NEW LEADERS

Dr. Pamela Hullinger, DVM, MPVM, ACVPM has been appointed director of the California Animal Health and Food Safety Laboratory System (CAHFS). Dr. Hullinger has worked in both the public and private sector including service as a veterinary medical officer for the California Department of Food and Agriculture and director of the school’s Large Animal Clinic. She has also served as Chief Veterinary Officer - Food and Agricultural Security Program, Global Security Directorate of Lawrence Livermore National Laboratory, U.S. 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 complete and timely diagnostic services related to food safety and security, animal health emergency management and equine health and performance.

Dr. Woutrina Smith, DVM, MPVM, Ph.D. 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 RELATED TO ANR

• 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

UC DAVIS VETERINARY STUDENT SHARES IN ZIKA VIRUS DISCOVERIES

Hannah Laurence, a third-year student in the UC Davis School of Veterinary Medicine and a Howard Hughes Medical Institute fellow, had the privilege of doing biomedical research during the past year in the laboratory of Professor Jeff Kieft at the University of Colorado, School of Medicine.
Recently, the Kieft lab announced in the journal *Science* discovery of the molecular process used by the Zika virus to “hijack” the cells that it infects and potentially how the virus makes molecules that are directly linked to disease. The discovery shows that a part of the Zika virus’s RNA genome folds up into a complex structure and that this structure leads to the production of smaller RNAs, which in related viruses are directly associated with disease.

“Stepping out of the veterinary curriculum for a year was challenging but ultimately an extraordinary experience, Laurence said. “Over the course of the year, not only did I have the opportunity to be a part of an incredible research team, but also together we were able to address fundamental questions about the structure and function of Zika virus. We hope that our findings will set the groundwork for future studies on therapeutics for Zika and related Flaviviruses.”

Kieft noted that the study findings could inform ongoing efforts to develop a vaccine or other anti-Zika therapeutics. The discoveries also may be broadly applicable to understanding and preventing other related viruses such as Dengue, West Nile, Japanese encephalitis and yellow fever.

Laurence, who completed her undergraduate studies at Colorado State University before coming to UC Davis, was one of 68 top medical and veterinary students chosen last year from 37 different schools in the nation to conduct full-time biomedical research in the HHMI’s Medical Research Fellows Program.

**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 UC 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 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. Understanding the One Health concept is valuable to tackling serious food-borne illness problems affecting the world’s population.
The new branch laboratory of the California Animal Health and Food Safety Laboratory System (CAHFS) dedication event was held October 28, 2016. The event was attended by more than 200 faculty, staff, producers, clients, agency leaders, and veterinarians. Key remarks were given by:

- Michael Lairmore, Dean-School of Veterinary Medicine
- Ken Burtis, Acting Provost-University of California Davis
- Karen Ross, Secretary-Department of Food and Agriculture
- Annette Jones, State Veterinarian-Department of Food and Agriculture
- Jack Hansen, Jr., Chairman-CAHFS Laboratory System Board
- John Adaska, Branch Chief-CAHFS-Tulare Branch

The lab was dedicated in honor of Dr. Alex Ardans whose vision and more than 20 years of leadership enabled the statewide laboratory system to become a national leader in detecting and preventing livestock and poultry diseases. The new 29,000-square-foot laboratory will provide rapid detection and response to both routine illnesses and catastrophic emerging animal diseases. Located adjacent to the existing Veterinary Medicine Teaching and Research Center in Tulare County, this $49.5M state funded project continues the long-term partnership between the university and the California Department of Food and Agriculture in protecting human and animal health.

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.
Major components 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 will help farmers achieve compliance with the prevention-oriented activities outlined in FDA’s produce safety regulations. 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.

**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 UC 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 egg-like 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.
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:

- **Biosecurity**
  - 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.

**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.
SMALL-SCALE LIVESTOCK OWNERS LEARNED ABOUT NEW ANTIBIOTIC RULES

A workshop held November 5, 2016 at the Stanislaus County Agricultural Center near Modesto explored how new rules on antibiotics will affect owners of small numbers of livestock. People with one or more goats, cattle, swine, chickens and other livestock were invited to the free event hosted by UC Cooperative Extension. A state law taking effect in 2018 will require prescriptions for certain antibiotics that have long been available over the counter. As of the start of 2017, federal rules will require the same if these antibiotics are delivered through feed or water.

The changes aim to prevent the overuse of antibiotics that also are important in human medicine but could become less effective as pathogens grow resistant. The rules apply to large-scale operations. Speakers and topics included:

- Antibiotic resistance and what the new law means, by Richard Pereira, assistant professor at the UC Davis School of Veterinary Medicine.
- Reducing the need for antibiotics in beef cattle, by Bret McNabb, chief of the school’s Livestock Herd Health and Reproduction Service.
- Keeping goats and people healthy, by Alda Pires, lecturer and researcher at the school.
- Raising poultry on pasture, by Myrna Cadena, junior specialist at the school.
- Healthy goats, by Dr. Thomas Bauman of the Lander Veterinary Clinic in Turlock.
- Pork production on pasture, by Theresa Becchetti, livestock and natural resource adviser for the Cooperative Extension.

