Title:	A human behavioral approach to reducing the impact of livestock pest or disease incursions of socio-economic importance		
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Program Code: A5152

Program Name:
Global Food Security: Minimizing Losses

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Kerr, Susan	CAHNRS-Extension
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Zia, Asim	CDAE
Tonsor, Glynn	Agricultural Economics
Merrill, Scott	Plant and Soil Science
McDonald, Jeannette	
Sellnow, Timothy	Nicholson School of Communication

Non-Technical Summary

Emerging diseases of socio-economic importance have food security, perceived food safety, and domestic and international trade implications for the marketing of animals or animal products. Understanding the human behavioral dimensions of the introduction, spread, identification, reporting, and containment of new, emerging, and foreign pests and diseases of livestock is critically important for developing effective strategies to sustain a productive, profitable, and secure food animal sector. Experts in animal science and veterinary medicine, agricultural economics, public policy, anthropology, adult education, and risk communication come together to lead this inter-disciplinary applied research and outreach project focused on enhancing biosecurity practices and strategies to reduce the impact of incursions of new, emerging, or foreign pests or diseases of dairy, beef, and swine. Through engagement with project activities, stakeholders in U.S. dairy, beef, and pork production will be encouraged to implement practices and policies that collectively reduce the impact and threat of new, emerging, and foreign pests and diseases to the nation's meat and milk supply. This proposal directly addresses **Priority Area A5152 within the Food Security Challenge Area--Animal Health and Production and Animal Products.** Educational resources, "games", and messages developed and tested during the project will be made available beyond the end of the funding period through learning object repositories and an innovative web portal.

Accomplishments
Major goals of the project
Overall Goal: The activities and outputs of this project will facilitate the development and adoption of practices and policies that collectively reduce the impact of new, emerging and foreign pests and diseases to domestic production of cattle, swine and small ruminant foods and byproducts.

The following objectives will guide the activities of this CAP:
Objective 1: Characterize determinants of behavior of stakeholders at critical control points where application of practices or protocols can prevent (or reduce the impact of) incursions of pests and diseases of cattle, pigs and small ruminants.
Objective 2. Determine economic attractiveness of solutions that enhance biosecurity.
Objective 3. Determine most effective communication strategies (message tactic and wording, channels, and sources).
Objective 4. Integrate disease characteristics, human risk perception and socio-economic influences on behavior in a simulated "game" environment.
Objective 5. Develop educational and outreach materials and methods that lead to measurable changes in attitude and behaviors at critical control points in cattle, swine and small ruminant production systems.

What was accomplished under these goals?
Overall
The execution of project objectives is simultaneous, not consecutive. While a few team members may have a primary role meeting a particular objective, there are many objectives being met with cross-disciplinary efforts. The project team met twice in year 2 to share progress, gather input from stakeholders, and chart a course forward. Strategic facilitation of team meetings ensures that we define our "jargon" and enhance cross-disciplinary understanding. Our second-year activities have built on our initial framework using the outbreak of porcine epidemic diarrhea virus as a case study and have extended to other livestock sectors in our surveys and educational deliverables. Cross-disciplinary linkages are strengthening, leading, in some cases, to modification of activities from what was originally proposed.

Objective 1. Characterize determinants of behavior of stakeholders at critical control points where application of practices or protocols can prevent (or reduce the impact of) incursions of pests and diseases of cattle and pigs.
As a starting point, a comprehensive list of types of locations, stakeholders, and behaviors, which influence animal health protection, has been generated by the team. We intend to prioritize the items on this list at future workshops. Through input at project team meetings, a workshop, and a special meeting in Riverdale, MD, advisors representing industry associations and education/outreach organizations as well as USDA personnel have provided input on disease scenarios to be used in surveys and games that generate data. We have used this feedback to determine the diseases and disease characteristics of importance to guide our research efforts.

We have used several approaches to identify determinants of behavior. An expert survey conducted of swine, beef and dairy cattle experts yielded important information on stakeholder behavior at the level of the production unit. The simulation games (for data collection purposes) described under objective 4 and agent-based models described here are also shedding light on determinants of behavior and network locations that influence the likelihood of disease spread. We have developed agent- based models to simulate the transmission of diseases within the U.S. hog production system. "Agents" as defined in this model include hog production premises, feed mills, auction houses and slaughter plants. Interactions among agents occur through networks representing the delivery of feed and movement of animals. This platform can be used to identify agents in the system where efforts to control disease spread should be prioritized.

