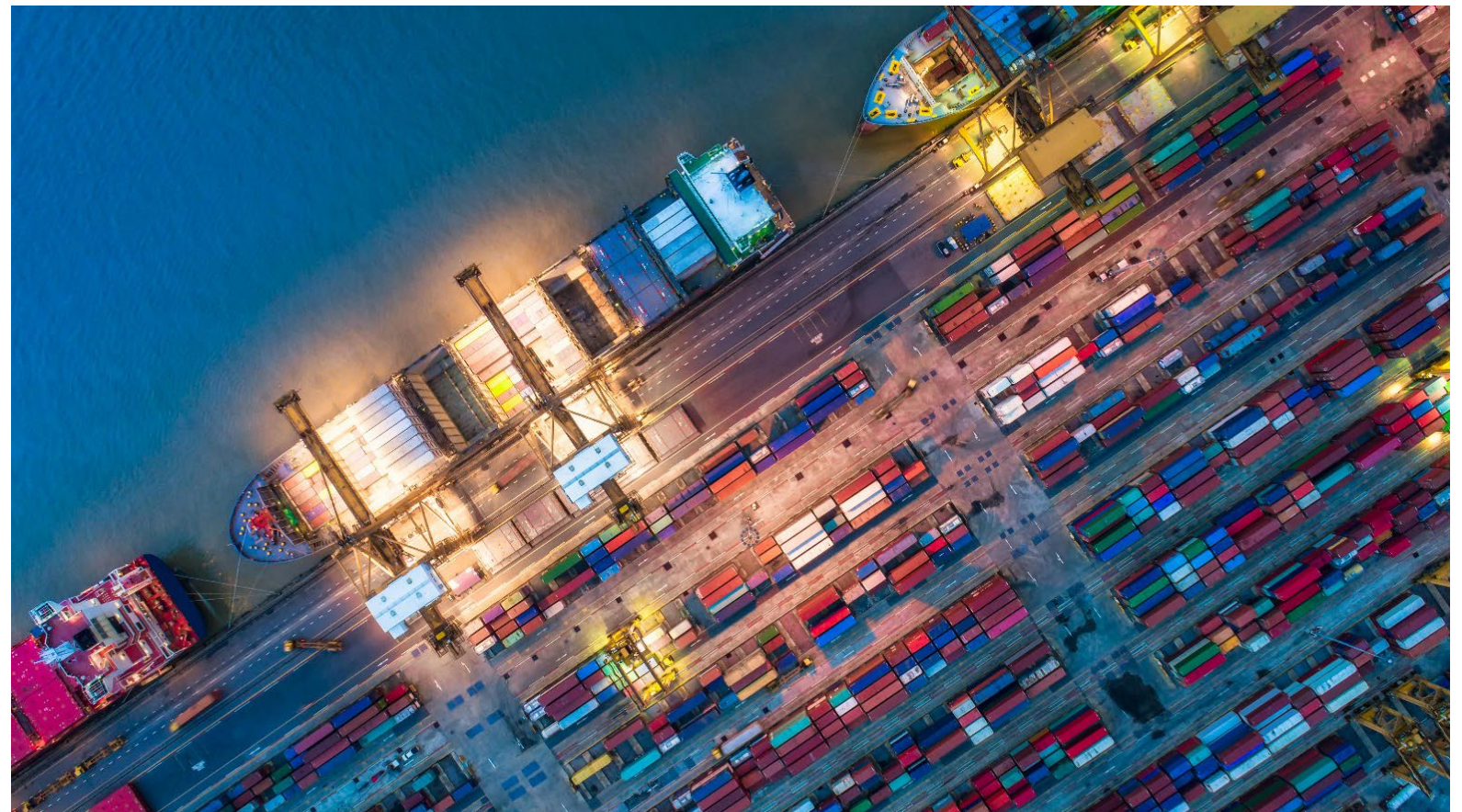CROSS-BORDER THREAT SCREENING
AND SUPPLY CHAIN DEFENSE

A Department of Homeland Security Center of Excellence

2024

Biennial Meeting Handout

Cross-Border Threat Screening and Supply Chain Defense – DHS COE
Biennial Meeting - Agenda

Location: **Bush School – Washington DC, 1620 L Street NW | Washington, DC 20036**
All times in Eastern time zone

March 4, 2024 – Biennial Meeting Agenda

8:30 – 9:00 a.m. **Coffee and Check-in**

9:00- 9:20 a.m. **Introductions and Opening Remarks**

- Introductions – Leadership, Board of Directors (BOD), and Center Staff
- Opening Remarks
  - Hilary Shackelford, DHS S&T Program Manager
  - Greg Pompelli, PhD – Director, CBTS

9:20 a.m. – 12:30 p.m. **African Swine Fever Project Presentations**
Presentations – 30 minutes/project
BOD and Stakeholders Discussions - 10 minutes/project

9:20 a.m. - User-Friendly Online Dashboard for the Assessment of the Risk of African Fever Virus Introduction, Exposure, and Potential spread into the United States
Presenting PI -

10:00 a.m.- Measuring the Economic Impacts of African Swine Fever Virus on United States Supply Chains
Presenting PI –

10:40 – 11:00 a.m. **Break**

11:00 a.m. - Threat Assessment of African Swine Fever Tick Vectors, Ornithodoros spp.- US-MX Border and In Proximity to Swine Operations
Presenting PI -

11:40 a.m. - A Validated Method for Environmental Surface Sampling for Detection of African Swine Fever Virus
Presenting PI –

12:20 p.m. - African Swine Fever Research Program Discussion with the BOD

12:30 – 1:40 p.m. **AQIM and Catered Lunch**
Lunch Service Break – 20 minutes
Presentation – 30 minutes   - BOD Discussion - 10 minutes

12:50 p.m.– Sampling Design for Random Inspections
Presenting PI:

1:20 p.m. - Sampling Design for Random Inspections Discussion with BOD

1:30 – 1:45 p.m. **Break**

Cross-Border Threat Screening and Supply Chain Defense – DHS COE Biennial Meeting - Agenda

1:45 – 4:10 p.m.   <u>**Center Management and Program Execution**</u>

1:45 – 2:10 p.m.   <u>**Education and Workforce Development Overview**</u>

<u>Student-focused Projects</u>

- Pathways to Graduate Studies in Cyber Intelligence
- CBTS Summer Research Institutes - Cybersecurity - Biodefense/biosecurity
- Blinn College NCBFAA Customs Specialist Scholars Training Program
- Summer Research Teams

<u>Workforce Development (TAMU AgriLife Digital Education Platform)</u>

- Development of Canine and Equine First Aid courses

2:10– 3:40 p.m.   <u>**Research Direction, Transition and Communications Overview**</u>

Center Management

- Mission and Vision
- Engagement
- Commitment

Research Direction

<u>Intelligent Data Systems</u>

- Development of a Verifiable, Privacy-Controlled Medical Information Exchange Network – System Concept and Testbed
- Systematic Mapping of Cross-border Threats to Enhance US Agricultural Security
- Systematic Mapping of Cross-border Threats Global Consequences

<u>Detection/Device Science</u>

- Borders of the Future
- New Insect/Pathogen Detection Tools RFP
- Cross-Border Biothreats – Public Health

<u>Supply Chain Explorations</u>

- Role of CBP Green Trade Workshop
- Latin American Workshop
- The Economics of Supply Chains: Existing Research and Open Questions

<u>Critical Success Factors</u>

- Ability to improve our understanding and frame issues in public research
- Ability to identify and attract the best mix of skills to address problem sets

<u>Project Identification and Management</u>

- Timely feedback, engagement, and communication crucial elements
- Clear lines of authority and project participants' functions clearly defined
- Defined project TRLs

Cross-Border Threat Screening and Supply Chain Defense – DHS COE Biennial Meeting - Agenda

Transition

- Begins with engagement
- Follow-on funding – research and education projects
- User feedback sessions – September 2023, March 2024
- Commercialization – RTI

Communications and Outreach

- Messaging
- Harmonizing
- Measuring
- Adjusting

3:40 – 4:10 p.m.   **<u>Discussion with the BOD</u>**

4:10 – 5:00 p.m.   **<u>CBTS Adjourns and Government-Only Discussion</u>**

Cross-Border Threat Screening and Supply Chain Defense – DHS COE User Feedback Meeting - Agenda

