Update for the Foreign and Emerging Disease Committee: USAHA

National Center for Foreign Animal and Zoonotic Disease Defense Center (FAZD)

Dr. Tammy Beckham
October 23rd, 2012
Greensboro, North Carolina
FAZD Center Mission

- To protect the nation’s agriculture and public health sectors against high consequence foreign animal, emerging and/or zoonotic diseases
  - Conducting Research
  - Developing Technology
  - Transitioning Products
  - Training Workforce
  - Communicating Results
109 partners in 34 states, DC, and 4 foreign countries

Alabama
- Auburn Univ.
- Alabama Dept. of Agriculture and Industries
- Cooperative Extension

Arkansas
- Cooperative Extension
- Arkansas Dept. of Ag Education
- Arkansas Veterinary Medical Assoc.

California
- IntegenX
- Univ. of California- Davis
- California Dept. of Food and Ag
- UCLA
- California Polytechnic State Univ.
- Cooper Extension
- University of California- Davis
- California Dept. of Food and Ag
- UCLA
- California Polytechnic State Univ.

Colorado
- Colorado Dept. of Agriculture
- Cooperative Extension

Connecticut
- Univ. of Connecticut
- Cooperative Extension
- Connecticut Dept. of Agriculture

District of Columbia
- USDA National Institute of Food and Agriculture (NIFA)

Florida
- Florida Dept. of Ag Education
- Florida Veterinary Medical Assoc.

Georgia
- Georgia Dept. of Agriculture
- Cooperative Extension

Idaho
- Idaho State Dept. of Agriculture
- Cooperative Extension

Indiana
- Indiana Board of Animal Health
- Cooperative Extension

Iowa
- Iowa State Univ.
- Iowa Dept. of Agriculture and Land Stewardship
- National Pork Board
- USDA National Veterinary Services Laboratories

Kansas
- Kansas State Univ.
- Center of Excellence for Emerging and Zoonotic Animal Diseases (CEEZAD)

Kentucky
- Kentucky Dept. of Agriculture
- Cooperative Extension
- Kentucky State Univ.

Louisiana
- Cooperative Extension
- Louisiana Dept. of Agriculture and Forestry

Maine
- Univ. of Maine
- Maine Dept. of Agriculture
- Maine Compost School
- Maine Dept. of Environmental Protection
- Cooperative Extension
- University of New England

Maryland
- Maryland Dept. of Agriculture and Rural Development

Michigan
- Michigan Dept. of Agriculture
- Michigan State Univ.
- Cooperative Extension

Minnesota
- National Center for Food Protection and Defense (NCFPD)

Mississippi
- Mississippi Dept. of Agriculture and Commerce
- Mississippi Board of Animal Health
- Cooperative Extension
- Jackson State Univ.

Missouri
- Univ. of Missouri
- Cooperative Extension
- Missouri Dept. of Agriculture

Montana
- Montana State Univ.
- Montana Dept. of Livestock

Nebraska
- Univ. of Nebraska- Lincoln
- Nebraska Dept. of Agriculture
- Cooperative Extension

New Hampshire
- New Hampshire Board of Veterinary Medicine
- Cooperative Extension

New Jersey
- New Jersey Dept. of Agriculture
- Cooperative Extension

New Mexico
- New Mexico Dept. of Ag Education
- Cooperative Extension

New York
- Cornell Univ.
- New York Dept. of Ag and Markets
- Plum Island Animal Disease Center
- TetraGenetics, Inc.
- Cooperative Extension

North Carolina
- North Carolina Dept. of Agriculture and Consumer Services
- North Carolina Farm Bureau
- Smithfield Premium Genetics Group
- Cooperative Extension

Ohio
- Ohio Dept. of Ag Education
- Cooperative Extension

Oklahoma
- Cooperative Extension

Pennsylvania
- Cooperative Extension

Texas
- AgriLife Extension
- AgriLife Research
- BISOO Scientific Corp.
- Caliber Biotherapeutics
- Texas A&M Univ.
- Texas Animal Health Commission
- Texas Center for Applied Technology
- Texas Veterinary Medical Diagnostic Laboratory
- Texas Veterinary Medical Assoc.
- UTMB

Vermont
- Vermont Agency of Agriculture, Food, and Markets
- Cooperative Extension

Virginia
- Ceres Nanosciences
- George Mason Univ.
- Virginia Dept. Of Agriculture and Consumer Services
- Virginia Dept. of Environmental Quality
- National Renderers Association

Washington
- VMRD, Inc.
- Micronics, Inc.