The agent-based model and simulation games were presented to stakeholders at a workshop in Mankato, MN. The team members affiliated with the social ecological gaming and simulation laboratory at the University of Vermont led the workshop, which consisted of giving presentations, allowing stakeholders to play the protocol adoption game (described under objective 4), and eliciting feedback on various aspects of the simulation models.

Objective 2. Determine economic attractiveness of solutions that enhance biosecurity.
A manuscript on the initial (year 1) survey of industry experts familiar with swine, beef cattle, and dairy industries has been submitted for publication. National swine producer and feedlot surveys have been completed. The national swine producer survey is designed to document current implementation of biosecurity and identify factors influencing the adoption of specific biosecurity practices. This survey is also being separately deployed in an area with a significant Hutterite population. The feedlot survey explores whether decision makers approach animal health and cattle price risks independently or if there are complement/substitute relationships in these decisions. Ultimately this will help better understand the managerial decision-making process and hence our comprehension of why certain decisions are made.

Objective 3. Determine, develop and apply most effective communication strategies (message tactic and wording, channels, and sources).

Qualitative research methods have been used to study the response of the U.S. swine industry to porcine epidemic diarrhea. A case study has been completed on message design and distribution during the initial incursion of the disease. The results have already translated into a number of presentations and a manuscript submission. Follow up analysis will generate additional manuscripts. Using an unexpected novel approach leveraging cross-disciplinary connections, the communication specialists have teamed up with the simulation game developers to test how messages affect decision-making during game play.

Objective 4. Integrate disease characteristics, human risk perception and socio-economic influences on behavior in a simulated "game" environment.

The first experimental (i.e., data gathering) game (aka protocol adoption game) was developed to examine the effect of information about disease prevalence and biosecurity practices on adoption of biosecurity protocols. With the first version of the game, played by 110 participants, we collected in-game decision-making data and post-game survey data (e.g., demographic and behavior motivation questions). A manuscript has been drafted. The second version of the game examines the hypothesis that showing realistic depictions of the fate of infected pigs versus showing healthy pigs will change the players' decision-making around implementing biosecurity protection. A third version of the game, an online version (created using the Unity platform), is in the early stages of development. Another experimental game, known as the biosecurity compliance game, has been developed on the Unity platform and beta tested. By deploying this game online, we will be able to target and engage stakeholders as players.

Objective 5. Develop educational and outreach materials and methods that lead to measurable changes in attitude and behaviors at critical control points in cattle, swine and small ruminant production systems.

The stakeholder workshop held in Mankato, MN, in early December 2016 was the first of several planned workshop focus groups designed to determine uses of the simulations and games for education and outreach purposes, including policy- making.
The first three learning objects have been produced: (1) What is Biosecurity? (2) Routes of Infection and Means of Transmission, and (3) Sources of Disease Risk. The first is ready to publish to a website or repository and the next two have been peer-reviewed and pilot-tested. Each learning object is a self-contained set of interactive learning activities accessible online and geared for youth in grades 4 through 12. Cattle, swine and small ruminant examples are included. An evaluation specialist is overseeing the review and piloting of these learning objects. Reviews were solicited from extension colleagues in 14 states.

Expected impact: The activities and outputs of this project will facilitate the development and adoption of practices and policies that collectively reduce the impact of new, emerging and foreign pests and diseases to domestic production of cattle, swine and small ruminant foods and byproducts. The project team uses several approaches to better understand the human behavioral dimensions of taking steps to protect animal health in the livestock sector. Novel educational tools are being developed for youth audiences to learn about protecting animal health. Food animal production, not counting poultry, represents roughly $140 billion per year of economic activity in the United States. Mitigating the consequences of diseases and pests with potentially severe social and economic ramifications is a vital aspect of sustaining a profitable and productive food animal sector.

What opportunities for training and professional development has the project provided?

Undergraduates

Caitlyn Danehy, Luke Trinity, and William Nupp at the University of Vermont have worked under Scott Merrill's supervision to learn and apply programming skills to developing experimental games for the project. They have also learned biosecurity concepts.
Artemis Sapountzi, a post-baccalaureate pre-veterinary student at the University of Vermont, created an EndNote library of biosecurity resources collected by Dr. Julie Smith. She also did initial coding of interviews from a previous research project that are relevant to the current project.

