

Chapter 10

ARMY VETERINARY LABORATORY SERVICE

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INTRODUCTION

Three pillars form the core of the US Army Veterinary Service's force health protection mission: research and development, animal medicine, and food safety. The Veterinary Laboratory Service has always supported each pillar and continues to do so. For example, veterinary officers currently hold key positions in medical research laboratories, particularly in toxicology, virology, pathology, and laboratory animal medicine. In public health, veterinary personnel in food analysis laboratories provide the science that complements the art of food inspection, and veterinary diagnosticians maintain the health of military animals, service members, and military families and their pets.

Throughout the last two centuries, veterinary laboratory personnel also offered diverse support to multiple military conflicts, from testing ice chlorination potability in Vietnam¹ to providing food testing and rabies diagnostics for Operation Iraqi Freedom and Operation Enduring Freedom. They also collaborated in myriad civil-military functions, supporting international missions (eg, Joint Task Force Bravo in Latin America) as well as operations closer to home (eg, relief efforts for Hurricane Katrina and the 2010 Gulf oil spill).

Although an Army veterinary laboratory service

has existed almost since the inception of the Veterinary Corps itself, its size has varied greatly throughout the years. In December 1917, the Army surgeon general established a veterinary laboratory service that included six or seven laboratory officers.² By the end of World War II, about 100 veterinary officers served worldwide in the veterinary laboratory sections of 32 Army medical laboratories.³ (See also Chapter 1, *Military Veterinary Support Before and After 1916*.)

Since 1945, the number of veterinary laboratories has greatly decreased. Base realignment and closures, along with the advent of overnight shipping services, allowed various regional laboratories to be consolidated into the current Department of Defense (DoD) Food Analysis and Diagnostic Laboratory (FADL) at Joint Base San Antonio-Ft Sam Houston, Texas, and the Public Health Command Region- Europe, Department of Laboratory Sciences (LS) in Landstuhl, Germany, formerly known as Veterinary Laboratory Europe. With the activation of the US Army Public Health Command, these two laboratories have taken on increased roles in public health surveillance, zoonotic disease diagnosis, and entomologic testing. Smaller food analysis laboratories in Hawaii and Korea cover those parts of the world that cannot quickly get samples to the two larger laboratories.

FOOD ANALYSIS CAPABILITIES

The mission of the Army's food analysis laboratories has also changed through time. Although food safety is always a primary concern, early mission focus was on quality assurance testing and contract compliance for large subsistence stockpiles. Dairy testing comprised a large portion of the food analysis laboratory work, as did packaging testing of operational rations and can analysis. Initially, most laboratories were aligned under the Quartermaster Branch; later, food analysis became a medical mission and, ultimately, the responsibility of the Veterinary Service.

More recently, particularly with the advent of prime vendor and direct delivery contracts, food protection has become a main focus for food analysis laboratories. Quality assurance checks are still performed, but usually in the context of verifying the producer's own quality assurance program. Detection of harmful pathogens, toxins, and chemicals, and providing laboratory testing for food-borne illness outbreaks have taken priority. Also, food analysis laboratories are now increasingly involved with food defense and have expanded their capabilities to quickly detect intentional subsistence contamination with either traditional food-borne threats or bioterror-

ism agents. (See also Chapter 9, *Food Safety and Food Defense*, for more information about the veterinary food defense mission.)

Department of Defense Food Analysis and Diagnostic Laboratory

The DoD FADL, the Army's largest food analysis laboratory, performs a wide variety of microbiological and chemical tests on food and bottled water samples and provides global support to military and non-military customers. Food microbiology assays at the DoD FADL run the gamut from basic, conventional microbiology using agar plates to advanced, rapid techniques, such as real-time polymerase chain reaction and genetic typing. The microbiology section tests for routine quality indicators as well as specific food-borne pathogens and toxins, and it tests samples associated with food-borne illness outbreaks (Figure 10-1). Although most of the samples submitted for microbiological testing come from North and South America, the section also receives samples from the Pacific region and confirms laboratory results for the laboratories in Hawaii and Korea when needed.