Wisconsin
- Univ. of Wisconsin- Madison
- Wisconsin Veterinary Diagnostic Lab

Wyoming
- Cooperative Extension
- Wyoming Livestock Board

International Partners

United Kingdom
- Institute for Animal Health- Pirbright
- Forsite Diagnostics, Inc.

Pakistan
- Pakistan National Vet Laboratory

Canada
- Canadian Food Inspection Agency
- Manitoba Dept. of Agriculture
- Nova Scotia Agricultural College
- Government of Alberta

Kazakhstan
- Kazakhstan National Vet Laboratory

Plus: USDA National Animal Health Laboratory Network (NAHLN) laboratories in 43 states and EDEN (Extension Disaster Education Network)
Core Alignments/Partnerships

- CEEZAD
- FAZD
- PIADC
- DHS
- S&T

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### Customers and Stakeholders

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<th>DHS</th>
<th>USDA</th>
<th>Other Fed/State Agencies</th>
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<td>Agricultural</td>
<td>Science and Technology Directorate</td>
<td>Animal and Health Inspection Service (APHIS)</td>
<td>Health and Human Services</td>
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<td>Bio-Pharma</td>
<td>Office of Health Affairs</td>
<td>National Veterinary Services Labs</td>
<td>Centers for Disease Control and Prevention</td>
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<td>Livestock</td>
<td>Plum Island Animal Disease Center</td>
<td>Foreign Animal Disease Diagnostic Laboratory</td>
<td>State Animal Health Officials</td>
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<tr>
<td>Transportation</td>
<td>Office of Infrastructure Protection</td>
<td>National Animal Health Laboratory Network</td>
<td>Federal Bureau of Investigation</td>
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<td>Transportation Security Administration</td>
<td>Centers for Epidemiology and Animal Health</td>
<td>Intelligence Community</td>
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<td>Customs and Border Protection</td>
<td>NCAHEM</td>
<td>Emergency Responders</td>
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<td>Other DHS entities</td>
<td>National Veterinary Stockpile</td>
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<td>Agricultural Research Service (ARS)</td>
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<td>National Institute of Food and Agriculture</td>
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<td>Foreign Agricultural Service</td>
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FAZD Portfolio Overview

- Biological Portfolio
  - Vaccines and Diagnostics
  - Agricultural Screening Tools
- Information Analysis Tools
  - Ag Connect
    - Emergency Response Support System
    - Biosurveillance Tools
    - Pakistan Lab Info Mgmt System
- Modeling
- Education and Outreach
  - K-12; Post-graduate; graduate
  - One Health curriculum
  - International Engagement
Biological Portfolio
## Biological Countermeasure Portfolio