March 5, 2024 - CBTS User Feedback Meetings Agenda

Location: **Bush School – Ninth Floor, 1620 L Street NW | Washington, DC 20036**
All times in Eastern time zone

8:30 – 9:00 a.m. Coffee and Check-in

9:00 – 9:10 a.m. – Morning Welcome and Introductions

Orion Bio-Science

9:10 – 10:00 a.m. Overview of Capacity, Demonstration, and Validation of Features

10:00 – 10:15 a.m. Break

10:15 – 11:30 a.m. User Feedback and Discussion

11:30 a.m. – 1:00 p.m. Lunch **(on own)**

1:00 – 1:10 p.m. – Afternoon Welcome and Introductions

Quantifind
Automated AI Capabilities for Entity Risk Screening to Highlight Supply Chain Vulnerabilities in Pharmaceutical, Chemical and ESG-Sensitive Industries

1:10 – 2:00 p.m. Overview of Capacity, Demonstration, and Validation of Features

2:00 – 2:15 p.m. Break
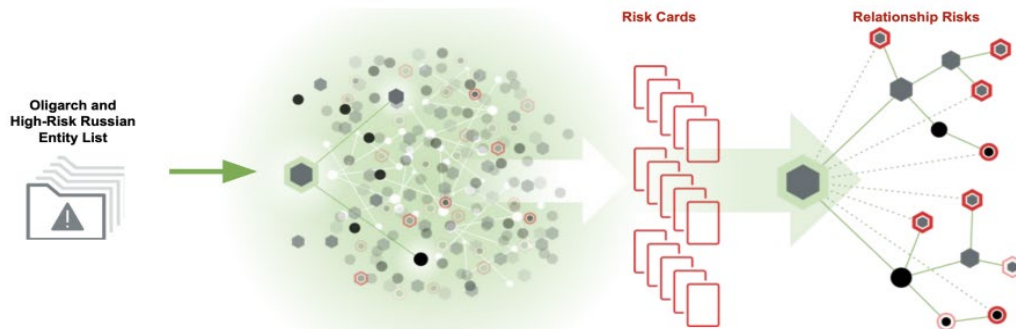
2:15 – 3:30 p.m. User Feedback and Discussion

Project Title: *Automated AI Capabilities for Entity Risk Screening to Highlight Supply Chain Vulnerabilities in Pharmaceutical, Chemical and ESG-Sensitive Industries* – Quantifind, Inc.

Total Budget - $729,762   **Start - January 2023**   **End – July 2024**

Starting with a seed set of entities, Quantifind screens them against a large number of data sets (corporate registries, sanctions lists, news articles, etc.), tags each entity with risks, and delivers an extended network to customers.

Issue: This project will examine how an artificial intelligence platform designed to deliver actionable intelligence and identify institutional risks in relation to human rights violations, environmental abuses, and foreign malign influence can be used to assess risks across selected supply chains. This project provides an opportunity to test the capacity of investigatory processes and resolution assistance in assessing risks and provides a basis for identifying supply chain risks on a global scale.

Objectives: 1) Define the necessary new risk typologies and data sets required for discovering supply chain risk. 2) Establish clear standards, definitions, and training data examples for target risk factors and supply chain vulnerabilities. 3) Train risk models and prove the ability of discovered features to identify threats optimizing for balance between minimal false positives and false negatives (precision and recall). 4) Demonstrate the effectiveness of Quantifind's models and discovered features in identifying emerging supply chain risks. 5) Train interested and relevant stakeholders, academia, and private industry on a curated environment of Quantifind's GraphyteSearch UI and GraphyteBatch. 6) Demonstrate time and cost savings, as well as enhanced coverage by automating supply chain risk identification.

Value Proposition: Analyze the pharmaceutical and chemical industry supply chains and develop the capability to evaluate vendor typologies for fraud and criminal risk, financial risk, foreign malign influence risk and ESG risk (including labor rights violations and sustainability issues). Train risk models on examples from supply chains with known counterfeit and fraudulent products, or products from organizations with known human rights or environmental violations or with links to entities with the same risk factors to automatically discover predictive features of fraud or human rights or sustainability violations.

Research Leadership	**Institution**
PI: John Stockton, PhD	Quantifind Inc.
Co-PI Ari Tuchman, PhD	Quantifind Inc.
Co-PI Jennifer Roy	Quantifind Inc.

CBTS Contact: Greg Pompelli - gregory.pompelli@ag.tamu.edu

Project Title: *Borders of the Future,* Migration Policy Institute

Total Budget - $487,186   **Start - January 2023**   **End – July 2024**
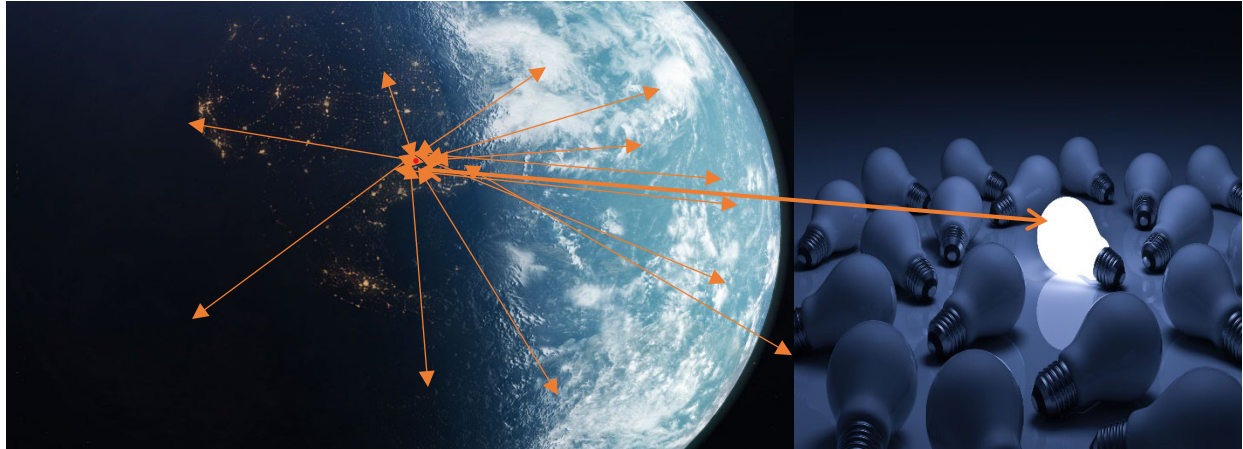
Issue: The Covid-19 pandemic exposed and exacerbated bottlenecks, while also spurring innovation and suggesting opportunities for improvement. In addition, technologies (especially in terms of data analytics and scanning) have continued to evolve rapidly. This project is taking stock of these developments, reflect on how the most leading-edge innovations are reshape the borders of the future, and learn from international examples that suggest lessons for the United States.

Objectives: 1) Take stock of new technologies and innovations, both domestic and international, and consider ways they could reshape border management. 2) Develop an ambitious vision of the air, land, and maritime ports of the future, including how technologies, information, targeting, infrastructure, and staffing could reconfigure operations. And 3) Suggest ways to improve management of U.S. land, air, and seaports in ways that simultaneously enhance security while facilitating trade and travel.

Value Proposition: Findings from this project are designed to provide DHS and other trade stakeholders with ideas they can use to develop a vision for a more effective use of data to enhance border security. The project is developing a catalogue of global leading-edge practices that could serve as reference points for government and industry leaders to consider. As the team catalogs potential insights and innovations, they are creating a positive vision of the future port to help focus priorities and identify barriers to change. These insights will be shared in conference and written formats in the coming year.