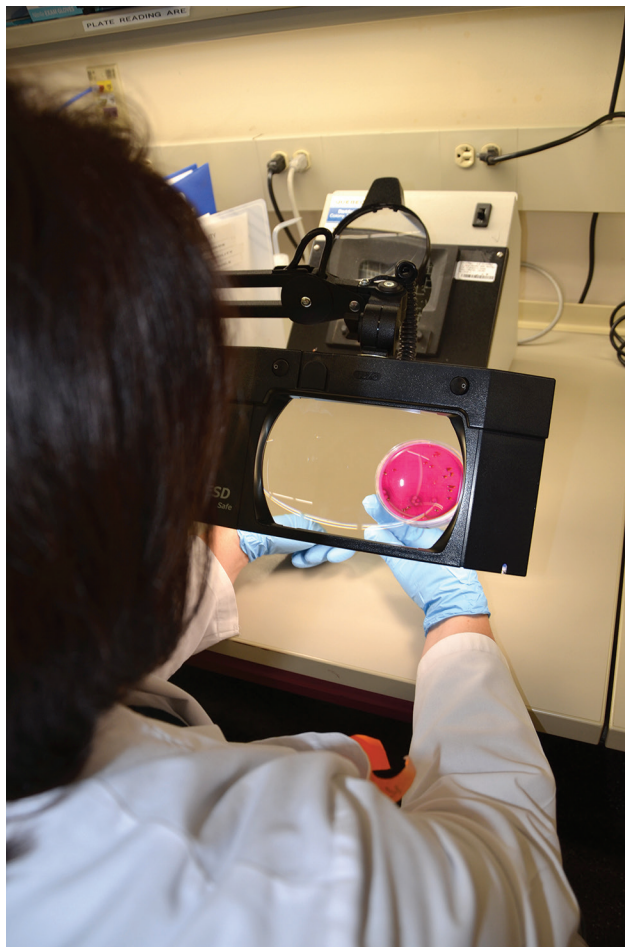


Figure 10-1. A Department of Defense Food Analysis and Diagnostic Laboratory microbiologist examines a cell culture plate for colonies while performing a membrane filtration test on bottled water samples. Photo courtesy of Lori Newman, Public Affairs Officer, Joint Base San Antonio-Ft Sam Houston, Texas.

The DoD FADL's food chemistry section also has specific capabilities, including detection of cyanide; pesticides, in food and water; histamine, in certain seafood; and antibiotic residues, in food and dairy products. In addition, the chemistry section conducts heavy metals analysis; proximate analyses, such as fat content of ground beef; and radiological screening of bottled water. DoD FADL chemists are also routinely called upon to identify foreign objects in food samples, respond to customer complaints, and handle other laboratories' samples when advanced chemistry testing is needed.

The DoD FADL works closely with the US Food and Drug Administration and the US Department of Agriculture, sharing results when food-borne pathogens are detected, so affected food items can be quickly removed from the US market. The DoD FADL is part of

the Food Emergency Response Network, headed by the US Food and Drug Administration, and the Defense Laboratory Network, headed by the DoD.

In addition to fulfilling routine testing and watch-dog functions, DoD FADL personnel work with the Army Medical Department Center and School, Health Readiness Center of Excellence, to teach students about food laboratory operations and sample submission procedures. The DoD FADL also tests animal feed, bedding, and drinking water at military medical research facilities. This testing helps military laboratories maintain their accreditation, keeps study animals healthy, and ensures that research results are valid.

Public Health Command Region-Europe, Department of Laboratory Services

The laboratory arm of Public Health Command Region-Europe, LS conducts microbiological testing of food and water for safety and wholesomeness utilizing classical agar-based media, rapid and field-expedient methods, and identification of microorganisms using classical biochemical and immunological techniques. LS also performs a limited number of food chemistry procedures, primarily pH in low-acid foods; however, the LS chemistry division performs a full spectrum of bottled- and source-water procedures, including testing for pesticides, herbicides, heavy metals, and radiation activity.