<table>
<thead>
<tr>
<th>Project Title</th>
<th>PoP</th>
<th>Partners</th>
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<tbody>
<tr>
<td>Development of a Prototype and Bench Validation of a 3B-FMDV Competitive ELISA Kit</td>
<td>8/16/11- 6/30/13</td>
<td>TVMDL, Pirbright Institute, OVI, USDA APHIS, USDA ARS</td>
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<td>Development of a Multiplex RT-qPCR assay for Surveillance of FADs during Routine Testing of Oral Fluid Samples</td>
<td>8/16/11- 8/8/13</td>
<td>TVMDL, National Pork Board, USDA FADDL</td>
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<tr>
<td>Differentiation of RVFV Infected from Vaccinated Animals Using a Blocking ELISA Based on Synthetic Peptides and Mammalian Cell Expressed Nonstructural Proteins</td>
<td>9/29/11 - 11/28/12</td>
<td>TVMDL, CDC</td>
</tr>
<tr>
<td>Identification of ASF Candidates by Reverse Vaccinology</td>
<td>9/20/11 – 9/29/13</td>
<td>Univ. of Wisconsin, Univ. of Michigan, BIOO Scientific</td>
</tr>
<tr>
<td>Development and Characterization of Monoclonal Antibodies to Foot-and-Mouth Disease Virus Structural Proteins</td>
<td>7/1/12-9/30/13</td>
<td>TVMDL, LLNL, BIOO Scientific</td>
</tr>
<tr>
<td>Development of a Fluorescent Microsphere Immunoassay Platform for Diagnosis and Surveillance of RVF</td>
<td>10/1/12-12/31/13</td>
<td>Kansas State University</td>
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<tr>
<td>Penside Detection of FMD by a Portable Microfluidics System</td>
<td>10/1/12-4/30/14</td>
<td>TVMDL, USDA FADDL, Micronics</td>
</tr>
<tr>
<td>Simple Diagnostic Tools for Rapid Decision Making in Feedlots: Development of a Multiplex RT-LAMP Assay to Discriminate FMD and VSV</td>
<td>10/1/12-12/31/14</td>
<td>Pirbright Institute</td>
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## Biological Countermeasure Portfolio

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<td>Optimization and Validation of a Real Time RT-PCR Assay for Rapid Detection of FMD Virus in Bulk Tank Milk Samples</td>
<td>8/16/11- 8/8/13</td>
<td>TVMDL, Pirbright Institute, USDA FADDL, CAHFS, WVDL, USDA CEAH</td>
</tr>
<tr>
<td>Negative Cohort Study for Validation of the SVANODIP® FMDV-Ag test</td>
<td>9/29/11 - 11/28/12</td>
<td>TVMDL, USDA APHIS NAHLN</td>
</tr>
<tr>
<td>Development of a Multiplex RT-qPCR assay for Surveillance of FADs during Routine Testing of Oral Fluid Samples</td>
<td>8/16/11- 8/8/13</td>
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<tr>
<td>Comparison of Different Sample Source and Sample Pooling for Detection and Surveillance of CSF</td>
<td>8/16/11-6/30/13</td>
<td>Kansas State University</td>
</tr>
<tr>
<td>Plant-based Expression Vectors for Rapid, High-throughput Development of Animal Vaccines</td>
<td>7/1/12 – 6/30/13</td>
<td>Caliber Biotherapeutics, Animal Health Pharmaceutical Company</td>
</tr>
</tbody>
</table>
Optimization and Validation of a real-time RT-PCR Assay for Rapid Detection of FMDV for Use in Bulk Tank Milk Samples

- FMD Bulk Milk Screening Tool can be used to restore normal milk and animal movement patterns
  - Support Secure Milk plan
  - Deploy and validate a standardized high-throughput protocol for detection of FMDV in bulk tank milk

- Public/private/international collaboration
  - Partners (USDA Plum Island, NAHLN, Pirbright Institute, Wisconsin, UC Davis, Dairy industry)
  - Sample extraction work at Plum Island
  - Animal work at Institute for Animal Health
  - Field Collection (bulk tanks) performed internationally
    - Sent to PIADC and/or Pirbright Institute
  - Coordination with NAHLN Technical Methods Working Group on protocol development and validation
Development of a 3B-FMDV Competitive ELISA Kit

- Production of the prototype cELISA kit—two pilot lots
  - First lot: calibration and optimization of reagents, reagents packaging, labeling and Q.C (currently in testing)
    - Results from first evaluation will feed adjustments for second lot
  - Second lot of kits will be used for beta testing (expected early 2013)
    - Compare analytic and diagnostic sensitivity/specificity to commercially available kits

