

Partners: Texas A&M University (lead), University of California at Davis, University of Texas Medical Branch, University of Southern California, University of Minnesota, and Georgetown University

Established through a competitive DHS award in June 2004, the FAZD Center is an integrated, full-spectrum center whose primary objective is to protect the nation from bio-threats that endanger both public health and economic stability

Role within U.S. homeland security

Ongoing threat and consequence assessment in the agriculture and public health sectors demonstrate – with devastating clarity – the urgent need to develop more robust security measures to protect the United States against a wide range of threats, including the threat of high-consequence foreign animal and zoonotic diseases (FAZDs) being introduced into the nation.

The FAZD Center employs emerging science to address gaps identified by the DHS planning process with regard to new diseases, threats, and vulnerabilities. It maintains relationships with national and federal laboratories, other COEs, private sector, and other institutions engaged in related research. In addition, the Center nurtures and expands relationships with bio-pharma industries to facilitate the successful transition of biological products to applications.

The Center is establishing enduring academic programs, including those conducted at minority-serving institutions, related to homeland security. Importantly, it will link to the new national and international thrust on “one health,” especially as it deals with global health and zoonotic diseases

Themes and products

The FAZD Center’s team of scientists and educators conduct cutting-edge inter-institutional and inter-disciplinary research across three major themes:

- **Biological Systems** – Vaccines, anti-virals, diagnostic tests and immunological platforms, with a focus on three select agents: Rift Valley Fever, Foot-and-Mouth Disease and Avian Influenza.
- **Information Analysis Systems** – Computer models and epidemiologic/economic analyses designed to enhance decision-making at multiple levels of scale for decision makers during disease outbreaks.
- **Education and Outreach Systems** – Graduate-level curricula, early responder training programs and stakeholder outreach programs designed to provide the next generation of science power.

Capacity and impact

The FAZD Center provides DHS with an enduring institutional capacity to address each DHS priority area and to meet future needs, plus an ability to provide a stream of ongoing, meaningful products that address high-priority needs. FAZD Center products emphasize threat awareness, protective countermeasures, surveillance, intervention, and recovery. These products offer the benefit of concurrently reducing the risks from naturally emerging, intentionally introduced, or accidental disease outbreaks.

FAZD Center research directly addresses the priorities set by DHS

DHS Priorities					
Thematic Categories	Prevention	Detection	Response	Recovery	Risk Communications / Education
Biological Systems	<ul style="list-style-type: none"> • Vaccines for select agents • Immodulators • Management practices • Border security 	<ul style="list-style-type: none"> • Rapid hand-held diagnostic field tests • Pathomics discovery platform • Mass-scale ELISA test 	<ul style="list-style-type: none"> • Modern methods and alternatives to slaughter and burn 	<ul style="list-style-type: none"> • Marker vaccines to distinguish vaccinated from infected animals. • Anti-virals to close immunity gaps 	<ul style="list-style-type: none"> • Undergraduate and graduate education through sponsored thesis research • Masters and Ph.D. programs
Information Analysis Systems	<ul style="list-style-type: none"> • Table top exercises • Gap analyses • Planning • Training 	<ul style="list-style-type: none"> • Bio-surveillance assessment and integration • Border/port monitoring • Evaluation of detection options 	<ul style="list-style-type: none"> • Options for managing outbreaks • Operational tools for incident command • Real time delivery of data to responders 	<ul style="list-style-type: none"> • Methods for risk assessment for resumption of trade after clean up • Impact of mitigation options 	<ul style="list-style-type: none"> • Distance education and training exercises for biodefense • Quantitative risk analyses, aversion and mitigation
Education & Outreach	<ul style="list-style-type: none"> • Training for early responders • Develop ongoing communication systems 	<ul style="list-style-type: none"> • Nationwide Train-the-Trainer programs in modern detection and diagnostic systems 	<ul style="list-style-type: none"> • First responder training in modern decision tools for incident command • Alert network to reach underserved farmers 	<ul style="list-style-type: none"> • Training international trading partners in modern risk assessment using new tools 	<ul style="list-style-type: none"> • HS-STEM based careers in FAZD defense • Multi-media risk communication educational tools

Products to defend America's health and economy from engineered and exotic animal diseases



The complexity of conducting research under biosecurity level 4 containment is illustrated in this photograph of laboratories at the University of Texas Medical Branch. Researchers in the laboratory are able to work at all levels of containment. Their research on Rift Valley Fever, for example (see related story directly below), is producing new vaccines and detection systems for animals to prevent, protect, and provide intervention in case of an outbreak.