In addition, LS provides response to food-borne illness outbreaks in support of military members throughout the Central Command (ie, Southwest and Central Asia), Europe, and Africa. LS customers include Army, Air Force, Navy, and Marine personnel and state department assets, and LS receives sample submissions from more than 40 countries.

Other Military Laboratory Resources

Two smaller laboratories support the Pacific theater. The Food Safety Laboratory at Tripler Army Medical Center, Honolulu, Hawaii, performs microbiological screening for food samples from the entire Pacific theater, using a variety of rapid and miniaturized methods. The 106th Medical Detachment (Veterinary Service Support) Laboratory, Yongsan, in Seoul, South Korea, provides microbiological screening and limited chemical analysis of subsistence (ie, fresh, canned, bottled, and frozen food and beverage products) procured from the Korean peninsula.

Despite the wide geographic dispersion of the fixed laboratories, sometimes, other more flexible military laboratory resources are needed to ensure adequate and timely testing. Many food products are perishable; long transport distances can cause these samples

to degrade significantly, rendering them unsuitable for assessment. Difficulties shipping food samples across borders or out of combat zones can also delay or even prevent needed testing. In other situations, operational circumstances demand more immediate preliminary results on-site, precluding shipment to fixed laboratories.

To help mitigate these problems, each deployable Medical Detachment (Veterinary Service Support) contains a food procurement and laboratory team (FPLT). The FPLT's role is to rule out problems based on indicator testing before sending referrals to a reference laboratory such as the DoD FADL or LS. The FPLT uses two specialized equipment sets to screen food and water samples for microbiological indicators of contamination and a few chemical contaminants such as pesticides and aflatoxin (Figure 10-2). The FPLT also utilizes the Joint Biological Agent Identification and Diagnostic System, a ruggedized polymerase chain reaction platform to test food and water samples for biological warfare agents. The Joint Biological Agent Identification and Diagnostic assays for more typical food-borne pathogens such as *Salmonella* are in development, which will further enhance the food protection capabilities of the FPLT.

Implementing these laboratory teams has greatly enhanced local surveillance and destination monitoring, allowing potential problems to be identified before they affect consumers. In addition, the equipment sets provide the FPLT some veterinary

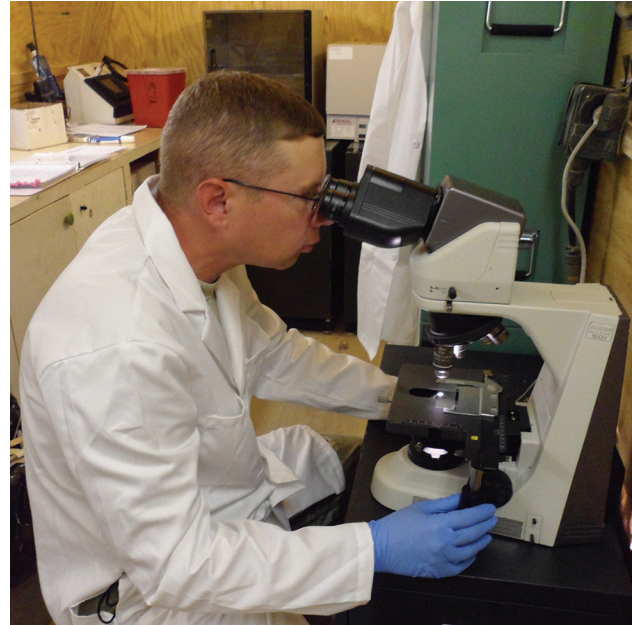


Figure 10-2. An Army Veterinary Corps officer evaluates bacteria cultured from a sports drink at Kandahar Airfield, Afghanistan. Photo courtesy of Lieutenant Colonel Scott Hanna, chapter author.

diagnostic capability, enabling the team to test for several animal disease agents that can also impact human health.