- Bench evaluation of the kit
  - Testing of FMDV serum samples from infected and vaccinated cattle at the Institute for Animal Health (IAH) - Pirbright, UK and USDA APHIS FADDL
  - Testing of FMDV positive wildlife samples at Onderstepoort Veterinary Institute (ARC-OVI) – Onderstepoort, S. Africa
  - Negative cohort testing performed at TVMDL
Multiplex RT-qPCR Assay for FAD Surveillance

- Molecular (RT-qPCR) approach to multiplex testing for endemic and FADs
  - ASFV, CSFV, FMDV, PRRSV, SIV, PCV2, and M. hyo in oral fluid samples
  - Optimize nucleic acid (NA) purification from oral fluid samples
  - Simultaneous detection of pathogens using oral fluid diagnostic samples and experimentally infected animals (proof of concept)
- Collaboration with USDA APHIS Plum Island, National Pork Board, Smithfield
Production and characterization of novel reagents for the development of diagnostic technologies for Rift Valley Fever

- Develop monoclonal antibodies with different specificities to RVFV for diagnostic/research use
- Use nucleoprotein (NP) as immunogen to produce highly specific monoclonal antibodies
- Produce and characterize monoclonal antibodies to purified RVF virus
- Antibodies characterized at ABADRU
Information Analysis Systems
AgCONNECT

- Emergency Response Support System (ERSS)
- Laboratory Capacity Estimation Model (LCEM)
- Enhance Passive Surveillance Pilot (EPS)
- Biosurveillance Field Entry System (BFES)
- Business Continuity (E2E)
Information Dashboard Framework

- Provides a robust and extensible framework for developing user-defined operational pictures
- Allows visual integration of multiple distributed information sources in a common display
- Built upon a service-oriented architecture that provides network-centric environments
- Capable of supporting a variety of usage contexts including operational, training, and analysis-based missions
Emergency Response Support System

- Developed for USDA’s Animal and Plant Health Inspection Service (APHIS)
- Provides a web-based tool for large and small-scale incident management
- Developed around a service-oriented architecture and allows integration of bio-surveillance information, various tools for incident management, real-time information to support continuity of operations, and many other external references to support incident management.
- Used as an operational tool during a response, as an analysis tool after an event is complete, and as a training tool to prepare for possible future incidents.
- Developed using the Texas A&M University's Information Dashboard Framework

Incident Management
Visualization, Analysis, Report Generation

Continuity of Operations
SecureEggs, SecureMilk, SecurePork

External Tool Integration
LCEM, CAHEMS, EMRS
Laboratory Capacity Estimation Model Overview

- Developed for USDA’s National Animal Health Laboratory Network (NAHLN)
- Provides a web-based tool to help increase the Nation’s capability to prepare and respond to a high consequence animal emerging and/or zoonotic disease
- Allows for the automated determination of diagnostic testing capacity estimates, supply and equipment usage, personnel requirements, and any process limitations for individual and overall NAHLN laboratories
- Offers a variety of capabilities to support both planning and operations
- Implemented using the Texas A&M University's Information Dashboard Framework

- Analyze Lab and Network Capacity
  - Max Throughput, Supply Usage, Required Personnel

- Improve NAHLN Activation Plans
  - Network Capabilities and Best Activation Strategies

- Assist in the Prioritization of Resources
  - Optimal Distribution of Personnel, Equipment, and Supplies

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Phase I Status

- Pilot testing completed and system was released to all NAHLN Labs on June 19th, 2012
- Created 194 users from 67 different facilities
- Developed several training videos, reference guides, and a user FAQ
- Setup a help desk to provide user support
- Providing ongoing system enhancements and defect fixes
Phase II Tasks

1. Support local and regional preparedness exercises
2. Integrate data elements with the NAHLN Portal
3. Incorporate budget/accounting capabilities
4. Incorporate monitoring of consumable laboratory supplies and reagents
5. Utilize these national estimates in an ICLN exercise
6. Provide system maintenance and support
7. Develop training materials and provide training sessions
Engage to Excel (E2E): Maintaining Business Continuity and Performing Risk Management During an Animal Disease Outbreak
Graphical Depiction of Secure Pork Data Streams
Biosurveillance Common Operating Picture and Enhanced Passive Surveillance

