development.

Recent changes to the hydrology of Tecopa Marsh have meant the die-off of extensive patches of habitat for the vole, causing a precipitous decline in population. An innovative restoration project initiated by the UC Davis School of Veterinary Medicine and the California Department of Fish and Wildlife has removed the dead bulrush, raised water levels, and encouraged the regrowth of bulrush in the vole's former habitat.

Now the DRECP will help make these conservation gains permanent. By forever protecting this habitat, BLM will prioritize conservation as the chief guiding principle for land management in the vole's habitat. The aforementioned UC Davis scientists have created a captive-bred vole colony in Davis (affectionately known as "Tecopa North"). The new California Desert National Conservation Lands in Tecopa Marsh will provide an ideal destination for this rescue population of voles, helping to ensure the long-term viability of this vulnerable species.

