UCDAVIS
VETERINARY MEDICINE

CAHFS

CALIFORNIA ANIMAL HEALTH AND FOOD SAFETY LABORATORY SYSTEM

Leading diagnostics nationally, protecting California locally

Welcome!

Pamela J. Hullinger

Welcome to the 2017 CAHFS annual report! We are celebrating 30 years as a unit within the UC Davis School of Veterinary Medicine, and 30 years of disease surveillance, fighting disease outbreaks and delivering high level diagnostic services. Although many of our original faculty and staff have retired, our current personnel continue to fulfill Assemblyman John Thurman's vision for a scientifically based diagnostic laboratory system providing excellent service to animal agriculture in California. Our longstanding partnership with the California Department of Food and Agriculture (CDFA) is critical in accomplishing this vision. Support from CDFA enables us to provide cost-effective, timely, consistent, high-quality services for comprehensive disease surveillance statewide. These services help to safeguard public and animal health, while protecting the food supply. In partnership with research faculty in the UC Davis School of Veterinary Medicine and experts in the United States Department of Agriculture we work to advance the science of diagnostic veterinary medicine and disease surveillance.

CAHFS Mission

CAHFS provides quality services that protect animal health and performance, public health and the food supply.

We continue to maximize our diagnostic capabilities through the utilization of traditional technology, like our new electron microscope (EM), as well as newer technology such as the MALDI-TOF (Matrix-assisted Laser Desorption/ Ionization Time of Flight) machine which allows us to identify potential bacterial pathogens much more rapidly and accurately than classical methods. Timely, accurate and actionable diagnostic test results remain our priority. As we look to the future, we continue to evaluate and adopt the next generation of diagnostic technologies to help keep us on the forefront of diagnostic veterinary medicine. A strategic planning retreat in 2018 will bring faculty and senior staff together to create our vision for the next 5-10 years.

We hope you will enjoy learning a little more about CAHFS' service and accomplishments from this past year. The report includes some highlights of our overall diagnostic testing as well as some details of a few unique disease investigations that involved our dedicated faculty and staff. Inside you will find our involvement in challenges the state has faced with a large increase in the incidence of Seneca Valley virus, information about the identification of an avian reovirus affecting our broiler industry, information on the new California Trichomonosis Program and a description of the large equine herpes virus outbreak that affected southern California. It has been a busy year as we have worked to provide diagnostic support for regulatory officials, veterinarians, farmers and ranchers.

As capturing all that we do in an annual report is not possible, I invite you to visit any of our four laboratories, and meet our dedicated faculty and staff. Whether you are a veterinarian, animal owner, or simply a member of the general public, we want you to think of **CAHFS as your laboratory**. At CAHFS we are committed to serving you.

Welcome to CAHFS!

Pam Hullinger

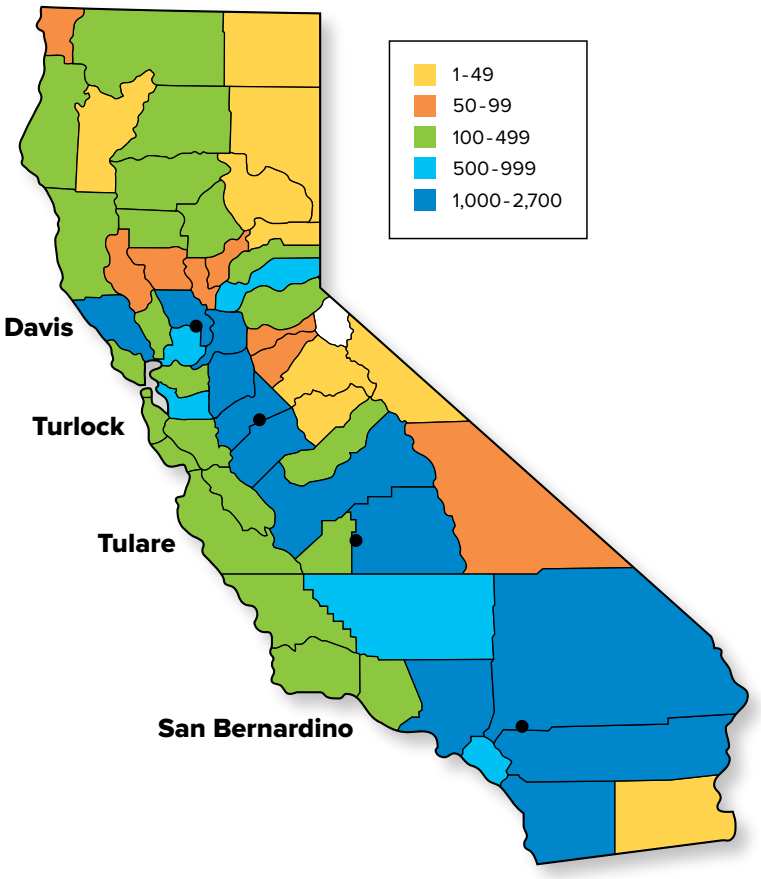
Pamela J. Hullinger, DVM, MPVM, DACVPM
Director, California Animal Health and Food Safety Laboratory System (CAHFS)

