FAZD CENTER

National Center for Foreign Animal and Zoonotic Disease Defense

A DHS Center of Excellence

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

Established through a competitive U.S. Department of Homeland Security (DHS) award in April 2004, the National Center of Excellence for Foreign Animal and Zoonotic Disease Defense (FAZD Center) is an integrated, full-spectrum center whose primary objective is to protect the nation from bio-threats.

The FAZD Center focuses on zoonotic diseases that pose catastrophic risks to public health and livestock health, as well as to the national agricultural economy, which provides about 13 percent of all U.S. jobs.

Role within U.S. homeland security

Ongoing threat and consequence assessments in the agriculture and public health sectors demonstrate the urgent need to develop more robust security measures to protect the U.S. against a wide range of threats. Among these are bio-threats, which include the threat of high-consequence foreign animal and zoonotic diseases being introduced into the nation. Of particular concern are zoonotic diseases, which infect both humans and animals, and which are transmissible between them. According to the Centers for Disease Control and Prevention, at least 60 percent of all human pathogens are zoonotic, and 75 percent of emerging, infectious human diseases begin as infectious animal diseases.

The ability to fully address the DHS priority areas – prevention, detection, response, and recovery – requires integration of biological, social, computational, and analytic sciences. The FAZD Center has successfully established and employed an inter-disciplinary and inter-institutional team of leading scientists, educators, and support staff to meet those priorities.

Capacity and impact

The FAZD Center has a national capacity with well-established collaborations with other DHS Centers of Excellence on a range of vital projects. It has a demonstrated track record of developing enduring institutional research and education programs, and an ability to apply these programs to provide a stream of meaningful products.

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.

Research at the FAZD Center is currently focused on three select agents

Select agents	*Rift Valley fever*	*Foot-and-mouth disease*	*Avian influenza*
Description	• Transmitted between animals and humans via insects • Mortality and abortion in livestock • Acute flu-like symptoms in humans	• Most contagious viral disease • Highly susceptible for multiple species • Multi-billion dollar impact	• Possible mutation to human pandemic • Transmission among species • Economic and public health consequences
Affected regions	Sub-Saharan Africa and Madagascar	Africa, South America, Asia and some parts of Europe	Asia, Europe, the Near East and Africa
FAZD Center products	• Animal vaccine reagents • Early detection and diagnostic tools • Quantitative models for prevention and management strategies	• Rapid portable tests for detection • Antiviral agents for immediate protection • Quantitative models for threat and vulnerability	• Define relationship between birds and humans for transmission • Vaccines and antiviral agents for prevention • New methods for rapid detection

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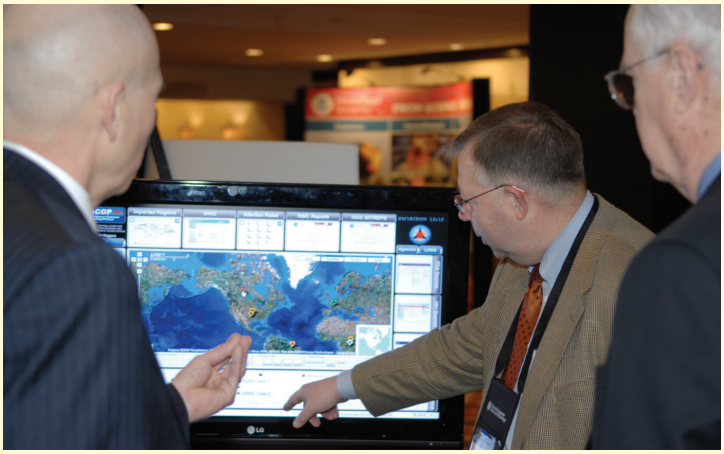

Principal Investigator James A. Wall (center) of Texas A&M University demonstrates Biosurveillance Common Operating Picture dashboard.

▶ **Development of a Dashboard Approach for the Common Operating Picture for the National Biosurveillance Information System (NBIS) –** The FAZD Center developed a dashboard approach for a Biosurveillance Common Operating Picture (BCOP) for the NBIS that provides a new capability for analysts to aggregate data from multiple sources into a common framework for assessment of emerging and ongoing biological events at national and global scales with the objective of providing improved and enhanced awareness of events threatening human and animal health. The NBIS aggregates information from multiple sources and agencies for both analysis and presentation to senior decision makers. With the outbreak of H1N1 influenza, the FAZD Center was asked to participate with DHS in taking the BCOP to an immediate operational stage. This was accomplished in weeks rather than months as originally scheduled. The system is now in use by analysts from several participating agencies with the Center providing an access portal for the system at Texas A&M. The BCOP will continue to be improved by the FAZD Center and eventually located within DHS for long term use.

▶ **Enhanced Immunity to Exotic Animal Diseases Affecting U.S. Public and Animal Health and the National Economy –** An animal vaccine against Rift Valley fever virus, one of the priority select agents, has been developed from the MP12 antigen developed for human use and is currently moving to commercial production trials. This product is being enhanced in further research with a genetic marker that allows the immunity resulting from vaccination to be distinguished from that associated with active disease, thereby allowing immunized animals to safely move through interstate commerce. The second generation vaccine will be tested in 2010.

▶ **Innovative Anti-Viral Products that Provide Greater Protection for Livestock –** Vaccination remains among the most effective strategies for protecting livestock during an outbreak. The FAZD Center has developed an antiviral product (an immunomodulator) that is incorporated into the FMD vaccine being developed by the Plum Island Animal Disease Center that reduces the time to develop an effective immune response to vaccination from 10 days to 3 days or less, thus providing accelerated protection. The anti-viral is undergoing tests at Plum Island Animal Disease Center.

▶ **Databases and Models for Interstate Movement of Animals to Support Models of Animal Disease Spread –** Most epidemic models assume disease is spread by direct or indirect contact at local levels without accounting for the long distance movement of animals across the country that occurs in commerce. The DHS has provided special funding to the FAZD Center and NCFPD to acquire the data to build a national transportation model to generate input for multiple epidemiologic modeling efforts. The initial effort focused on beef, dairy, and swine, with other commodities to be added in the future. Known as the Food and Agriculture System Transportation (FASTRANS) model, this project is providing the first quantitative estimates of interstate livestock movement effects on the spread of high-consequence animal diseases.

▶ **Research Education for Students and Fellows –** A total of 147 students and post-doctoral fellows have participated in FAZD Center 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.

▶ **Rapid Detection of Infected Animals During Disease Outbreaks –** Early detection drastically reduces the spread of disease and resulting economic impact. The FAZD Center has developed an effective, accurate, and economical experimental strip test (similar to a home pregnancy test) that provides the ability to detect foot-and-mouth disease (FMD) and Rift Valley fever viruses in the field. This system will be tested at the Plum Island Animal Disease Center in 2010.

Jose Martinez (right) and Emily Leon – undergraduates from UPR-Ponce – served as FAZD Center interns during Summer 2009.

▶ **Contributions to Major Projects by MSIs and Minority Students** – 59 minority students and 10 Minority-Serving Institutions (MSIs) play integral roles in research and development projects – as well as in education and outreach programs – at the FAZD Center. For example, the Center has provided summer internships to undergraduates from the University of Puerto Rico at Ponce since 2007. So far, six students from UPR-P have served. The Center is also currently launching new education and research initiatives with Jackson State University (JSU) Center for Bioinformatics and Computational Biology. Ultimately, these types of partnerships are intended to both leverage expertise from the Center and its MSI partners in a mutually productive manner, and to establish enduring and sustainable capacity within partner MSIs.