VETERINARY DIAGNOSTIC CAPABILITIES

Like the food analysis mission, the veterinary diagnostic mission has evolved. For example, although rabies testing remains a priority, modern technology has eliminated the need to maintain mouse colonies for disease diagnosis. The rabbits formerly kept for pregnancy diagnosis are now similarly archaic. Today, veterinary diagnosticians increasingly concentrate on the diagnosis and surveillance of zoonotic diseases—those diseases shared between humans and animals—as part of an overall public health system.

Department of Defense Food Analysis and Diagnostic Laboratory

As its name suggests, the DoD FADL promotes current animal and zoonotic disease diagnostic objectives. Because rabies is foremost among the important zoonoses, the DoD FADL provides rabies testing for both human and animal samples. The laboratory team performs rabies testing of all animal specimens, including

bats, to determine if humans bitten or scratched by a potentially rabid animal need postexposure treatment to prevent disease contraction (Figure 10-3).

The DoD FADL also provides the fluorescent antibody virus neutralization blood test for both government and privately owned animals; this test determines the rabies vaccine's efficacy and is a requirement for animals to travel to many rabies-free countries and regions. The DoD FADL performs a similar rabies antibody test for humans to determine if high-risk personnel, such as veterinarians, who have been vaccinated for rabies, are protected against the disease or if they need a booster vaccination. (See also Chapter 12, Rabies and Continued Military Concerns.)

In addition to rabies, the DoD FADL analyzes human, animal, and arthropod specimens for diagnosis and surveillance of several diseases of public health and zoonotic significance, including serologic and molecular diagnostic testing for leptospirosis, leishmaniasis, Chagas disease, and West Nile disease. In fact, the

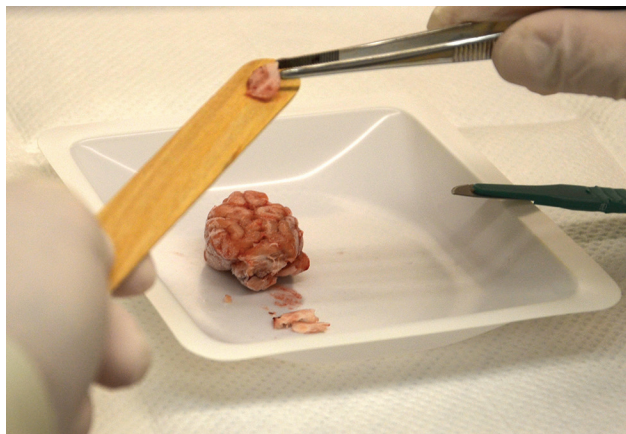


Figure 10-3. A Department of Defense Food Analysis and Diagnostic Laboratory technician prepares the brain of a skunk for rabies testing.

Photo courtesy of Lori Newman, Public Affairs Officer, Joint Base San Antonio-Ft Sam Houston, Texas.

DoD FADL conducts all the mosquito and bird testing for West Nile virus on military installations throughout the southern United States and was the first to detect the virus in the San Antonio, Texas, area in 2012. The laboratory team also tests for several tick-borne diseases in military working dogs and avian influenza in birds.

Besides testing, DoD FADL personnel assist US Army South in evaluating and building laboratory capacity in partner nations throughout the Southern Command area of responsibility, primarily Central America. The laboratory participates in multiple research projects, funded by diverse entities, such as the Global Emerging Infections Surveillance and Response System and the US Army Edgewood Chemical and Biological Center. A primary mission is evaluating new technologies and test methods that might be used someday by the FPLT and other deployable laboratories. The laboratory also conducts disease surveillance work to protect the health of military working dogs and humans.

The DoD FADL is part of the National Animal Health Laboratory Network, headed by the US Department of Agriculture, specifically for response to

avian influenza. The laboratory team assists Texas with its state feral animal rabies control program and supports the San Antonio Military Medical Center with laboratory testing for diseases such as rabies and leptospirosis. It also maintains a military working dog serum repository, similar to the DoD human serum repository, that can be utilized for retrospective disease surveillance studies.

