



Animal Agriculture Updates and Impacts March 2018

UC DAVIS' VETERINARY SCIENCE RANKED TOP IN WORLD FOR 4TH CONSECUTIVE YEAR



UC Davis held on to its top spot in veterinary sciences in the latest QS World University Rankings. As the inaugural No. 1 university in Veterinary Science, UC Davis is renowned for applying a “One Health” approach to addressing critical health concerns on a local and global scale.

The school, also ranked #1 by U.S. News and World Report, is home to a robust research program with more than \$85 million in annual research funding (21 percent from NIH) and provides clinical services to more

than 50,000 animal patients annually in 34 specialties. As a strong leader in veterinary medical education, prominent faculty teach nearly 600 DVM students with a curriculum built on sound educational theory. Advanced training is also provided to 170 graduate students and 110 clinical residents.

PREVENTING ANTIBIOTIC RESISTANCE ON THE FARM

Antimicrobial resistance is a serious problem impacting both human and animal health. The Centers for Disease Control and Prevention (CDC) estimates that more than two million antibiotic resistant infections occur annually in humans, resulting in some 23,000 deaths. In order to help stem the development of antimicrobial resistance, the veterinary and animal agriculture sectors are adapting medication practices which mirror requirements already in place in human medicine.

In order to support livestock producers facing these new regulations Dr. Michael Payne, Dairy Outreach Coordinator, with the help of Greg Wlasiuk, Western Institute for Food Safety and Security (WIFSS) Curriculum Designer, recently completed the development of a series of short informational videos for dairy producers. The goal of this video series is to raise awareness about the facts around antibiotic resistance and describes how to implement sustainable livestock medication practices. Benefits to updating farm protocols potentially include reducing medication costs and preserving treatment effectiveness on the farm. The topics covered in this series include:



1. What is antibiotic resistance and how does it develop?
2. Why should producers care about resistance?
3. What does good stewardship look like on the farm?
4. A quick look at the new state and federal laws

This video series is available online. <https://vimeo.com/album/4905089>

TRAINING THE NEXT GENERATION OF LIVESTOCK VETERINARIANS



As the world population grows, so too does the need for more veterinary students trained in livestock medicine. Veterinarians like Hannah MacDonald (pictured), a 2017 graduate of UC Davis, who care for dairy cows, beef cattle, swine, poultry, sheep and goats, will be on the front line of protecting the nation's food supply by ensuring the health of animals in these industries.

MacDonald grew up in northern California, in a small Native American community where she rode as a cattle hand for a nearby beef operation. She also participated in several international service trips in Mexico and India where she saw a strong need for herd health.

After learning more about the industry in veterinary school, MacDonald decided to specialize in livestock medicine. During her clinical rotation in Dairy Production Medicine at the [Veterinary Medicine Teaching and Research Center](#) (VMTRC) in Tulare, she worked on large sized dairies typical of California's Central Valley learning how important herd health is—preventing one sick animal from affecting others.

Keeping livestock and poultry healthy is critical in preventing the rise of antibiotic-resistant infections that kill more than 23,000 people each year in this country. Veterinary students receive diagnostic training to identify sick animals promptly, to prevent disease outbreaks, and to decrease dependence on antibiotics.

In addition to the VMTRC rotation, livestock students rotate through two clinical services—Livestock Medicine and Surgery Service and the Livestock Herd Health and Reproduction Service—based at the veterinary hospital in Davis. While rotating on the three livestock services, students work alongside faculty members and residents gaining practical hands-on experience in medicine and surgery of client-owned cows, sheep, goats and pigs.

HOW TOXIC IS WILDFIRE SMOKE?

Professor Kent Pinkerton has spent the past 30 years studying air pollution and how it affects respiratory, cardiovascular and neurologic health of humans and animals. So, when wildfires swept through vast areas of California in 2017, they became the center topic of a graduate course he was co-teaching on environmental health. What are the health effects of wildfire smoke? And what are the components of that smoke when a wildfire hits urban areas like Santa Rosa or agricultural lands where human-made chemicals and pesticides become part of airborne particles?

“Most of the studies we've conducted over the years look at the effects of environmental tobacco smoke and combustion particles on lung growth and development,” said Pinkerton who serves as director of the Center for Health and the Environment, as well as director of the Western Center for Agricultural Health and Safety. “We don't have the complete data on the complexity of wildfire smoke composition that may contain chemicals that are quite toxic.”