Research Leadership
PI: Meghan Benton, PhD
Co-PI: Andrew Selee, PhD
Co-PI: Chappell Lawson, PhD
Co-PI Alan Bersin, Esq

Institution
Migration Policy Institute
Migration Policy Institute
Massachusetts Institute of Technology Policy Lab
Independent Consultant

CBTS Contact: Chris Scarmardo- c.scarmardo@ag.tamu.edu

Project Title: *The Economics of Supply Chains: Existing Research and Open Questions –* National Bureau of Economic Research

Total Budget - $48,708   **Start – May 2023**   **End – May 2024**

Issue: Over the last two decades, supply chains for many products have become longer and more reliant on single-source low-cost providers of inputs or assemblers of final products. Just-in-time practices became more common, creating greater vulnerability to shocks. While in many cases the evolving nature of supply chains reduced unit costs, it also created the potential for shocks at any point along the chain to be amplified**.**

Objectives: 1) CBTS is partnering with NBER to solicit research papers for a conference that will be held in January 2024. The conference will emphasize a review of existing economic research on supply chains, as well as current research papers on related topics. 2) This project sought work in seven distinct research areas. Some papers focused on industries, while others examined data from multiple industries to identify broader trends and variations in how vulnerabilities emerge in different market and institutional environments. 3) The research considered how firms respond to the risk of disruption by investing in resilience and creating market institutions of various types, and more generally on how resilience can be built into supply chains and at what cost.

The conference took place January 26, 2024, and had more than 100 attendees. Eight novel supply chain research papers were presented, and a keynote address from Christa Brzozowski, Assistant Secretary for Trade and Economic Security, Department of Homeland Security.

Value Proposition: While the shift to globalized and highly coordinated production has been well documented, less is known about why firms have moved in this direction, the location of potential choke points in current supply chains, and the impact of public policies such as tariffs and domestic content restrictions on these chains. The conference provided an opportunity to feature frontier and ongoing research on several of these issues. The mix of papers was drawn from a competitive process that attracted over 50 high-quality research studies from prominent and talented researchers who have invested in supply chain economic issues in part because of the CBTS/DHS/NBER initiatives.

Research Leadership	Institution
James Poterba	MIT and National Bureau of Economic Research (NBER)
Co-PI: Laura Alfaro	Harvard Business School and NBER
Co-PI: Chad Syverson	University of Chicago Booth School of Business and NBER

CBTS Contact: Chris Scarmardo- c.scarmardo@ag.tamu.edu

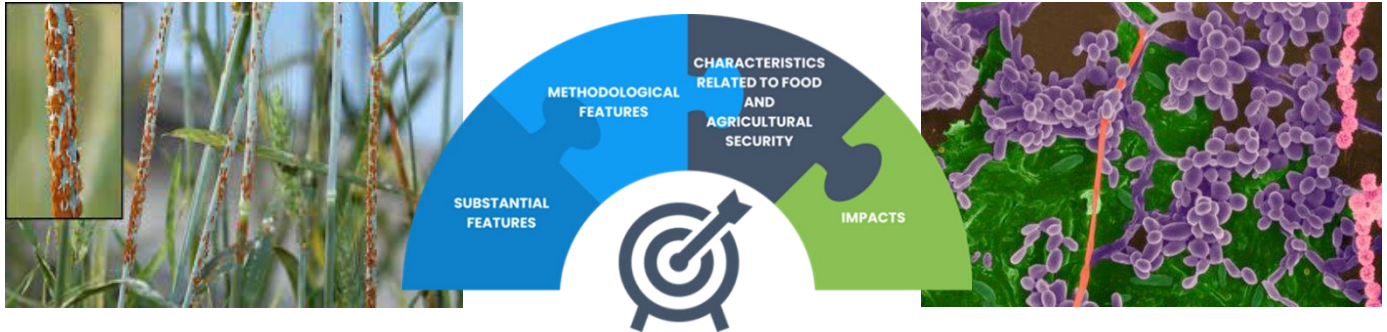**Project Title:** *Systematic Mapping of Cross-border Threats to Enhance U.S. Agricultural Security –* Texas A&M University – College of Agriculture and Life Sciences, Department of Agricultural Leadership, Education and Communication

Total Budget - $792,481   **Start – September 2023**   **End – August 2025**

Issue: Protecting food security, preventing biosecurity threats, and ensuring a stable food supply is crucial for promoting economic stability, international trade, and national security. A great deal of research has addressed critical food and agricultural defense/security issues and attracted interest across a broad array of public and private institutions. Unfortunately, the breadth of the issues, and fluctuations in topical interest and funding levels all contribute to an incomplete mapping of the body of work in these areas.

Objectives: To address these challenges, the team proposes a systematic approach to analyzing threats to agricultural security. By synthesizing existing knowledge through systematic mapping, the aim is to identify knowledge gaps, prioritize research areas, and promote collaboration to develop a holistic perspective on food and agricultural defense and security. Objectives are: 1) Systematically map information about existing and ongoing research measuring the potential social and economic consequences of food and agricultural defense/security events on vulnerable populations, political stability, and the economic and public health impacts on communities/nations; 2) Develop a series of conferences designed to review the information gathered, and to produce conference proceedings that present key findings and identify possible gaps.

Value Proposition: The systematic mapping database, research paper, and conference proceedings will contribute to knowledge dissemination, facilitate collaboration, and serve as valuable references for further research, policy development, and practical implementation in the field.

Research Leadership	Institution
PI: Zhihong Xu, PhD	Texas A&M University
Co-PI: Matt Baker, PhD	Texas A&M University
Co-PI: Bruce Herbert, PhD	Texas A&M University
Co-PI: Jaehyun Ahn, PhD	Texas A&M University
Co-PI: Ashlynn Kogut, PhD	Texas A&M University
Donnalee Sullins, PhD	Texas A&M University

CBTS Contact: Heather Manley Lillibridge – Heather.Manley@tamu.edu

Project Title: *Mapping the Consequences of Disruptions to Global and Domestic Food and Agricultural Systems* – Kansas State University

Total Budget - $500,000   **Start – TBD**   **End – TBD**

Issue: Concerns regarding food and agricultural defense and security events have escalated in recent years because of the increasing scale and duration of the resulting economic and social impacts on communities and countries across the world. This project will systematically map assessments of the social and economic consequences of domestic and global food and agricultural defense/security events on vulnerable populations, political stability, and the economic and public health impacts on communities/nations.

Objectives: Systematically mapping the current state of knowledge on the consequences of global and domestic food and agricultural defense and security events will be achieved by 1) identifying subject matter experts to review and consult on our understanding of the relationships between food and agricultural threat impacts on production, markets and distribution, and consequences; 2) applying systematic mapping methods and tools to gather, organize, and evaluate the existing and ongoing research on the consequences of domestic and global food and agricultural defense and security events; and 3) refining mapping efforts and communicating the findings.

Value Proposition: This mapping will aid efforts to identify possible gaps in the existing body of research and highlight potential national security ramifications of domestic and global food production and distribution disruptions. The results will be used to aid efforts to characterize potential impacts of intentional and unintentional food and agricultural threat events, and aid information sharing, and research efforts needed to mitigate or prepare for the consequences of food and agricultural defense/security events.

Research Leadership	Institution
PI: Dustin Pendell, PhD	Kansas State University
Co-PI: Ashley Railey, PhD	Oklahoma State University
Co-PI: Juergen Richt, DVM, PhD	Kansas State University

CBTS Contact: Heather Manley Lillibridge – Heather.Manley@tamu.edu

Project Title: *U.S., Mexico, Canada Risk Taskforce*, Texas A&M University – College of Engineering

Total Budget: $574,107   **Start - August 2022**   **End- February 2024**
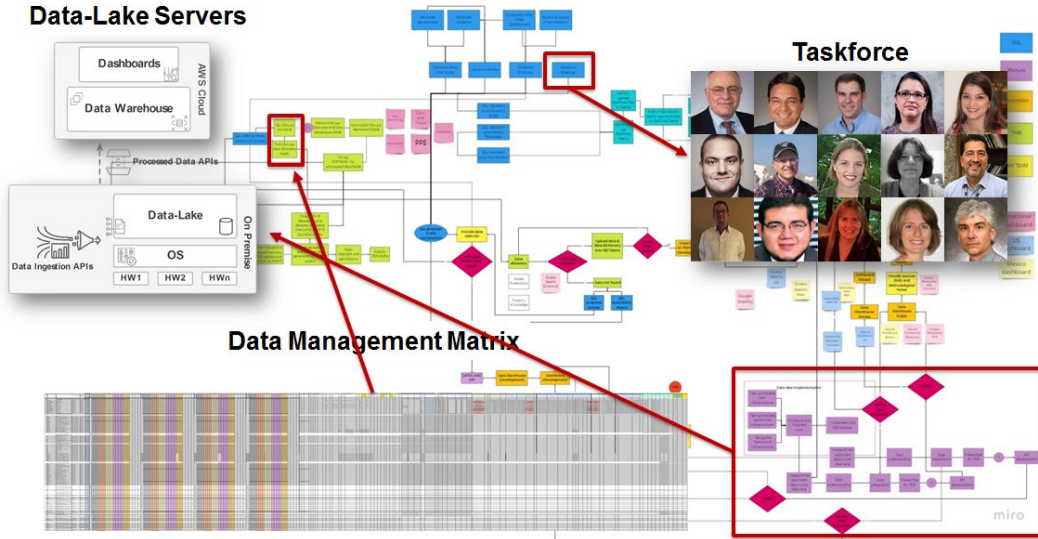
Issue: To assess and manage the state of risk of any given U.S. supply chain extending across North America (MEX-USA-CAN), it is necessary to account for its complexity and for all evidence available to characterize it. This is facilitated through the integration of a Data Lake System (CBTS-DLS) coupled with a Data Management Workflow (CBTS-DMWF*)*, supporting the development of a set of supply chain *Case Studies*, where each, includes the formulation and validation of a Risk Minimum Viable Model (i.e. a Bayesian RMVM)*,* and its corresponding calibration and testing.