About CAHFS

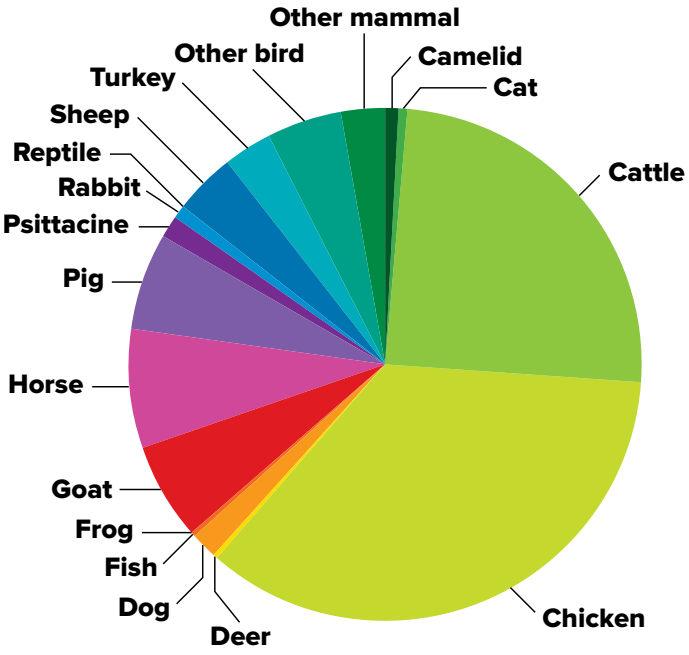
The California Animal Health and Food Safety Laboratory System (CAHFS) is the backbone of California's early warning system that helps to protect the health of our state's livestock, poultry and aquaculture industries. CAHFS serves the people of California by safeguarding public health with rapid and reliable diagnoses for animal diseases including those affecting humans. It also serves the equine industries by providing high-quality drug testing and pharmacology programs.

CAHFS offers a multi-disciplinary team approach using a comprehensive menu of tests and innovative services to protect animal health and commerce, public health and the food supply. Diagnostic services offered include bacteriology, electron microscopy, food pathogen testing, pathology, serology/immunology, toxicology, molecular diagnostics and virology.

Accessions by County



Accessions by Species



Protecting Against Foreign Animal Diseases

Seneca Valley (SV) virus, named after the region of its original discovery, it belongs to the same family as foot-and-mouth disease (FMD) virus and causes almost identical clinical signs. The virus is an important look-alike for FMD and Vesicular Stomatitis (VS) virus, and, as a result, requires immediate testing to ensure that California remains free of foreign animal diseases. Infected pigs develop blisters around the nose, mouth and hooves, with associated lameness and other non-specific signs, including fever and lethargy. While the SV virus has historically only rarely been seen in the U.S., several outbreaks occurred in the Midwest in 2015 and 2016. In the summer of 2017, multiple pig shipments into California from other states that showed symptoms compatible with SV virus infection were investigated by CDFA veterinarians. The CAHFS laboratory performed STAT testing for SV, FMD and VS viruses; the samples were consistently positive for SV virus and negative for FMD and VS, allowing quarantines to be released within 24 hours. In 2017, CDFA and CAHFS worked together on over 100 foreign animal disease investigations mostly related to SV virus.

Epidemiology investigations show the virus has been introduced from several different states, providing an indication that the SV outbreak will continue to require a strong commitment and collaboration between CDFA, CAHFS and industry.