Particles and gases in wildfire smoke can cause tightness and pain in the chest, wheezing, coughing and dizziness. There is a greater concentration of particles in wildfire smoke that vary in size and different constituents in those particles that may create a more toxic combination than researchers find in other sources of air pollution. In a paper published in *Current Topics in Toxicology*, Pinkerton and co-author Jerold Last recommend the need for more studies on the compounds found in wildfire smoke. With an increase in the number and intensity of these fires over the past couple of years, the need for this information continues to be urgent.

Additionally, the amount of aerial fire retardant used in California from 2012 to 2015 increased from approximately three million gallons to about seven million. During the same timeframe, pesticide use in the state increased from about 186 million pounds to 194 million pounds. Fire retardant chemicals are necessary to suppress wildfire and keep it from reaching heavily-populated urban areas, but the health risks of the chemical compounds remain poorly studied, a critical need for health professionals.

VET-FOR-A-DAY

Recently, 24 Davis High School students interested in veterinary medicine participated in Vet-for-a-Day, an outreach effort hosted by the school. This was the second in a two-part program put on this year by faculty and staff to engage younger students on the potential career options available in veterinary medicine.

“Early exposure to the profession, along with direct mentorship, have proven to be the most powerful drivers for a career choice in veterinary medicine,” said Karl Jandrey, associate dean for Admissions and Student Programs. “We hope to inspire these up and coming students to consider a career in this great profession while exposing them to the daily skills and knowledge we apply to solve patient problems.”



The students participated in a parasitology presentation and hands-on learning lab in the school’s Multi-Purpose Teaching laboratory, and a clinical skills lab where they practiced on dog mannequins how to give injections, draw blood, and suture wounds.

“Drawing blood was easy, stitching up the ‘skin’ was the hardest, and observing the surgeries was incredible,” commented one student. Overall, the group felt the day was a great experience.

BACKYARD POULTRY WORKSHOP

The school’s poultry experts Drs. Rodrigo Gallardo and Maurice Pitesky, were featured speakers at a backyard poultry workshop organized by UC Cooperative Extension in January. Geared towards 4-H volunteer leaders who work with youth in raising poultry, the workshop offered participants training on topics such as:

- Poultry Behavior
- Backyard Biosecurity
- Disease Transmission, Risk Assessment
- Disease Transmission Activities
- Poultry Pests and Management Techniques
- Using the California Animal Health and Food Safety Lab (CAHFS)



DR. PRAMOD PANDEY HONORED WITH CALIFORNIA GEELA AWARD

The California Environmental Protection Agency (CalEPA), on behalf of Governor Brown, presented California Safe Soil (CSS) and Dr. Pramod Pandey, UC Davis School of Veterinary Medicine, with a Governor's Environmental and Economic Leadership Award (GEELA) during a recent special award ceremony held in Sacramento, California.



The award recognizes the public-private partnerships, and collaborative research with the school and the California Department of Food and Agriculture (CDFA) for conducting research, developing technology, and demonstrating that food can be recycled in a way that protects the environment and enhances public safety. (Pictured Assembly member Ken Cooley, Dan Morash, Dr. Pramod Pandey)

The annual GEELA Award, California's highest honor, is administered by CalEPA to recognize individuals, organizations, and businesses that have demonstrated exceptional leadership and made notable, voluntary contributions in conserving California's precious resources, protecting and enhancing our environment, building public-private partnerships and strengthening the state's economy. GEELA recipients are chosen from five categories including climate change, ecosystem and land use stewardship, environmental education, sustainable practices, and waste reduction.

"This year's GEELA recipients are demonstrating exceptional leadership in addressing some of our most significant environmental challenges," said California Secretary for Environmental Protection Matthew Rodriquez.

It is public policy in California to increase the recycling of organic biomass for improving the sustainability of agriculture. CSS has a proprietary new technology – enzymatic digestion – to do just that. However, the problem was to prove that the food recycling into fertilizer and feed can be done safely, without foodborne pathogens. CSS worked with UC Davis Specialist Pramod Pandey to conduct pathogen challenge research. Pandey's research, which was published in a peer-reviewed journal, proved definitively that the new CSS method for recycling organic food waste into fertilizer and feed is based on robust science and technology. This was a successful example of a public-private partnership between CSS, CDFA, and UC Davis.