► **Commercialization of Vaccine for Rift Valley Fever (MP-12)** – A major pharmaceutical company has approached the University of Texas Medical Branch – a partner in the FAZD Center – to support the development of a commercial vaccine for Rift Valley Fever using the MP-12 antigen, which is also being considered for development of a human vaccine. Successful rescue of the MP-12 vaccine strain of the virus from DNA has been achieved (and represents the first such achievement for a Phlebovirus), paving the way forward for vaccine candidates that are highly protective but incapable of reversion. Immunogenicity testing will take place at Texas A&M University in BSL2 facilities, and subsequently, for vaccination-challenge infection evaluation at the Galveston National Laboratory BSL3Ag facility.

► **Anti-viral protection against Foot-and-Mouth Disease (FMD)** – Standard vaccines for FMD require up to 10 days before becoming effective, creating an immunity gap during which livestock remain vulnerable to one of the most contagious of viral diseases. A new anti-viral from the FAZD Center promotes “natural killer cells” (NK) that attack the FMD virus, providing protection within three days. Research in this area contributes to vaccine development at Plum Island Animal Disease Center. Vaccine modulation rationales for more rapid protective immunity were developed and tested in challenge studies at Plum Island. These studies confirmed significant increases in NK activity against FMDV-infected cells to accelerate immunity.

► **Cross-cutting generic platforms for foreign animal and zoonotic disease** – The ability to detect multiple organisms or the host response to these organisms simultaneously and to provide generic immunogens that protect against multiple organisms are high-priority DHS needs. FAZD Center research has established the pathomics discovery platform as a new approach to produce diagnostic biosignatures for known, unknown, emerging, and potentially engineered pathogens, to identify new therapeutic targets and generate new rationales for enhanced protective immunity.

► **National Bio-Surveillance Integration System (NBIS)** – At the request of the Office of Health Affairs, the FAZD Center (in collaboration with the National Center for Food Protection and Defense), adapted a system used for training emergency responders to develop a dynamic display system to portray the products of the NBIS system in an interactive format for decision makers at multiple levels of government. This involved developing and deploying the new Biological Systems Common Operating Picture (BCOP) dashboard for display across multiple agency members of NBIS.

► **Dynamic Preparedness Simulator** – Addressing a gap in the training and preparation of emergency response management to a foreign animal and zoonotic disease event, a prototype Dynamic Preparedness Simulator (DPS) system was developed. The DPS, developed in collaboration with the FAZD Center’s Education and Outreach theme, provides emergency response managers access to FAZD-based modeling, decision-support, and situational awareness tools during training or during an actual FAZD event. The DPS will be used to train response personnel on the systems and tools to be used during an actual event. APHIS and OHA have expressed active interest in this system, as has the TAHC.

► **Risk assessment models for Rift Valley Fever** – Rift Valley Fever (RVF) is a zoonotic disease recognized as a candidate for intentional or unintentional introduction into the U.S. from the Horn of Africa, where an outbreak in animals and humans recently occurred. The Center developed the first animal disease spread model specifically addressing the potential consequences of a RVF outbreak in the U.S. livestock industry. Combined with an existing economic model, estimates were made of the impact of the introduction of RVF in the continental U.S. As an input to the National Biodefense Analysis and Countermeasures Center’s biennial Biothreat Risk Assessment for the White House, the Center is a member of a national working group of government institutions communicating and collaborating on RVF research.

► **Master’s degree professional programs at Texas A&M University and the University of California at Davis** – The FAZD Center has developed new curricula for professional veterinary students that injects homeland security-relevant tenets into programs relating to epidemiology, public health, and risk analysis, thereby providing a pathway for students to enter homeland security-critical careers. The FAZD Center and DHS support in the form of fellowships, stipends, internships, and other innovative learning experiences, has already paid dividends in the form of graduated students with critical trans-disciplinary skills entering the workforce.



Dr. Edu B. Suarez-Martinez (right), associate professor from the University of Puerto Rico-Ponce, and Noried M. DeJesus-Velazquez, an undergraduate from UPR-Ponce, participated in FAZD Center research as part of the Summer Research Team Program for Minority Serving Institutions. They later made research presentations to S&T Undersecretary Jay M. Cohen.

► **Research education for students and fellows** – A total of 147 students and post-doctoral fellows have participated in FAZD Center research and education programs. These include 21 post doctoral fellows, 61 doctoral students, 39 master’s students, 8 veterinary medicine students and 18 undergraduates. The population reflects students supported by the Center as well as those supported by leveraging funds on research directly related to the Center’s agenda.