



Transportation: A Key to Animal Health ... Research ... and One Health

The U.S. agricultural sector is vital to the nation's economic, social, and political well-being. At the same time, this sector is perhaps one of the most vulnerable to a natural and/or intentional introduction of a foreign-animal, emerging and/or zoonotic disease event. (A zoonotic disease is any animal disease that crosses the species barrier to affect humans, and vice versa.)

The sector is particularly vulnerable to contagious animal diseases that may be spread through the transportation of animals and/or animal products. Disruptions in transportation also jeopardize business continuity within the agricultural sector. Protection of this sector from potentially catastrophic disease events, whether naturally or intentionally introduced, requires proactive, aggressive, and comprehensive approaches that include basic and translational research; countermeasure development, validation, and deployment; robust, documented epidemiologic and economic models; and an innovative, 21st century technology-driven education and outreach program.

As a result, in 2004 the National Center for Excellence in Agriculture was competitively awarded to the Foreign Animal and Zoonotic Disease Defense (FAZD Center), with Texas A&M University as the lead institution. In 2010, DHS awarded the Agricultural Center of Excellence to two universities; the Center of Excellence for Emerging and Zoonotic Animal Diseases (CEEZAD), with Kansas State University as the lead institution, and the FAZD Center, with Texas A&M as the lead institution. CEEZAD and the FAZD Center are Co-Leads for the DHS Program on Zoonotic and Animal Disease Defense (ZADD) through 2016.

Capacity and Impact

Together, the FAZD Center and CEEZAD have strong inter/multi-disciplinary programs and research teams that focus on countermeasure development, basic research, information analysis systems, translation of research results into end user products, and last but certainly not least, education and outreach. ZADD is committed to five multi-disciplinary policies:

- Harnessing the intellectual and "brick-and-mortar" research capacities of partner institutions, on both an immediate and sustained basis, in order to fill critical knowledge gaps;
- Leveraging research activities through established relationships with complementary national and federal laboratories, as well as federal, state, local, and non-profit agencies and programs;

- Aggressively extending and implementing our educational and outreach programs to augment and broaden national capabilities in global agricultural and public health;
- Organizing efforts to contribute to the national and global One Health–One Medicine–One World Initiative; and
- Increasing participation and recognition at national and international symposiums, conferences, and workshops.

Themes and Products

ZADD conducts research across three major themes:

- **Biological Systems** – Vaccines, anti-viral agents, detection/diagnostic tests, and universal platforms that satisfy DHS goals of detection, diagnosis, prevention, and recovery
- **Information Analysis Systems** – Modeling and analysis tools to support better-informed decision making at multiple levels of scale
- **Education and Outreach Systems** – Graduate programs, early responder training, and stakeholder workshops to provide the next generation of science power for homeland security.

Institutional Collaborators



Plus: National Animal Health Laboratory Network labs in 40 states

- Alabama**
 - Alabama A&M
 - Tuskegee Univ.
- Arkansas**
 - Ark. Pine Bluff
- California**
 - California Department of Food and Agriculture
 - Univ. of Calif. -Davis
 - Univ. of Calif. -Los Angeles
 - Univ. of Southern California
 - Cooperative Extension
- Florida**
 - Florida A&M Univ.
 - Univ. of Florida
- Georgia**
 - Fort Valley State Univ.
 - Univ. of Georgia
- Indiana**
 - Purdue Univ.
- Iowa**
 - Iowa State Univ.
- Kansas**
 - Kansas State Univ.
 - Cooperative Extension
- Kentucky**
 - Kentucky State Univ.
 - Univ. of Kentucky
 - Cooperative Extension
- Michigan**
 - Cooperative Extension
- Minnesota**
 - Univ. of Minnesota
 - Cooperative Extension
- Missouri**
 - Univ. of Missouri
- New Mexico**
 - New Mexico State Univ.
- New York**
 - Columbia Univ.
 - Mount Sinai School of Medicine
 - Orion Integrated Biosciences
 - Plum Island Animal Disease Center
- North Carolina**
 - North Carolina A&T Univ.
- Ohio**
 - Ohio State Univ.
- Pennsylvania**
 - Penn. School of Veterinary Medicine
- Puerto Rico**
 - Univ. of Puerto Rico, Ponce
- Texas**
 - AgriLife Extension
 - AgriLife Research
 - Texas A&M Univ.
 - Texas A&M College of Veterinary Medicine
 - Texas A&M-Kingsville
 - Texas Animal Health Commission
 - Texas Engineering Experiment Station
 - Texas Veterinary Diagnostic Laboratories
 - Univ. of Texas Medical Center
- Utah**
 - Cooperative Extension
- Virginia**
 - Old Dominion Univ.
 - Virginia Tech Univ.
- Washington, D.C.**
 - Georgetown University
- Germany**
 - Freie Universitaet Berlin, Institut fuer Virologie