For more information:

Keith Biggers, Ph.D.
Director, Computing and Information Technology
Texas Center for Applied Technology
Texas Engineering Experiment Station

(979) 458-0264 (o)
(979) 204-3131 (c)
biggers@tamu.edu
Enhanced Passive Surveillance (EPS) Pilot Project

Proof-of-concept study designed to demonstrate the usefulness of multiple-data stream syndromic surveillance by:

- Applying the power of real-time reporting and data aggregation to animal and wildlife surveillance
- Leveraging first responders (veterinarians) for animal and public health surveillance
- Estimating baseline prevalence rates of observed animal health anomalies for each stream
- Evaluating the significance of resulting signals as disease detection events
- Providing early warning information obtained from validated signaling activity to stakeholders to assist in making decisions
Biosurveillance Field Entry System (BFES) iPad App

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Analyst Workstation

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Development and Implementation of a Laboratory Information Management System and Biosurveillance Program for Foot-and-Mouth Disease in Pakistani Veterinary Diagnostic Laboratories
PKLIMS Software Suite

**Form Designer**
Allows design of forms:
- Visual form building
- Exporting of form data

**PKLIMS**
Facilitates lab operations and biosurveillance:
- Create result forms
- Create test specifications
- Import report designs for use by provincial and national labs
- Data entry through test process
- Management of users/groups
- Biosurveillance visualizations
- Exporting of lab data
- Biosurveillance and LIMS reporting

Available to LIMS Administrator at National Lab only.
Permissions based access to features. Available to all users.

**Report Designer**
Allows design of reports:
- Visual report building
- Exporting of report data

Available to LIMS Administrator at National Lab only.
Education & Outreach
• K-12 Programming provides outreach to **over 5,400 students (~220 schools)** in six states and **over 300 High School Agriculture and 4-H Extension** personnel trained or in program on an annual basis.

• Approximately **250 graduate students** have matriculated through FAZD Center since 2004.

• More than **1200 individuals** have been trained on activation and use of the Animal Health Network in **21 states** since inception

• **194 users in 67 labs** (~85% of users trained) work with the Laboratory Capacity Estimation Model

• **41 users** trained in the Biosurveillance Field Entry System

• International training
# Education and Outreach Portfolio

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<tr>
<th>Title</th>
<th>PI and Institution</th>
<th>Collaborators</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Diffusion of the Animal Health Network</td>
<td>Tom A. Vestal- Texas AgriLife Extension Service</td>
<td>State animal health officials and extension personnel from 21 states (AL, CO, CT, GA, IA, ID, IN, KY, LA, MD, MI, MO, MS, MT, NC, NH, NJ, TX, VA, VT and WY)</td>
</tr>
<tr>
<td>4th international Symposium on Managing Mortality, Products, By-Products, and Associated Health Risk</td>
<td>Dale Rozeboom-Michigan State University</td>
<td>Alberta Agriculture Food and Rural Development, AVMA, California Department of Food and Agriculture, Canadian Food Inspection Agency, Cornell Waste Management Institute, ISU Cooperative Extension, Maine Department of Agriculture, Maine Department of Environmental Protection, Manitoba Department of Agriculture, NCFPD, NPB, National Renderers Association, Oklahoma State University, Penn State University, Texas AgriLife Extension Service, University of Maine, University of New England, and Virginia Department of Environmental Quality.</td>
</tr>
<tr>
<td>Renewal of the HS-STEM Career Development Program from the National Center for Foreign Animal and Zoonotic Disease Defense</td>
<td>Heather Simmons-FAZD</td>
<td>Iowa State University, University of California Davis, and Kansas State University</td>
</tr>
<tr>
<td>Pathways to Prepare Underrepresented Fellows to Meet the Needs of Global Agricultural Biosecurity: A Graduate-Level Career Development Program</td>
<td>Heather Simmons-FAZD</td>
<td>Jackson State University, University of Puerto Rico Ponce, and LeHigh University.</td>
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## Education and Outreach Portfolio Continued