VULNERABILITIES IN AMERICA'S AGRICULTURAL SECTOR

The increasing rate of emerging and reemerging zoonotic disease, along with threats and attempts by those with nefarious intent to attack food and agriculture, point to the need to exert more effort to eliminate vulnerabilities and reduce consequences associated with America's agricultural sector – Executive Summary, [Defense of Animal Agriculture](#), Bipartisan Report of the Blue Ribbon Study Panel on Biodefense, October 2017

A good example of our nation's vulnerability was the highly pathogenic strain of avian influenza that entered the United States via migrating wild birds in 2014 and resulted in the biggest animal health disaster ever experienced in the country. State and federal governments spent \$879 million on outbreak response. The outbreak impacted 21 states and led to the depopulation of more than 50 million birds on 232 farms.



The Western Institute for Food Safety and Security (WIFSS) has multiple projects and resources to train members of the agriculture community about the dangers of agroterrorism and natural disasters. It received a Specialty Crop Grant from the CDFA to assist companies in developing food defense plans as mandated by the Food Safety Modernization Act. WIFSS currently offers an [awareness level course](#), All Hazards Preparedness for Animals in Disasters; and a [management course](#), All Hazards Planning for Animal, Agricultural, and Food Related Disasters. The WIFSS team will soon be updating their Department of Homeland Security [AWR-152](#) Principles of Preparedness for Agroterrorism and Food Systems' Disasters course.

FBI and USAID-APHIS Workshops

Concerned about intentional tampering of the food supply, the FBI and the U.S. Department of Agriculture, Animal Plant Health Inspection Service (USDA-APHIS) have scheduled eight workshops in the coming year around the U.S. to raise awareness of their role in the prevention of and response to emerging and reemerging zoonotic disease, as well as the agencies' approaches to the threat of agroterrorism.

WIFSS and the School of Veterinary Medicine hosted and participated in one of the workshops, Animal-Plant Health Joint Criminal-Epidemiological Investigations, held on the UC Davis campus, January 3-4, 2018. The course curriculum was developed by the FBI Weapons of Mass Destruction Directorate (WMDD)-Biological Countermeasures Unit (BCU) and USDA-APHIS.

In 2015, agriculture, food, and related industries contributed \$992 billion (5.5%) to the U.S. gross domestic product, making the protection of the food and agriculture infrastructure a matter of national security. Dr. Scott Dee, DVM, Director of Research for Pipestone Veterinary Services presented information on the 2013-14 viral disease outbreak in pigs, porcine epidemic diarrhea virus (PEDV), which resulted in the loss of 8 million pigs. Although not identified as intentional act of agroterrorism, the outbreak was devastating to the swine industry, resulting in economic losses ranging from \$900 million to \$1.8 billion.

Dr. Jonna Mazet, Executive Director, UC Davis One Health Institute, spoke about identifying and mitigating viral spillover risk in human populations. She presented a comprehensive overview of the on-going global surveillance for pathogens taking place through the One Health Institute's PREDICT program to help prevent widespread infectious disease pandemics in animals and humans.

The workshop identified guidelines and protocols for joint animal, plant, public health and law enforcement investigations and the need to develop recognition points to detect potential hazards. Speakers discussed animal, plant and pest diseases that have or could have dire consequences to public health, production agriculture and export markets. Breakout group exercises identified the importance of information sharing between private industry, governmental entities, academics, and law enforcement. Workshop participants walked away with a better understanding of their roles and responsibilities during an outbreak.

RAT POISON FROM MARIJUANA FARMS IS HARMING FEDERALLY THREATENED NORTHERN SPOTTED OWLS

The northern spotted owl has had many adversaries. Three decades ago it was loggers, whose forays into the remote forests of the Pacific Northwest threatened the shy creatures, then it was the more aggressive and adaptable barred owls. Now, its unpermitted marijuana farms suspected of spreading rat poison up the owl's food chain, according to a study led by researchers at UC Davis in cooperation with the California Academy of Sciences.



"We have discovered a new potentially lethal threat to this struggling species that many conservationists have spent decades trying to save from extinction," said Mourad Gabriel, lead author of the study and a researcher with the UC Davis Karen C. Drayer Wildlife Health Center.

Seven of 10 spotted owls and 34 of 84 barred owls collected between 2009 and 2013 tested positive for anticoagulant rodenticides. The study area encompassed Humboldt, Mendocino and Del Norte counties, a region where increasing numbers of marijuana cultivation sites overlap with the owls' hunting grounds.