Objectives: 1) To assess and expand the current U.S.-Mexico Taskforce membership to include Canadian representatives 2) To expand the CBTS Data Lake System (CBTS-DLS) from the previous taskforce project to add the computational infrastructure needed for producing probabilistic risk analytics and for adding backup capabilities to CBTS-DLS. 3). To update the design and operation of the current CBTS Data-Management Workflow (CBTS-DMWF) to provide a common computational research convergence platform, to make use of datasets, and to facilitate production of dashboards associated with each R19 case study.

Value Proposition: To provide U.S. supply chain stakeholders operating in North America (MEX-USA-CAN) with the best actionable information and available resources to improve their operational decision making*,* based on the assessment and management of the supply chain state of risk.

Research Leadership	**Institution**
PI: Zenon Medina-Cetina, PhD	Texas A&M University (TAMU), College of Engineering, College of Geosciences
Co-PI: Dennis Gorman, PhD	TAMU, School of Public Health
Co-PI: Julie Loisel, PhD	TAMU, College of Engineering College of Geosciences

CBTS Contact: Matt Cochran - Matt.Cochran@ag.tamu.edu

Project Title: *Bayesian Risk Modeling,* Texas A&M University – College of Engineering

Total Budget: $1,196,969   **Start - August 2022   End- February 2024**
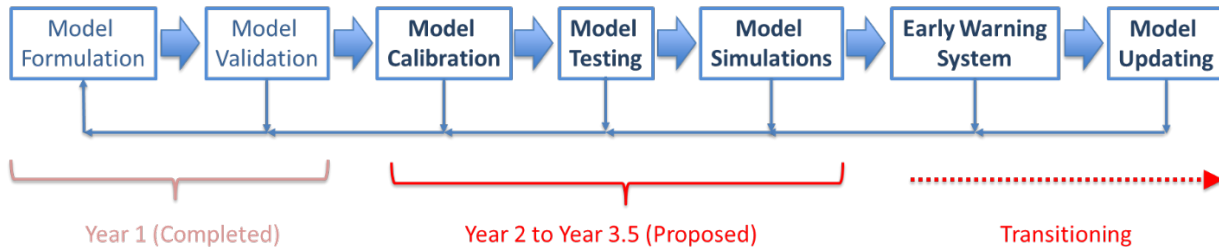
Issue: Mexico became the top U.S. trade partner in 2020 according to U.S. Census. While Canada remained as No. 2 U.S. trade partner for the fifth consecutive year, followed by China in the third position. These shifts and the framework outlined in the 'United States-Mexico-Canada Agreement (USMCA), make the region one most important trade and supply chain regions in the world. The COVID-19 epidemic and Russia's attempted invasion of Ukraine highlight the many different threats facing North American and global supply chains, yet those are just a few of the many social, economic, and environmental, climatic, and logistical risks that could be assessed.

Objectives: 1 To expand U.S.-Mexico Taskforce to include Canadian representatives from government, academia, industry, and community-based organizations, with a focus on global competencies. 2) To expand Data-Lake System's infrastructure and Data-Management Workflow to expedite and multiply the production of risk-based analytics. 3) To foster collaborations with other supply chain projects with a focus on strategic collection of supply chain evidence. 4) To expand the availability of evidence to inform Risk Minimum viable Models (RMVMs), for the Calibration, Testing and Simulation of specific supply chain case studies.

Value Proposition: The integration of the Risk Taskforce for North America (MEX-USA-CAN) will facilitate the establishment of multiple international collaborations for the identification and characterization of variables/processes defined specific supply chains RMVMs and case studies. The expansion of Data-Lake System's infrastructure and Data-Management Workflow enables more rapid development of risk analytics based on input from multiple remote collaborators (Dataiku), and open of collaborations other evidence-driven projects. Finally, this work will support RMVMs ability to identify and characterize evidence, produce of risk-based analytics to Calibrate, Test and Simulate, social, economic and environmental States of Risk, and produce nine case studies that reflect varying availability of data, models and expertise on which to base risk assessments for chains that represent a range of complexities.

Research Leadership	**Institution**
PI: Zenon Medina-Cetina, PhD	TAMU, College of Engineering, College of Geosciences
Co-PI: Dennis Gorman, PhD	TAMU, School of Public Health
Co-PI: Julie Loisel, PhD	TAMU, College of Engineering College of Geosciences

CBTS Contact: Matt Cochran - Matt.Cochran@ag.tamu.edu

Project Title: *Sampling Design for Random Inspections* – The University of Texas at Austin

Total Budget: $250,000   **Start – November 2022**   **End – November 2024**
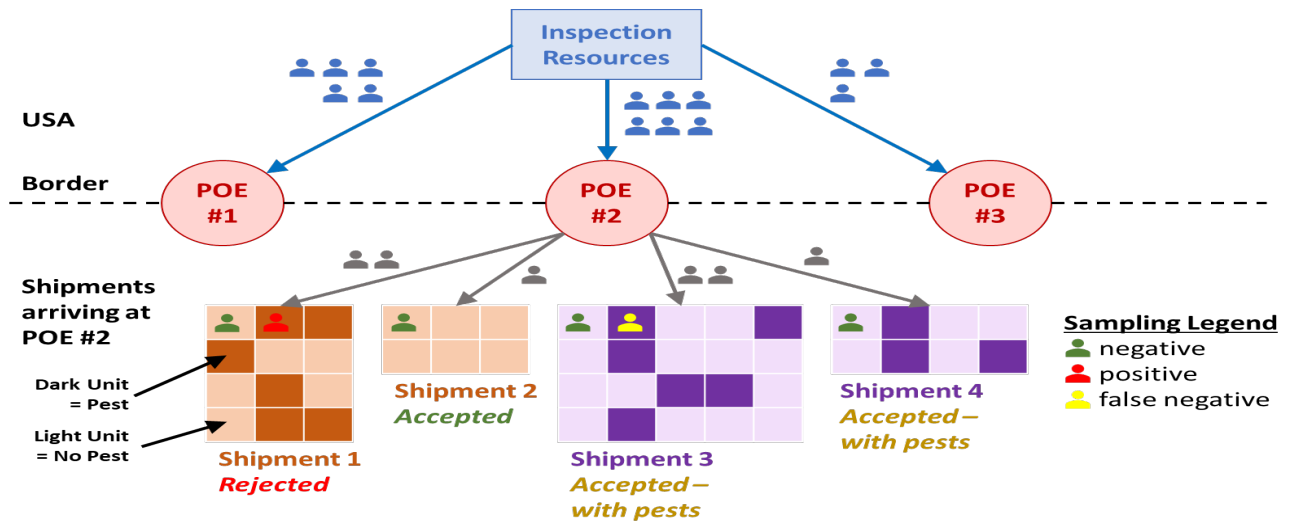
Issue: USDA's Plant Protection and Quarantine (PPQ) division is accountable for reducing the pest threat to U.S. agriculture in a way that does not unduly restrict commerce. To accomplish this, PPQ is moving to better methods for determining not only what to inspect, but how to inspect it. Fundamentally, the issue is that USDA and DHS have limited resources available to inspect the vast amounts of people and cargo that enter the U.S. through ports of entry. The problem is to allocate these resources to conduct inspections as efficiently as possible in order to minimize the damages caused by pests imported into the U.S.