Over the past year, the CAHFS Turlock and Tulare branches have received large numbers of submissions of broiler chickens with splayed legs, poor growth performance and increased culling. Submitted chickens ranged from 10 to 47 days of age, with an average age of 23 days. Clinically, live birds exhibited difficulty standing and walking. At necropsy, swollen hock joints with increased synovial fluid and occasionally hydropericardium were observed. Microscopically, lesions were noted in the tendons and synovium of joints as well as in the heart muscle. In these cases, **avian reovirus (ARV)** was often isolated from tendon/synovial fluid (76%) and/or heart (41%) and confirmed by direct electron microscopy. Since March 2016 a reovirus PCR assay has been available on cell culture (sensitivity and specificity of 100%) to help shorten the turnaround time.

Control of ARV is typically achieved through vaccination of breeder flocks with live attenuated or inactivated vaccines. However, antigenically different viruses can overcome vaccine immunity. Recently, newly emerging ARV variants have been identified in the United States, Canada, and Europe. ARV genes can reassort to generate diversity in both viral genotype and pathotype resulting in significant challenges to control. Molecular characterization of the ARV isolates from CAHFS recent submissions, identified five genotypic clusters, one of which contained most of the isolates and was similar to vaccine strains with the genetic homology between the field isolates and the vaccine strain ranging from 58% to 78%.

Protecting Human Health

California legislators passed Senate Bill 27 (SB27) in 2015 to promote the judicious use of antimicrobial drugs in livestock throughout the state. The bill charges the California Department of Food and Agriculture (CDFA), in consultation with other regulatory agencies including the Veterinary Medical Board, the Department of Public Health, universities, and cooperative extension, to develop antimicrobial stewardship guidelines and best management practices on the proper use of medically important antimicrobials. Future activities include direct veterinary oversight of all prescribed antimicrobial treatment in livestock as well as evaluating sales and use of antimicrobial drugs and animal health outcomes. A critical component of this directive is to mitigate the development of antimicrobial resistance present in bacterial pathogens while protecting animal health and the viability of livestock industries in California. CAHFS is working closely with CDFA to develop testing plans that will detect potential pathogens that affect animals and humans and to assess the genotypic and phenotypic resistance patterns present in these organisms. The laboratory is validating the use of a testing system which will provide information on antimicrobial susceptibility to drugs labelled specifically for use in livestock and poultry species as well as evaluating any concerns with resistance development to human-use antimicrobials. CAHFS faculty and staff will also participate in producer education forums, provide information for outreach activities, and investigate intervention strategies for stakeholders which may reduce or eliminate the need for antimicrobial use in their production systems.

Annette Jones, DVM
State Veterinarian
California Department of
Food and Agriculture

"I am proud to be a part of the California coalition of farmers, ranchers, veterinarians, researchers and other experts and advocates determined to lead efforts to preserve the effectiveness of antimicrobials, protecting animal and human health into the future"

– Annette Jones, DVM

Backyard Chickens and Lead – an Issue of Public Concern

Backyard chickens have become increasingly popular among households as a source of eggs. However these birds are potentially exposed to a variety of heavy metals including lead. CAHFS' avian influenza surveillance program includes necropsy of backyard chickens at a reduced rate. Occasionally birds have been positive for lead in their livers even though no clinical signs of lead exposure were noted. One of the major concerns with lead exposed birds is the potential for lead reaching humans through egg consumption. Ingestion of lead is particularly hazardous for children and pregnant women where numerous studies have described the harmful effects of exposure on behavioral and neuronal development.

Dr. Arya Sobhakumari, CAHFS toxicology resident, carried out a 1-year surveillance project that tested the livers of 1,476 backyard chickens for lead. Preliminary findings showed that 3% of the tested backyard chickens had detectable lead. Many of these birds were lead positive despite not having any clinical signs or indications of lead exposure which is interesting and worrying. The owners of positive birds were contacted to obtain further details such as the details of the premise and egg consumption habits of the family members.

Follow up testing of eggs from the lead contaminated flocks showed that some eggs had total lead concentration as high as 13 micrograms which is more than twice the FDA recommendation for maximum daily lead intake for children (6 micrograms). However, many owners did not submit environmental or egg samples due to financial reasons or lack of interest. There are still many unknowns regarding this issue such as how lead concentrations in the bird correlate with lead concentration in eggs from the same hens and the sources of lead exposure.

Recently, the toxicology section in CAHFS received a USDA grant to do more extensive testing in selected lead-exposed flocks to help answer questions about sources of exposure, blood-egg lead relationships and individual bird variation in lead exposure.