Separate studies conducted by Gabriel in 2012, 2013 and 2015 were the first to link rat poison and illegal marijuana farms to the deaths of fishers, a weasel-like mammal living in the Pacific Northwest. Scientists fear the beginning of recreational sales of marijuana in California could spur the creation of more illegal cultivation sites that could further contaminate rodents eaten by predators, including birds of prey.

Anticoagulant rodenticides inhibit the ability of mammals and birds to recycle vitamin K resulting in clotting and coagulation problems including uncontrollable internal bleeding. Images of dead and dying bobcats, mountain lions, coyotes and owls shared among residents in the vicinity of the Santa Monica Mountains National Recreation Area in 2016 attributed the animals' condition to the ingestion of prey contaminated with rodenticides.

All spotted owls collected in the study were found dead in wilderness and timberlands and submitted to U.S. Fish and Wildlife Service field offices and the Humboldt State University Wildlife Museum in Arcata, Calif. All of the owls collected were from remote forested lands with no nearby urban or agricultural settings, suggesting the sources were marijuana farms. Further study is needed to better understand the magnitude of the contamination and its effects on fledgling survival and embryos. The study, funded by the U.S. Fish and Wildlife Service, was part of an effort to build a scientific case for increased forest monitoring and species protection before it's too late.

CALIFORNIA WATERFOWL TRACKER

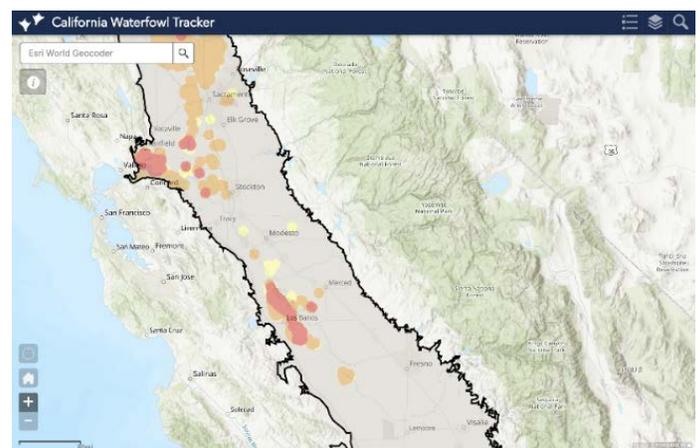
A new interactive California Waterfowl Tracker website developed by Cooperative Extension Specialist Maurice Pitesky at the school, and colleagues from the University of Delaware, U.S. Geological Survey, and [UC Agriculture & Natural Resources](#) shows the location of waterfowl.

"While the current version of the website is designed for California, the long-term goal is to develop and expand this system for the continental U.S. to promote health and safety of poultry flocks nationally," Pitesky said.

While not all waterfowl carry avian influenza, the migratory birds are the primary reservoir of the virus that kills chickens, turkeys and other birds and can take an economic toll on the poultry industry (2014-15 U.S. outbreak killed nearly 50 million birds).

"Avian influenza is such a devastating disease, in an abundance of caution, we want to limit any interaction between waterfowl and domestic poultry," said Pitesky.

From September through March, geese, ducks and other waterfowl migrate by the millions via the Pacific Flyway and winter in California wetlands, rice and corn fields. At the height of migration, the Central Valley is



home to 3 million waterfowl and the majority of the state's commercial egg-laying hens, broiler chickens and turkey flocks.

Using the web app to understand when and where waterfowl are feeding and roosting, poultry farm managers and other stakeholders will be able to consider waterfowl in their decision making. They may decide to place pasture-raised poultry in a region of the state that has less wetlands, such as Fresno. If a large number of Canada geese take up residence nearby, poultry owners may decide to move their domestic birds indoors to reduce their exposure until the migrating waterfowl move on.

Additional waterfowl habitat and next-generation radar analysis of waterfowl are integrated into the web app. Users can search one or more addresses to anticipate their farms' interaction with waterfowl. Based on the proximity of waterfowl and wild bird monitoring information from the U.S. Fish and Wildlife Service, poultry owners can make biosecurity decisions.

To use the California Waterfowl Tracker, visit: <http://ucanr.edu/sites/poultry>.