Objectives: (1) Assess the performance of existing random sampling protocols using historical data from inspections. (2) Formulate a mathematical decision support model that optimizes inspections at ports of entry based on pest arrival data and estimated economic damages caused by pests that enter the U.S. (3) Demonstrate how the model can be employed to efficiently allocate inspection resources and sample arriving units using data from real-world case studies.

Value Proposition: Mathematical tools, software, and results produced in this project will help the USDA and DHS minimize the damages caused by pests imported into the U.S.

Research Leadership	Institution
PI: Benjamin D. Leibowicz, PhD	University of Texas – Austin
Co-PI: John J. Hasenbein, PhD	University of Texas – Austin

CBTS Contact: Chris Scarmardo- c.scarmardo@ag.tamu.edu

Project Title: *Development of a Verifiable, Privacy-Controlled Medical Information Exchange Network –System Concept and Testbed*, Texas A&M University – College of Engineering - Computer Science

Total Budget: $752,622   **Start – April 2023**   **End – March 2025**
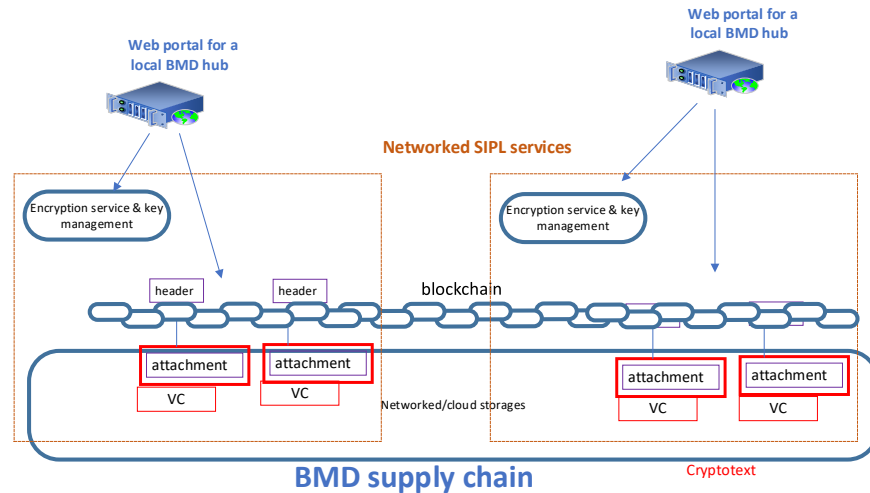
Issue: Source assured biomedical data (BMD) distribution is critical to medicine, public health, and biological threat research. Researchers need to have high confidence that the digital assets in hand are produced by vetted principals, and that the chains of data recombination and alteration, both intentional and unintentional, are traceable. The data owner should be assured of indisputable ownership amidst a very complex data distribution process, with confidence that principles found to violate the access protocol can be banned from further access to the digital asset(s) in question.

Objectives: This project is developing the foundational system concept, basic system architecture, and system protocols for a next generation medical and public health information network, the *BMD Supply Chain* (BMDSC). This system will support (a) *verifiable*, *privacy-protected* information inquiry and response between subjects, and (b) management of identifiers of subjects and their cryptographic credentials to engage in the information exchange. Capabilities are built around (a) the W3C standards on <u>*Verifiable Credentials*</u> (VC), ownership-protected data analysis through three party co-computing, and (b) the W3C standards on <u>*Decentralized Identifiers*</u> (DID).

Value Proposition: Data traceability, contribution/edit attribution, and verification/identification of data from disperse sources is all paramount in detection, response to, and synthesis of reliable operational awareness. Detection of current and yet undefined threats and associated conditions or syndromes, whether naturally occurring or synthetic in origin, remains a critical challenge for US medical and public health systems and for the populace. This project is applying a combination of best and emerging practices from the supply chain, medical informatics, and computer science domains to build a functioning testbed to allow trial and exercise of novel medical data aggregation and verification paradigms.

Research Leadership
PI: Steve Liu, PhD
Co-PI: Matt Cochran, DVM

Institution
TAMU, Computer Science and Engineering
Cross-Border Threat Screening Center of Excellence

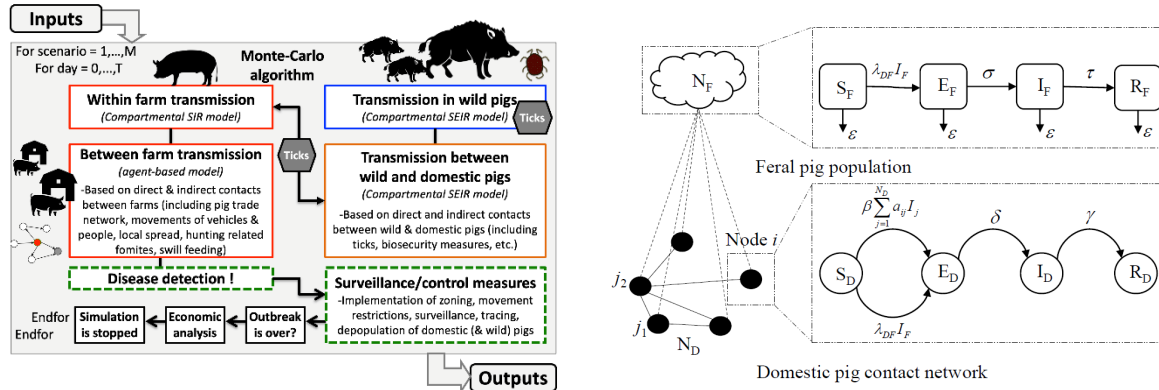**CBTS Contact:** Matt Cochran - <u>Matt.Cochran@ag.tamu.edu</u>

Project Title: *User-Friendly Online Dashboard for the Assessment of the Risk of African Fever Virus Introduction, Exposure, and Potential spread into the United States, (R16)* – University of California, Davis

Total Budget - $500,000   **Start – July 2022**   **End – June 2024**

Issue: The lack of accessible, operational, tools that allow the rapid estimation and update of the risk of ASF introduction and spread under diverse and continuously changing epidemiological scenarios, makes difficult to identify the pathways, areas, and time periods at higher risk of disease introduction/spread (and its associated uncertainty) in a timely manner. Thus, it becomes an important barrier to better plan and allocate ASF preventive, early detection, and control/risk-mitigation strategies in the US.

Objectives: 1) develop a quantitative risk assessment to evaluate the risk of ASF introduction into the US through multiple pathways; imported feed components, contaminated fomites, unintentional introduction in passenger cargo, international garbage and its inappropriate use for swill feeding, importation of contaminated pork and pork products, etc.; 2) develop a spatially explicit disease spread model to evaluate progression of ASF once introduced, and; 3) develop an open access online dashboard to facilitate adoption and quick update of risk assessment and US ASF disease spread model. Models will use open-source data and will provide risk estimates for the entire US and at fine spatio-temporal scale by state.

Value Proposition: The web-based dashboard with the dynamic risk assessment and modeling tools will provide an operational tool for DHS and other US officials at the federal and state level to dynamically assess the risk of ASF introduction/exposure/spread per pathway. This will help identify the most important introduction/exposure/spread pathways and pathways with high uncertainty (due to potential data gaps) where additional data collection is needed.

Research Leadership   **Institution**
PI: Beatriz Martinez Lopez, DVM, MPVM, PhD   University of California, Davis
Co-PI: Caterina Scoglio, PhD   Kansas State University
Co-PI: Maria Jose Clavijo, DVM, PhD   Iowa State University
Co-PI: Gustavo Silva, DVM, MS, PhD   Iowa State University

CBTS Contact: Heather Manley Lillibridge - Heather.Manley@tamu.edu

Project Title: *Threat Assessment of African Swine Fever Tick Vectors, Ornithodoros spp.- US-MX Border and In Proximity to Swine Operations (R17)* – Texas A&M AgriLife Research

Total Budget - $508,731   **Start – May 2022**   **End – August 2024**

Issue: African Swine Fever virus (ASFv), if introduced into the U.S. across the southern border by domestic or wildlife animal movements, or by human traffic could be complicated if a tick-susceptible host interaction, known as the sylvatic cycle of disease transmission, establishes a permanent reservoir of ASFv disease in Texas.