DISEASE
HIGHLIGHT

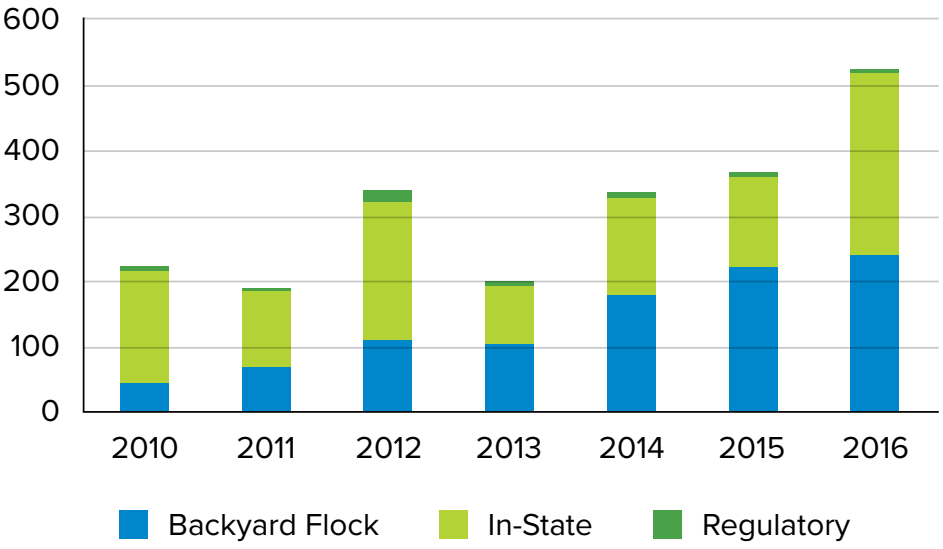
Infectious coryza

Infectious coryza is a respiratory disease that primarily affects chickens but has also been reported in pheasants, quail and guinea fowl. The disease is caused by infection with *Avibacterium paragallinarum* bacteria. In previous years, CAHFS has typically diagnosed coryza in less than ten necropsy case submissions per year. From January to May 2017, 45 necropsy cases of infectious coryza were identified. All submissions originated from commercial chicken flocks located in California's Central Valley. While 18% (8/45) of the cases were from commercial layer submissions, 82% (37/45) of coryza cases were from broiler flocks. Affected flocks reported a rapid onset of mortality and signs of respiratory disease that included facial subcutaneous edema (swollen heads), nasal and ocular discharge, and respiratory difficulty. In addition to the upper respiratory tract lesions, severe pneumonia, airsacculitis, pericarditis and perihepatitis lesions were prominent features of this outbreak, even in the absence of concomitant diseases.

Control of infectious coryza in layers is traditionally achieved by the use of commercial bacterins. In broilers, maintenance of coryza-free flocks is achieved by the use of biosecurity and all-in all-out management. In broiler flocks affected in this outbreak, management is currently underway to conduct genotyping and serotyping of the *Avibacterium paragallinarum* isolates from the outbreak. CAHFS is also currently in the process of validating a real-time PCR test on clinical samples to supplement the bacteriology and molecular detection protocols currently used for detection of coryza at CAHFS.

In addition to the upper respiratory tract lesions, severe pneumonia, airsacculitis, pericarditis and perihepatitis lesions were prominent features of this outbreak

Chicken submissions positive for *Gallibacterium* or *Avibacterium* on bacterial culture 2010-2016