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<tr>
<td><strong>USDA Scientific Exchanges: Kazakhstan, Egypt, Bangladesh</strong></td>
<td>Heather Simmons, FAZD Center</td>
<td>Texas A&amp;M University, USDA (CEAH and NVSL), TAHC, Borlaug Institute for</td>
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<td>International Agriculture, TVMDL</td>
</tr>
<tr>
<td><strong>Veterinary Science Program</strong></td>
<td>Floron Faries Jr-FAZD Center and Texas AgriLife Extension Center</td>
<td>Department of Education, State Veterinary Medical Associations, and 4-H Extension</td>
</tr>
<tr>
<td><strong>Curriculum enhancement for disease that threaten food security.</strong></td>
<td>Derek Mosier-Kansas State University</td>
<td>Iowa State University, Center for Food Security and Public Health, Joint Pathology Center (DOD), FAZD Center, and CEEZAD</td>
</tr>
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</table>
K-12 Programs

- Principal Investigator: Floron Faries, Jr., FAZD Center and Texas A&M AgriLife Extension Service
  - “Veterinary Science Program”
    - Clinical track
    - One Health Science and Technology track
    - Laboratory Science and Technology track
  - Certified Veterinary Assistant
    - Completion of 150 lessons
    - 500 contact hours for apprenticeship
  - Total enrollment
    - High School: 3,912 students
    - 4-H Extension= 1,512 student*
  - Teacher and Extension Agent Training
    - 327 in 6 states (AR, FL, NM, MD, OH, and TX), however program products sold into 19 states during FY 2012.
  - Program diffusion in 4 tiered process
    - Awareness
    - Evaluation
    - Adoption
    - Implementation
Animal Health Network

How It Works:

State Veterinarian
Origin of animal disease emergency alert

State Extension POC
Relay animal disease alert to local Extension Educator

Local Extension Educator
Relay animal disease alert to local feed retailers

Local Feed Retailer
Relay animal disease alert to underserved, non-commercial and hobby livestock and poultry customers

Feed Manufacturer POC
Relay animal disease alert to local feed retailers
Animal Health Network

Principal Investigator: Andy Vestal, Texas AgriLife Extension Service

- 21 states actively participating
- Total Trained
  - State Department of Agriculture/State Veterinarians = 38
  - State Cooperative Extension = 63
  - Local Cooperative Extension = 304
  - Feed Retailers = 803

= States participating in 2012 cohort
= States participating in 2011 cohort
= States participating in Pilot Test
4th International Symposium on Managing Mortality, Products, By-Products and Associated Health Risk

- 147 participants
  - 8 countries (U.S., Canada, Australia, New Zealand, S. Korea, U.K., Nigeria, and Vietnam)
  - 26 different states

- Activities
  - Cross border FMD Response Simulation Workshop
    - Goal: identify issues and gaps related to movement, depopulation, disposal and decontamination activities
  - International Panel Discussion
  - Session focused on preventing and managing pre-harvest contamination and post-harvest reduction of contamination of food products of animal origin
  - 1 week session of presentations on disposal, depopulation, and decontamination

http://umaine.edu/byproducts-symposium/
EOS Capacity Building and Training

- Training fellowship developed and implemented with the following collaborators
  - Laboratory Biosafety and Diagnostic Detection
    - TVMDL, NVSL, ARS, and FADDL
  - Disease Surveillance and Epidemiology
    - FAZD Center and USDA CEAH
  - GIS
    - TAMU Spatial Sciences Laboratory
  - Field Training
    - Texas Animal Health Commission
    - Department of State Health Services

- Programmatic Diseases
  - Brucellosis, Tuberculosis, and FMD
Questions?