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.

ADDRESSING STUDENT DEBT

The cost of a quality professional education can be a significant impediment for veterinary students. The school has taken multiple steps to reduce the student’s financial burden.

Tuition and Fees Stablized

We have stabilized tuition and fees since 2011. The current annual cost for the veterinary program is $31,320. Student fees for the DVM program have been modestly increased only once in six years to keep pace with inflation rates.

Increased Financial Aid

Our aggressive approach to increase financial aid through loans, grants and scholarship support has made a significant impact in helping our students. At the university, approximately one-third of all tuition is returned to students as financial aid. Veterinary students receive an average of $6,700 annually in financial aid grants in addition to scholarship support. The school’s scholarship endowment has now grown to more than $68.7 million, making it one of the largest in the country. In 2016, we were able to provide $2.7 million in scholarships and another $4 million in financial aid, as well as $500 to each first year student for computer support.

Financial Aid Guidance and Career Resources

To help students successfully obtain funding, manage their money and control their debt, the school provides financial counseling services, information and on-line resources. We also ensure a smooth transition into the veterinary workforce by providing multiple professional career services including resume writing, interviewing, and career counseling and exploration. The school has also established the following resources:
• **VetMedJobs** – a free online job board used by more than 950 students and alumni, and 500 employers.

• **Career and Networking Night** – held annually to facilitate interactions between our students and veterinary professionals to explore extended learning and employment opportunities.

• The **Mentor Network** – an informal student-driven information network designed to connect current DVM students to professionals who represent a wide variety of careers in veterinary medicine.

Thanks to these efforts, 90 percent of the school’s graduates are employed or entering advanced training (internships or residencies) at the time of graduation.

“I was ecstatic when I learned I was accepted at UC Davis, but also worried about how I would pay off all the money I would need to borrow to pay for veterinary school.”
-- Catherine Deng, Class of 2019

“I want to make the most of every opportunity because of the scholarship that I was fortunate to receive. I feel like I have a partner going through school, helping me to achieve success.”
-- Christian Munevar, Class of 2018

NEW VETERINARY MEDICINE EXTENSION WEBSITE

Under the leadership of Assistant Director, Maurice Pitesky, the school recently developed and launched a new website for Veterinary Medicine Extension - [www.vetmed.ucdavis.edu/vetext](http://www.vetmed.ucdavis.edu/vetext)

The new site highlights the missions and programs of Veterinary Medicine Extension, which links science with communities by delivering the power of knowledge and research to the people of California, and beyond. Current programs include:

• Animal Welfare
• Beef Cattle Herd Health
• Dairy Production and Food Safety
• Microbial Waste Management
• Poultry Programs
• Small & Urban Farms
• Youth Scientific Literacy

Also featured are the Agricultural Experiment Station faculty, Cooperative Extension Specialists and Farm Advisors, as well as, the partnership programs in California and nationwide. Please bookmark this website and check back often for news updates and the launch of the unit’s newsletter early in the new year.
RECENT FACULTY PUBLICATIONS

A Deterministic Model to Quantify Risk and Guide Mitigation Strategies to Reduce Bluetongue Virus Transmission in California Dairy Cattle.
Mayo C, Shelley C, MacLachlan NJ, Gardner I, Hartley D, Barker C.

Overwintering of Bluetongue virus in temperate zones.
Mayo C, Mullens B, Gibbs EP, MacLachlan NJ.

Prevalence and molecular characterization of Cryptosporidium spp. and Giardia duodenalis in dairy cattle in Beijing, China.

Epidemiology of Salmonella sp. in California cull dairy cattle: prevalence of fecal shedding and diagnostic accuracy of pooled enriched broth culture of fecal samples.
Abu Aboud OA, Adaska JM, Williams DR, Rossitto PV, Champagne JD, Lehenbauer TW, Atwill R, Li X, Aly SS.

Estimation of tulathromycin depletion in plasma and milk after subcutaneous injection in lactating goats using a nonlinear mixed-effects pharmacokinetic modeling approach.
Lin Z, Cuneo M, Rowe JD, Li M, Tell LA, Allison S, Carlson J, Riviere JE, Gehring R.

Prevalence and Characteristics of Salmonella Isolated from Free-Range Chickens in Shandong Province, China.
Zhao X, Gao Y, Ye C, Yang L, Wang T, Chang W.

Descriptive survey and Salmonella surveillance of pastured poultry layer farms in California.
Dailey N, Niemeier D, Elkhoraibi C, Senties-Cué CG, Pitesky M.

Serosurvey of Greater Sage-Grouse (Centrocercus urophasianus) in Nevada.
Sinai NL, Coates PS, Andrele KM, Jefferis C, Senties-Cué CG, Pitesky ME.
J Wildl Dis. 2016 Oct 5. [Epub ahead of print]
https://www.ncbi.nlm.nih.gov/pubmed/27705104

Assessing Salmonella typhimurium persistence in poultry carcasses under multiple thermal conditions consistent with composting and wet rendering.
Vaddella V, Pitesky M, Cao W, Govinhasamy V, Shi J, Pandey P.