CEEZAD

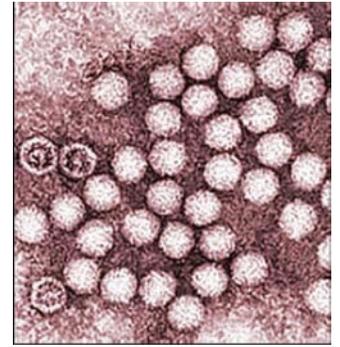
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ZADD Generates Products Designed to Protect U.S. Agriculture from Catastrophic Animal Diseases

Rift Valley Fever (RVF) research: vaccines, detection, and epidemiology/modeling – RVF is a viral zoonosis that infects animals and, to a lesser extent, humans. The RVF virus is on the select agent list and is considered one of the most significant threats as a potential bioterrorism agent. Both CEEZAD and the FAZD Center are working on the development of vaccines against this pathogen for use in sheep and cattle. The FAZD Center is developing a second-generation modified live vaccine with a DIVA (Differentiate Infected vs. Vaccinated Animal) compatible diagnostic assay. CEEZAD is developing a DIVA-compatible recombinant subunit vaccine. The vaccine products will complement each other and will provide comprehensive tools to control potential RVF outbreaks. They may also be used in preventive campaigns and eradication programs. Both vaccine development programs are being conducted in close coordination with industry partners to commercialize final products and to bring them to designated customers. CEEZAD and the FAZD Center are working on assays for the differential diagnostic of RVF and on the development of predictive risk-assessment models with the goal of increasing resilience against RVF virus-posed threats. In addition, CEEZAD is conducting epidemiological studies in RVF virus.



Emergency Response Support System (ERSS) — Outbreaks of exotic animal diseases present a complex challenge for decision makers. Incident commanders require immediate access to both historical information and emerging data. The ERSS technology provides methods for consolidating and synchronizing viewing of this data, as well as shared situational awareness among decision makers at different levels of government with diverse functional responsibilities. The FAZD Center is developing this tool for the U.S. Department of Agriculture's Animal and Plant Health Inspection Service (APHIS) in partnership with the APHIS emergency management program.



Investigator Keith Biggers demonstrates the FAZD Center's information technology that supports both ERSS (above) and FASTeggs (at bottom).

FASTRANS – The nation lacks sufficient documentation of the infrastructure for transporting Food and Agriculture Sector (FAS) commodities. FASTRANS is capable of providing a secured repository of interstate and intrastate livestock movement records, premise information, and infrastructure data. It has the potential to offer trace-back and trace-forward livestock movement support, based on history and market-driven conditions. FASTRANS is designed to promote business continuity by allowing responders and industry to react quickly to disruptions.



FASTeggs – Outbreaks of avian influenza lead to movement restrictions on poultry and poultry products. The poultry industry and egg producers lack the capacity to hold eggs or egg products for long periods of time. The industry needs a tool to help maintain continuity of business. The FASTeggs decision support tool (a joint project between the FAZD Center and CEEZAD) works with the ERSS information technology to present vital information (that will aid in allowing movement of products) in an integrated format. A working prototype is under development with the Center for Food Safety and Public Health, Iowa Department of Land and Agriculture, and U.S. Department of Agriculture's Animal and Plant Health Inspection Service (APHIS).



C · E · E · Z · A · D
Center of Excellence



Dr. Ian Lipkin at Columbia University developed unbiased high throughput pyrosequencing methods described below.

Unbiased pathogen detection methods – Unknown novel and synthetic infectious agents are considered to be a significant threat which needs to be addressed. Unbiased high throughput pyrosequencing (UHTP) methods provide the capacity to detect newly emerging, previously unknown, or genetically engineered synthetic biological threats. The method was developed by Dr. Ian Lipkin at Columbia University and has been utilized for the discovery of several new human viruses. Within the CEEZAD program, this method will be adapted for use in the detection of novel infectious agents in samples from unresolved veterinary diagnostic cases, suspicious for novel pathogens.

Continuing education courses on foreign animal and zoonotic diseases – As part of its Education and Outreach program CEEZAD is developing web-based continuing education courses for veterinarians, graduate students, and animal health professionals who are studying animal diseases. These courses provide an introduction to foreign, zoonotic, and emerging diseases with a focus on differential diagnostic and real-world experiences. The use of these courses will result in a better-trained workforce and increased national preparedness for emerging zoonotic threats.