Objective: This study builds upon prior research focused on the historical occurrence of *Ornithodoros* spp. ticks as well as previously published predictive models (Donaldson et al., 2016; Sage et al., 2017; Wormington et al., 2019; Golnar et al., 2019) to identify at-risk locations throughout Texas for the establishment of ASFv in wildlife through contact with competent Ornithodoros spp. tick vectors. The locations of such *Ornithodoros* spp. ticks have not been documented extensively in Texas to date in relation to existing feral swine, commercial swine, or warthog population locations. This study seeks to create a surveillance system focusing on specific locations to consistently evaluate the sylvatic tick-swine transmission cycle potential.

Value Proposition: This study complements efforts to interdict at-risk materials entering the U.S. and potentially strengthens the U.S. border protection infrastructure by evaluating other locations along the border not undergoing inspections for risk potential. By identifying locations for future surveillance system development where animals and people may enter the U.S. through non-traditional locations in South Texas pasture locations along the Rio Grande, this DHS-supported program will help update the geographic distribution of *Ornithodoros* spp. ticks and the ecogeographical variables influencing their distribution, identify at-risk locations for the establishment of ASFv in wildlife through contact with competent tick vectors, and provide relevant information for early detection of tick vectors.

Research Leadership	**Institution**
Co-PI: Dee Ellis, DVM	TAMU AgriLife Research
Co-PI: Meriam Saleh, PhD	TAMU College of Veterinary Medicine and Biomedical Sciences

CBTS Contact: Heather Manley Lillibridge - Heather.Manley@tamu.edu

Project Title: *A Validated Method for Environmental Surface Sampling for Detection of African Swine Fever Virus, (R20)* – Kansas State University Department of Diagnostic Medicine/Pathobiology and Department of Animal Sciences and Industry

Total Budget - $334,86   Start – December 2022   End – December 2024

People 12%

Feed Trucks 41%

Mill Surface (non feed contact) 23%

Gebhardt et al. (2021)

Mill Surface (feed contact) 18%

Feed 6%

ASFV detection in a region of ongoing circulation

Adapted from: https://pubmed.ncbi.nlm.nih.gov/29486878/
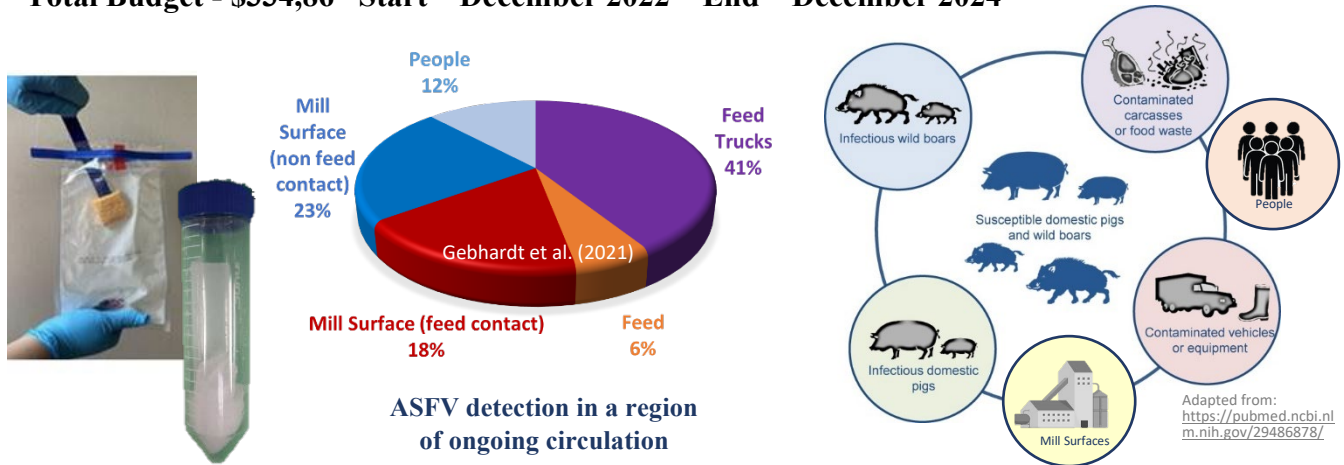
Issue: The global spread of African swine fever virus (ASFV) in recent years poses a tremendous risk to swine production in the U.S. as well as to associated agricultural industries and communities. With the recent spread of ASFV into the Western hemisphere, the risk continues to increase. Previous research has demonstrated that ASFV can be spread by movement of live animals, animal products such as meat, and a wide variety of surfaces that may have come in contact with ASFV (e.g., shipping containers, vehicles, and personnel). However, the methodology used to detect environmental contamination with viruses such as ASFV has not been clearly established using a scientific approach.

Objective: Develop and validate sampling methods for ASFV on various surfaces, representative of surfaces on which the virus could potentially enter the United States and threaten U.S. agricultural systems.

Value Proposition: The results from this project will enable recommendations for best practices for environmental sampling based on a scientific approach. These practical methods will be used to inform accurate determination of risk levels and validate decontamination procedures for a variety of surface types found on transport containers and vehicles entering the U.S. that pose a biological threat to national security. Given the substantial impact ASFV would have on the U.S. (estimated to be $15 to 50 billion USD; Carriquiry et al., 2020), the ability to identify contaminated surfaces to enact additional biosecurity measures would be a tremendous asset to combat the risk of virus introduction. Such validated methods would be a critical tool to be used by DHS to assess risk and identify potential biosecurity gaps which pose a threat to our swine industry and national security.

Research Leadership	Institution
PI: Jordan Gebhardt, DVM, PhD	Kansas State University
Co-PI: Natasha Gaudreault	Kansas State University
Co-PI: Juergen Richt, DVM, PhD	Kansas State University
Co-PI: Cassie Jones	Kansas State University
Co-PI: Jason Woodworth	Kansas State University
Co-PI: Chad Paulk	Kansas State University

CBTS Contact: Heather Manley Lilllibridge - Heather.Manley@tamu.edu

Project Title: *Measuring the Economic Impacts of African Swine Fever Virus on United States Supply Chains, (R23)* – Texas A&M AgriLife Research

Total Budget - $574,107   Start – November 2022   End – November 2024
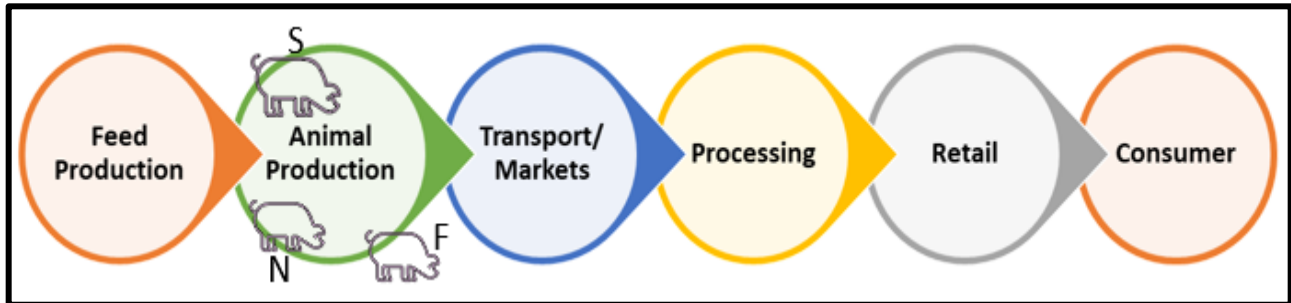
Issue: The disruption of trade and supply chains from a transboundary animal disease (TAD) spread through U.S. land, air, and seaports. A TAD event, such as African swine fever (ASF), can significantly impact the Nation's supply chain infrastructure and economy in a globalized world. Pig meat is a major source of protein in the human diet, with a share of 35-40% of global meat production, currently representing an annual consumption of greater than 110,000 metric tons. ASF is a disease known for its economic impact on producers, smallholders, and emerging commercial farmers in both lower- and middle-income countries (LMICs). For developed nations such as the U.S., an incursion of ASF could have catastrophic economic impacts on our trade supply and supply chains.