A web app video demonstration can be viewed at: https://youtu.be/EOO0Q_ggZ9I.

CAHFS CONNECTION

Highlights from the California Animal Health and Food Safety Laboratory System's (CAHFS) monthly newsletter CAHFS Connection for February and March include:

Bovine:

- **Pine needle abortion syndrome** occurs in cattle that ingest needles from pine, spruce, cypress and juniper trees that contain isocupressic acid. Pine needle abortion was confirmed on submissions from two large abortion outbreaks in beef cattle in northern California and southern Oregon, respectively.
- **Fungal abomasitis** was the primary cause of death in two, 22- to 24-day-old Jersey dairy calves.
- **Exsanguination into the abdominal cavity** was the cause of death in two Holstein cows from a dairy where six cows in various stages of lactation had died in a 2-week period.
- **Leptospirosis** was diagnosed in a 3-year-old bison with a history of weight loss and death.

Porcine:

- ***Trueperella abortusuis*** was the cause of severe placentitis and near term abortion in an animal on a 45 sow farm.
- ***Staphylococcus hyicus* infection (greasy pig disease)** caused epidermitis in an 8-day-old piglet from a farm where five other piglets had developed skin lesions and died at 4-10 days of age.



Small Ruminants:

- ***Trueperella pyogenes*** caused several third trimester abortions in a sheep dairy and in a small goat herd.
- ***Mycoplasma sp. septicemia*** was the cause for sudden recumbency and death in a 2-week-old goat kid.
- **Enzootic ataxia** from in utero **copper deficiency** resulted in weak goat kids that were in lateral recumbency and unable to stand since birth. Two of 20 does in a herd had affected kids.
- ***Neospora sp.*** and ***Chlamydia sp.*** were the diagnosed causes of **abortion** in yearling ewes in one flock with a history of some weak born lambs.

Poultry and Other Avian:

- Acute septicemia due to ***Erysipelothrix rhusiopathiae* infection** (turkey erysipelas) was diagnosed in 14-week-old organic turkey toms experiencing increased mortality of up to 25 birds per day, in a flock of 2,000 birds.

- Many cases of primary **Infectious Bronchitis Virus (IBV)** infection complicated by colibacillosis were diagnosed in broiler chickens ranging in age from 31 to 42-days.
- **Avian cholera** (*Pasteurella multocida*) was diagnosed as the cause of high flock mortality in which 40 turkeys in a flock of 60 died over a 10-day period.
- **Septicemia** due to *Streptococcus gallolyticus* was diagnosed in a flock of 15,600, 14-day-old Pekin ducks.
- **Systemic trichomoniasis** was diagnosed in a 7-day-old pigeon squab submitted from a commercial squab operation, which was undergoing high mortality in birds 2- to 10-days-old.



RECENT RESEARCH PUBLICATIONS

Colostrum immunoglobulin G concentration of multiparous Jersey cows at first and second milking is associated with parity, colostrum yield, and time of first milking, and can be estimated with Brix refractometry

Silva-Del-Río N, Rolle D, García-Muñoz A, Rodríguez-Jiménez S, Valdecabres A, Lago A, Pandey P
<https://www.ncbi.nlm.nih.gov/pubmed/28478013>

Aquatic Bird Bornavirus-Associated Disease in Free-Living Canada Geese (Branta canadensis) in the Northeastern USA

Murray M, Guo J, Tizard I, Jennings S, Shivaprasad HL, Payne S, Ellis JC, Van Wettere AJ, O'Brien KM.
<https://www.ncbi.nlm.nih.gov/pubmed/28445657>

A review of potential bluetongue virus vaccine strategies

Mayo C, Lee J, Kopanke J, MacLachlan NJ.
<https://www.ncbi.nlm.nih.gov/pubmed/28377132>

Environmentally relevant concentrations of herbicides impact non-target species at multiple sublethal endpoints

Hasenbein S, Peralta J, Lawler SP, Connon RE.
<https://www.ncbi.nlm.nih.gov/pubmed/28711003>

Susceptibility of Salmonella Biofilm and Planktonic Bacteria to Common Disinfectant Agents Used in Poultry Processing

Chylkova T, Cadena M, Ferreiro A, Pitesky M.
<https://www.ncbi.nlm.nih.gov/pubmed/28561639>

Fourth year DVM students get hands-on training during their dairy production clinical rotation on farms in Tulare area.