DISEASE
HIGHLIGHT

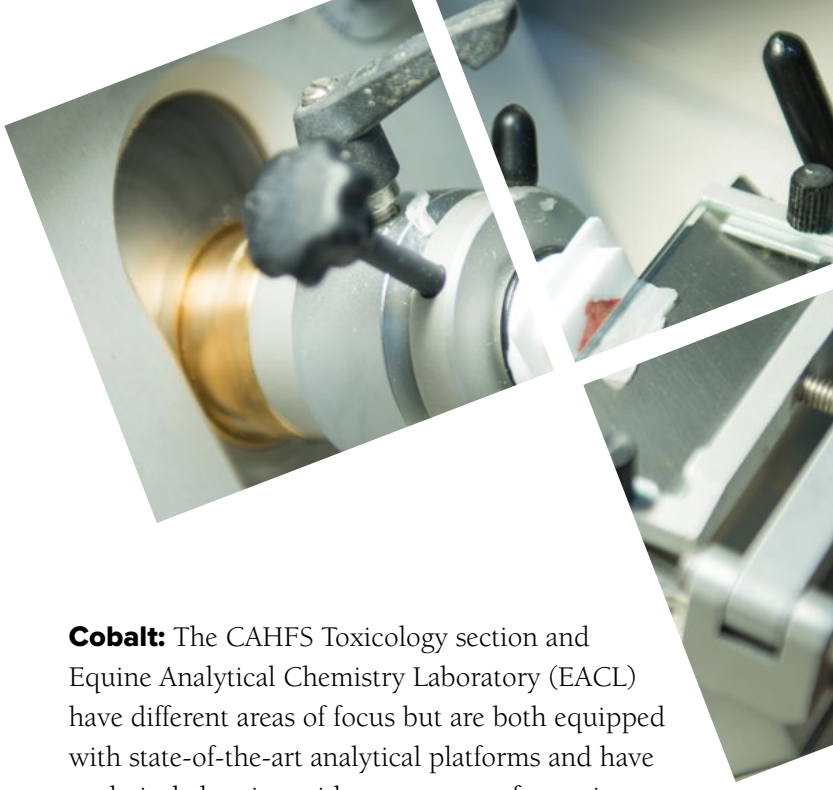
Equine Herpes Virus – 1

Since the fall of 2016, CDFA and CAHFS have worked together to detect and control two unrelated outbreaks of **Equine herpesvirus** (EHV) in horses. In the first outbreak, the index case presented with neurological signs but CAHFS determined the disease was caused by the non-neuropathogenic strain of EHV-1. Regardless of whether neurological disease in equines is caused by a non-neuropathogenic or neuropathogenic strain of EHV-1, regulatory actions need to be taken by CDFA. In this case these included quarantine, enhanced biosecurity, isolation of affected animals, temperature monitoring of exposed animals and oversight by regulatory officials. The outbreak started in October 2016 and CDFA surveillance and CAHFS testing to ensure the outbreak had been fully controlled continued through April 2017. During that time, horses from three different facilities were involved including from one premises outside of the southern California area. The second outbreak, this time associated with the neuropathogenic form of EHV-1, was diagnosed by CAHFS in December 2016 and included 11 horses. The outbreak was contained over a 1-month period and involved intensive testing and follow up on the part of CDFA and CAHFS. The neuropathogenic strains of EHV-1 differ from the non-neuropathogenic strains by a single amino acid in a DNA polymerase gene. While both strains of the virus can cause neurological disease, the non-neuropathogenic strains more typically cause respiratory and reproductive problems.

Trichomoniasis

In early 2017, new regulations related to the **California Trichomonosis Program** went into effect. These regulations require that any bull ≥ 18 months of age which is entering into or changing ownership within the state is now required to have a negative individual DNA detection test (PCR for *T. foetus*). Culture testing is still allowed for herd screening purposes and for certified semen services, but not for entering the state or for changes in ownership, including public and private sales. From 2016 to 2017 the total number of trichomonosis tests performed at CAHFS increased 18.1%. In addition, 73% of those tests in 2017 were performed using PCR compared to 64% in 2016. For the previous three years 0.6-0.8% of samples were positive when results from all Trichomonas diagnostic methods were combined but so far in 2017 just over 1% of all samples have been positive for *T. foetus* by PCR, which is expected given the greater sensitivity of the PCR method. The increased sensitivity and specificity of PCR testing procedure maximizes CAHFS' ability to detect this insidious pathogen and improves confidence that a positive test result reflects *T. foetus* infection rather than contamination.

State-of-the-Art Testing



Avian Super Panel: CAHFS continues to support the California Department of Food and Agriculture (CDFA) in surveillance and diagnosis of high risk avian pathogens. Recently the Biotechnology section developed and validated an "avian super panel" consisting of real-time PCR testing for ten pathogens that can impact not only commercial chickens and turkeys, but also psittacines, waterfowl, game birds and wild birds. Disease agents included in the panel include important viruses, chlamydia, and bacteria that can cause economically devastating diseases if not detected and controlled in a timely manner. The panel was primarily designed to help CDFA veterinarians rule-out avian influenza and exotic Newcastle disease (END) look-alike diseases. The test panel is also suitable for use by CAHFS non-regulatory clients for fulfilling export testing requirements for selected agents. The agents in the super panel include avian metapneumovirus, avian polyomavirus (budgerigar fledging disease), duck viral enteritis virus, fowlpox virus, psittacine herpesvirus-1 (Pacheco's disease), turkey hemorrhagic enteritis virus, *Pasteurella multocida*, Chlamydia spp, Reovirus, and duck hepatitis virus.