Public Health Command Region-Europe, Department of Laboratory Services

Public Health Command Region-Europe, LS, provides rabies diagnostic testing, vector-borne disease testing, and anatomic pathology diagnostic services and is the front-line testing laboratory for units located in or deployed to the Central Command, Europe, and Africa. LS also cooperates with veterinarians from indigenous laboratories to establish rabies diagnostic capabilities within these operational areas.

Samples submitted for rabies testing are primarily from animals that have bitten a service or family member. LS provides after-hours and weekend on-call testing services for rabies submissions to ensure medical personnel are provided timely and accurate test results to make appropriate treatment decisions.

In addition to testing for rabies virus, LS provides vector-borne disease analysis of arthropod specimens. The team uses molecular diagnostic testing for surveillance of several diseases of public health and zoonotic significance, including anaplasmosis, ehrlichiosis, Lyme disease, Sicilian sandfly fever, Crimean Congo hemorrhagic fever, dengue disease, leishmaniasis, West Nile disease, tick-borne encephalitis, malaria, and chikungunya disease.

LS also has a board-certified veterinary anatomic pathologist assigned to the team, which allows it to provide diagnostic histological and cytological analysis of animal tissues, necropsy services, and training in support of local and deployed military working dogs and service members' privately owned pets.

LABORATORY ACCREDITATION

Although veterinary laboratories have strived to maintain quality systems to ensure the accuracy and validity of their results, until recently, each laboratory adhered to individual standards. In 1999, the International Organization for Standardization/International Electrotechnical Commission (ISO/IEC) issued ISO/IEC 17025, *The General Requirements for the Competency of Calibration and Testing Laboratories*, which was adopted as an American national standard. The ISO/

IEC 17025 incorporates many of the management and quality system requirements found in the widely used ISO 9000 but includes a technical requirements section specific to analytical laboratories.⁴ Independent accreditation agencies use ISO/IEC 17025, which was updated in 2005, as a template to ensure that analytical laboratories worldwide continue to consistently produce valid results and meet stringent competency requirements.

In the early 2000s, both the DoD FADL and Veterinary Laboratory Europe (now LS) underwent rigorous assessments by the American Association for Laboratory Accreditation to ensure the competency of their laboratory operations and the validity of their results. This accreditation provides further confidence in the accuracy and reliability of these laboratories' analytical results and allows them to act as confirmatory testing laboratories. In addition, this accreditation ensures that test results are legally

defensible and readily accepted by other government agencies. More recently, LS expanded its scope of accreditation, becoming the first DoD laboratory to be ISO/IEC 17025 accredited for veterinary anatomical pathology diagnosis.

The DoD FADL is also accredited by COLA, the Commission on Office Laboratory Accreditation, for its zoonotic disease testing of human samples. This certification allows this veterinary laboratory's test results to be fully accepted by human clinical laboratories.

SUMMARY

While the focus and number of veterinary laboratories may have changed over the years, the Army Veterinary Laboratory Services' primary missions of food analysis and zoonotic disease diagnosis have remained more constant. In fact, with the continued, collaborative focus on the One Health concept, the recurring demand for public health and veterinary laboratory services will continue to increase. The recently published DoD Directive 6400.04E, *DoD Veterinary Public and Animal Health Services*, affirms the importance of the laboratory mission to military operations. It assigns the Army, and specifically the Army Veterinary Service, the responsibility to "maintain laboratories or contract the capability for laboratory examinations (organic or purchased) for wholesomeness and quality of food products and diagnosis of animal diseases."^{5(p5)}

Currently, two key fixed veterinary laboratories serve most geographic needs and offer a full spectrum of food, water, and disease testing options. Two smaller veterinary laboratories plus newly organized veterinary laboratory teams capable of providing services to deployment areas provide even greater global flexibility and timeliness, especially when circumstances demand rapid field expediency. Finally, the recently adopted accreditation process continues to guarantee that individual veterinary laboratory resources provide valid and accurate testing that veterinary personnel, civilian and military health care providers, and military commanders can rely upon to make informed and accurate decisions. As they always have, Army veterinary laboratories will adapt and respond to the changing needs of their customers—needs that will endure as long as humans and animals continue to serve their country.

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