Objective: This project proposal is directly linked to the DHS requirements for food and agricultural events that are a catastrophic event of national concern. To measure economic impacts on the U.S. pork production supply chain. (1) To estimate the economic welfare impacts on the U.S. pork supply chain. (2) To estimate the direct, indirect, and induced effects of the U.S. swine industry, allied industries, and non-agricultural industries. (3) To determine the duration for which economic indicator impacts can be categorized at the regional, national, and international levels.

Value Proposition: Measure the economic impacts of African Swine Fever virus (ASFv) on U.S. supply chains in the Food and Agriculture sector. This research will provide insights to numerous groups such as policy makers, government agencies (i.e., DHS, USDA, APHIS, and ERS), and researchers. Because ASFv is not in the United States, this research also allows policy makers to make better informed decisions in finalizing any future mitigation and eradication strategies for ASF.

Research Leadership	**Institution**
Co-PI: Heather Simmons, DVM	TAMU AgriLife Research - IIAD
Co-PI: Jonathan Rushton, PhD	University of Liverpool
Co-PI: Dustin Pendell, PhD	Kansas State University
Co-PI: Jimmy Tickel, DVM	TAMU AgriLife Research - IIAD
Co-PI: Amanda Countryman, PhD	Colorado State University

CBTS Contact: Chris Scarmardo - c.scarmardo@ag.tamu.edu

Project Title: *Animal Disease Diagnostics Using a Raman Sensor*, Texas A&M University – College of Agriculture and Life Sciences – Department of Biochemistry and Biophysics

Total Budget: $453,752   **Start – December 2023**   **End– December 2024**
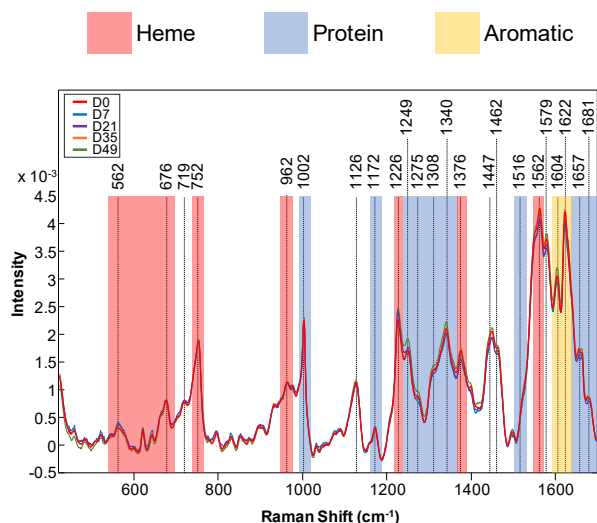
Issue: Traditional PCR-based animal disease detections methods follow a well-defined but often laboratory intensive process for disease detection, characterization, or confirmation. However, emerging applications of label-free, non-destructive field-forward methods for disease detection should be researched and explored, and Raman spectroscopy offers these possibilities.

Objectives: This project will develop a Raman-based sensor for non-destructive identification of chemical changes in body fluids, occurring upon infection with viral or bacterial diseases. Statistical, chemometric models will be developed and implemented for high accuracy detection and characterization of biochemical changes. Given the novelty of the sensor-based approach, gold nanoparticles will be synthesized with pathogen-specific ornamentation for delivery of very sensitive pathogen detection capabilities in combination with the Raman sensor.

Value Proposition: Detection and confirmation of the presence or absence of pathogens, whether in vivo or environmental is the foundation of disease response and control, and the epidemiology used to inform decisions. This is a touchstone for response and preparedness for introduction of potentially catastrophic animal diseases to US populations and economies and is therefore an important part of the DHS mission. This project offers a time-efficient mechanism to deliver cutting edge spectroscopic science to the arena of viral animal disease detection, with all the associated possibilities for field-forward capacities with minimal laboratory preparation requirements.

Research Leadership	Institution
PI: Dmitry Kurouski, PhD	TAMU, Biochemistry and Biophysics
Co-PI: Matt Cochran, DVM	Cross-Border Threat Screening Center of Excellence

CBTS Contact: Matt Cochran - Matt.Cochran@ag.tamu.edu

Project Title: *Characterization of the Background Air Microbiome in the US Utilizing 3rd Generation Sequencing Approaches*, University of Texas Medical Branch – Department of Pharmacology and Toxicology

Total Budget: $999,218   **Start – December 2023**   **End– June 2025**

Issue: There is a recognized need for use of next-generation sequencing approaches for detecting microbes and background/baseline flora in air filter samples collected at strategic locations throughout the United States, given varying seasonal and climactic conditions

Objectives: This project will analyze the microbial composition of the air filters collected at strategic locations by applying next-generation DNA sequencing technology to detect and identify the presence of known and unknown pathogens. The UTMB team will organize sample transfer and processing of the biobanked air filters for further DNA isolation, amplification, and metagenomic sequencing using the Oxford Nanopore sequencing platform of the microbes captured by air filters.

Value Proposition: Real-time hazardous aerosol detectors and identifier systems based on genomic signatures may enable early warning of the presence of a biological agent in the environment, potentially reducing the consequences of a biological incident. DHS is currently invested in developing detectors and identifier systems for biological agents. For these systems to perform in operationally relevant environments, i.e., outdoor, and indoor populated areas, these systems need to be able to discriminate between the existing background aerosols and those that represent a hazardous anomaly due to a biological incident.

Research Leadership   **Institution**
PI: George Golovko, PhD   UTMB, Pharmacology and Toxicology
Co-PI: Kamil Khanipov, PhD   UTMB, Pharmacology and Toxicology

CBTS Contact: Matt Cochran - Matt.Cochran@ag.tamu.edu

ED1 – TAMU Kingsville - Pathways to Graduate Studies in Cyber Intelligence

Total Budget - $500,017　　　　**Start – April 2023**　　　　**End – April 2025**
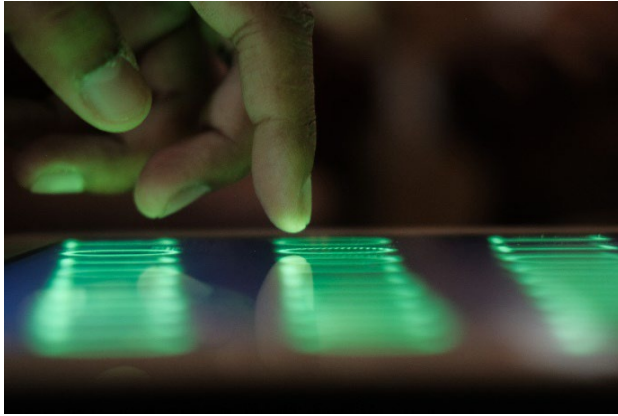
Issue: This project supports efforts to improve the supply of skilled cyber security experts who can help safeguard and secure information systems by providing the skills needed by next generation threat detection technology developers. This project will attract and support five students each year into the Master of Science program, and support opportunities for faculty and student opportunities to interact with government and industry cyber security professionals.

Objective: 1) Increase the number of local and domestic graduate students pursuing a Master of Science (MS) in computer science (CS) with an emphasis on cyber intelligence and cybersecurity. 2) Provide opportunities for students completing the recently established DHS sponsored Minor in Cyber Intelligence program to continue their studies at the graduate level. 3) Attract and train marginalized/underrepresented students and industry professionals, particularly Hispanics and females in the areas of DHS related operations. 4) Partner with DHS Centers of Excellence, DHS related agencies, National Labs, and commercial entities to provide students with experiential learning/internship opportunities to make them Cyber Intelligence workforce ready. 5) Promote faculty development through Cyber Intelligence research projects.

Value Proposition: This project builds on the success of a DHS funded minor program in Cyber Intelligence that was recently established at TAMUK. This program will provide opportunities for undergraduate students to pursue and complete a Computer Science degree while specializing in a Cyber Intelligence or Cyber Security related topic and to continue their studies at the graduate level with a focus in Cyber Intelligence.