ELISA Pregnancy Testing: CAHFS evaluated the performance of a commercial ELISA test for the detection of early pregnancy-associated glycoproteins in the serum of ruminants. Working with the School of Veterinary Medicine's VMTH Livestock Herd Health and Reproduction Service, CAHFS evaluated the performance of the test over a single breeding season in two goat herds and found that diagnostic sensitivity was 89% for goats bred 28-30 days earlier, and 97% for goats bred more than 30 days earlier. The diagnostic specificity in goats was 97%. This means the test is good at detecting pregnancy and has very few false positive results. The manufacturer reports similar sensitivity and specificity in cattle and sheep.

Cobalt: The CAHFS Toxicology section and Equine Analytical Chemistry Laboratory (EACL) have different areas of focus but are both equipped with state-of-the-art analytical platforms and have analytical chemists with many years of experience. The Toxicology Section focuses on developing methods for the diagnosis of animal intoxications and identifying chemical contamination of animal feeds and human foods. The EACL focuses on the identification of drugs and other substances prohibited from use in performance horses and show livestock. While the areas of focus are different, there are occasions when the two laboratories collaborate to solve an emerging problem. As an example, concern was raised by the California Horse Racing Board (CHRB) about the administration of cobalt to racehorses as a way to enhance performance by increasing red blood cell numbers. The EACL was not equipped to test for cobalt, but the Toxicology section has extensive capability for metal detection at low concentrations and quickly developed a method to measure cobalt in plasma and liver at low levels. Samples from a number of horses were tested and high concentrations were commonly detected, especially in Standardbred horses. This led to the establishment of a plasma threshold for cobalt of 25 ppb in race horses; meaning that a concentration of > 25 ppb is violative and results in an enforcement action. The CHRB, EACL and the Toxicology section currently test over 1,000 samples per year for cobalt. The Toxicology section recently achieved ISO 17025 accreditation for the method, this accreditation assures both the high quality of these testing efforts and the acceptability of the test for enforcement actions.

Advanced Imaging

CAHFS receives new electron microscope

Thanks to the California Department of Food & Agriculture and the Office of Emergency Services, CAHFS received funding to purchase a state-of-the-art electron microscope (EM). The new scope is one of the most powerful diagnostic electron microscopes available. The EM scope quickly provides a visual image of the potential disease agents in tissues and other samples. This is especially important for new and emerging pathogens including viruses, bacteria and protozoa where it can be the primary, and in some cases, the only way to diagnose these agents. Current molecular techniques, e.g., real-time PCR and immunohistochemistry, are able to deliver rapid results, but only for known agents; new strains of an existing or novel pathogen may not be detected.

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- Larry Rawson, Ex-officio
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- Tom Talbot
- Windy Van Dam

Our Faculty

Faculty members at CAHFS are board certified by the:

- American College of Veterinary Pathologists
- American College of Veterinary Microbiologists
- American College of Clinical Veterinary Pharmacology
- American College of Poultry Veterinarians
- American Board of Veterinary Toxicologists
- American College of Veterinary Preventive Medicine

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The California Animal Health & Food Safety Laboratory System relies on the generosity of supporters to fulfill our mission. Please join us in working to protect the health of California's livestock and poultry. For information on how you can help, contact our Office of Development at (530) 752-7024.

Laboratory Locations

Visit us at:
www.cahfs.ucdavis.edu

Davis

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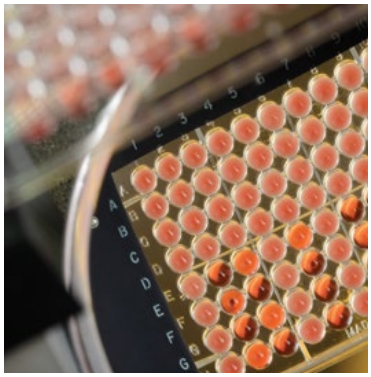

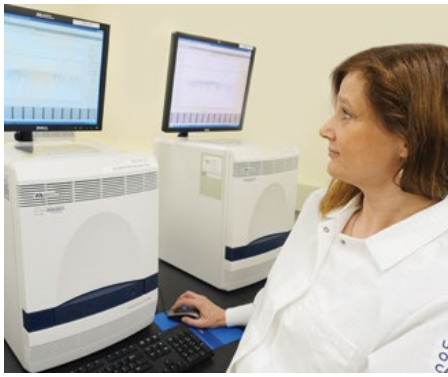

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