Research Leadership Team	Institution
Co-PI Mais Nijim	Texas A&M University Kingsville (TAMUK)
Co-PI Avdesh Mishra	TAMUK
Co-PI David Hicks	TAMUK
Co-PI Ayush Goyal	TAMUK

CBTS Contact: Katlin Shoemaker - Katlin.shoemaker@ag.tamu.edu

Project Title: *CBTS Cybersecurity Summer Research Institute*

Expected Total Budget: $250,000   **Start – April 2024**   **End – October 2024**

Issue: The U.S. faces ongoing and increasingly sophisticated malicious cyber campaigns that threaten the public and private sectors and ultimately the Nation's privacy and security. To help address these challenges, the Cross-Border Threat Screening and Supply Chain Defense (CBTS) Center of Excellence (COE) is partnering with the Texas A&M University System RELLIS Academic Alliance and Bryan Texas Utilities (BTU) on a "Summer Research Institute" in the discipline of cybersecurity. This program will be hosted at the RELLIS campus in Bryan, Texas and will be open to students nationwide. This annual program will help build a future homeland security science and engineering workforce by engaging undergraduate students on research projects encompassing prevention, detection, assessment, and remediation of cyber incidents.

Objectives: The purpose of the Cybersecurity CBTS Summer Research Institute is to provide education and hands-on research experience for promising science and engineering undergraduate students. They will be placed into one of two teams led by highly qualified cybersecurity faculty for a 10-week program conducting DHS-mission relevant research. The team approach will reflect "real-world" work environments as they counter threats to critical infrastructure. Invited guest lectures and field trips with industry and DHS officials will round-out student experiences with opportunities to learn about the broad range of career opportunities in the homeland security enterprise.

Value Proposition: The CBTS Summer Research Institute in Cybersecurity will provide opportunities for students to develop hands-on technical skills and conduct research to help provide solutions to DHS mission-relevant problems. They will learn how to put together competitive applications for graduate schools and/or technical jobs. They will have the opportunity to hear directly from industry leaders working in critical infrastructure and from professionals in the homeland security enterprise who work to protect the U.S. from harm. This project supports the goals of the May 2022 Executive Order 14028, "Improving the Nation's Cybersecurity" and the objectives of the DHS Cybersecurity and Information Security Agency's (CISA) Cybersecurity Talent Management System.

Leadership	Institution
Co-PI: Katlin Shoemaker	CBTS Education Director
Co-PI: Heather Manley Lillibridge, PhD	CBTS Executive Director
Co-PI: James Nelson, PhD	Associate Vice Chancellor,
	Director of the RELLIS Academic Alliance

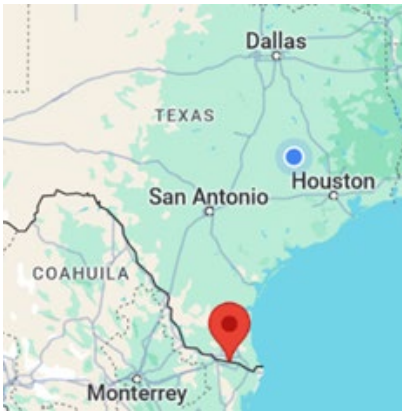**CBTS Contact:** Katlin Shoemaker – Katlin.Shoemaker@ag.tamu.edu

Project Title: *CBTS Biothreat Defense Summer Research Institute*

Expected Total Budget: $250,000   **Start – April 2024**   **End –December 2024**

Issue: Biological threats and hazards can significantly impact the Nation's health, critical infrastructure, and economy. To help address these threats, CBTS is partnering with Texas A&M AgriLife Research to host a "Summer Research Institute" in agriculture biodefense at the Southern Border in Weslaco, Texas. This annual program will help build and sustain future homeland security capacity by engaging undergraduate students on in biothreat defense research projects.

Objectives: The CBTS Summer Research Institute will provide education and hands-on research experience for promising juniors and seniors having STEM majors from institutions nation-wide. They will be placed into teams led by highly qualified faculty who are subject matter experts in plant pest and diseases, for hands-on, 10-week summer research programs to counter biological threats (whether naturally occurring, accidental, or deliberate in origin and whether impacting human, animal, plant, or environmental health). Invited guest lectures and field trips with industry, USDA and DHS officials will round-out student experiences with opportunities to learn about the broad range of career opportunities in the homeland security enterprise.

Value Proposition: The CBTS Summer Research Institute will provide opportunities for students to develop hands-on technical skills and conduct biodefense research to help solve DHS mission-relevant problems. They will also have opportunities to develop professional skills and hear directly from industry professionals and homeland security experts. This program supports the White House National Security Memorandum-15 (NSM-15), the *National Biodefense Strategy and Implementation Plan for Countering Biological Threats, Enhancing Pandemic Preparedness, and Achieving Global Health Security*, which outlines objectives to effectively counter the spectrum of biological threats. It also supports the DHS response to NSM-15, discusses mitigation to *reduce pathogen spillover*.

Leadership	Institution
Co-PI: Kat Shoemaker	CBTS Education Director
Co-PI: Heather Manley Lillibridge, PhD	CBTS Executive Director
Co-PI: Kranthi Mandadi, PhD	Texas A&M AgriLife Research and Extension - Weslaco

CBTS Contact: Katlin Shoemaker – Katlin.Shoemaker@ag.tamu.edu

Project Title *Blinn College Customs Specialist Scholars Training Program* – Blinn Community College Bryan, Texas

Total Budget - $20,460   **Start – September 2023**   **End – July 2024**
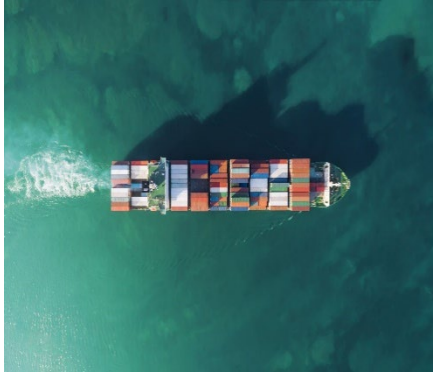
Issue: The finding trained, entry-level Customs Compliance Specialists represents a critical concern for U.S. importers and exporters, and U.S. industries that depend on the movement of goods across our borders.

Objectives: This project will help fill the need for entry-level Customs Compliance Specialists by supporting the launch of a new non-degree, workforce training program at Blinn College. Also to enhance the professional development and career interests of students and make them aware of career opportunities within the homeland security enterprise.

Value Proposition: This effort combines the strengths of Blinn College's applied technology, workforce development expertise with a leading industry certification program developed by the National Customs Brokers & Forwarders Association of America. The Blinn Customs Specialist Scholars Training Program will provide opportunities for students to develop hands-on technical skills and conduct research to help provide solutions to DHS mission-relevant problems.

Research Leadership	Institution
Co-PI: Marshall Rich, M.S.	Blinn College District
Co-PI: Cody Stetler, M.Ed.	Blinn College District
Co-PI Jay Anderson	Blinn College District
Co-PI: Katlin Shoemaker	CBTS
Industry Mentor: Cynthia F. Whittenburg	National Customs Brokers & Forwarders Association of America

CBTS Contact: Katlin Shoemaker – Katlin.Shoemaker@ag.tamu.edu

Cross-Border Threat Screening and Supply Chain Defense – DHS COE
Biennial Meeting – Education Summaries

DHS Summer Research Teams - 2023

1. **Arizona State - A Novel 3D Printing Mechanism for Rapid Prototyping Personalized Protective Equipment as Response to Chemical and Biological Exposures - Follow-on Funding - Yes**

2. **The City University of New York- Extending auditability to known and unknown endpoints using blockchain - Follow-on Funding - Yes**

3. **Prairie View TAMU - Efficient Detection and Identification of Small Ring Polycyclic Aromatic Hydrocarbons via Fluorescence Energy Transfer and GC-MS in Shrimp - Follow-on Funding – Yes**

4. **North Texas University - Asylum policies and the decision-making of migrants at the U.S. south border - Follow-on Funding - Yes**

Potential CBTS - DHS Summer Research Teams - 2024

1. **Prairie View A&M University (PVAMU) - Capturing Inorganic Arsenic from Fertilizers by using Metal Complexation Techniques**

2. **University of Incarnate Word (UIW) - Autonomous Insect Detection Using Collaborative Robotic Swarms with AI**

3. **University of North Texas (UNT) – Hyperspectral Imaging for Pest detection and Sampling Inspection**

4. **University of Texas at El Paso (UTEP) - A Comparative Study of Rice Grains from Mexico and the USA, Assessing Nutritional Variations, Heavy Metal Presence, and Pathogen Susceptibility**