Graduate students

James Mitchell, PhD candidate in Agricultural Economics at Kansas State University, has been supported by the project since August 2016. He has assisted with building an equilibrium displacement model for estimating market-level effects of various biosecurity investments and scenarios, which will be instrumental for objective 2.

Qianrong Wu, PhD candidate in Economics at Iowa State University, came on board in 2016. She developed and conducted the expert surveys described in objective 2 and is on track to complete a manuscript on that work in year 2. She has a second manuscript in preparation. Qianrong will be assisting in documenting the state of the industry in regard to animal health and biosecurity as the swine producer data becomes available. Qianrong is expected to defend her dissertation by May 2017.

Emily Helsel, MA candidate in Communication at the University of Central Florida, assisted with data analysis from the porcine epidemic diarrhea virus case study interviews and subsequent manuscript preparation.

Adria McCardy, MA candidate in Communication at the University of Central Florida, is involved in collecting data and writing a manuscript based on the exemplification experiment associated with the disease risk tolerance game.

Serge Wiltshire, PhD candidate in Food Systems and working on a Certificate in Complex Systems at the University of Vermont, was funded by the project fall 2015 through summer 2016 and has been working part-time for the project since then. He has been instrumental in bringing new members of the Social Ecological Gaming and Simulation laboratory up to speed with the use of AnyLogic for programming agent-based models. He presented an abstract at Swarmfest 2016 (a national conference for complex systems researchers, which focused on agent-based modeling this year). He has also accepted an invitation to give a seminar and several demonstration workshops on the use of AnyLogic at Montana State University in early 2017.

Eric Clark, PhD candidate in Math and Statistics at the University of Vermont, came on board in August 2016. He has assisted with converting the protocol adoption experimental game into an online format and making it accessible. This work supports objectives 3 and 4. He attended his first project team meeting in November 2016.

Post-doctoral researchers

Gabriela Bucini, post-doctoral assistant at the University of Vermont, has been employed by the project since September 2016. She is using AnyLogic to program agent-based models. In early December she presented the model to stakeholders at a project workshop.

Staff

Eileen Kristiansen, project budget manager at the University of Vermont, is completing her doctoral program in educational leadership as a benefit of employment.

Susan Moegenburg, project manager with the Social Ecological Gaming and Simulation Laboratory at the University of Vermont, has been with the project since December 2015. She attended Swarmfest (hosted by the University of Vermont) to hear presentations related to the USDA project by several project collaborators.

Eileen and Susan have both attended project team meetings to strengthen relationships with others on the project and gain relevant knowledge.

Faculty

Tim Sellnow, professor at the University of Central Florida, met with project researchers at the University of Vermont to further cross-disciplinary research plans.

Julia M. Smith, project director and research associate professor at the University of Vermont, attended the US Animal Health Association Annual Meeting in Greensboro, NC, and the NIFA Animal Health PD meeting in Chicago in December.
How have the results been disseminated to communities of interest?

This year we published two project newsletters, included stakeholders/advisors in two project team meetings (one of which was a facilitated focus group workshop), developed a peer-review tool for evaluation of learning objects, completed one learning object, submitted one manuscript (with more in progress), gave three invited talks (one recorded), presented at one local and nine national or international conferences in a range of disciplines, and have one submitted and two accepted proposals for presentation before the end of project year 2.

What do you plan to do during the next reporting period to accomplish the goals?
Overall
The project team plans to continue meeting twice a year to share progress, gather input, and determine next steps. Project communications through a website and newsletter will continue. A project logo will identify all outreach going forward. The project director will attend the USDA project director's meeting.

Objective 1. Characterize determinants of behavior of stakeholders at critical control points where application of practices or protocols can prevent (or reduce the impact of) incursions of pests and diseases of cattle and pigs.

The list of locations, stakeholders, and behaviors, which influence animal health protection, forms the basis for considering enlarging circles of influence of policy or practice. This list will inform project activities, including an industry forum being planned for 2018 with the National Institute for Animal Agriculture. A consultant with experience in regulatory veterinary medicine will assist with the development of this forum and will solicit additional feedback from experts. A more robust list of diseases and disease characteristics from which to select scenarios will be created with assistance of veterinary consultants working with the project team. Efforts described under objective 3, support the third part of objective 1: developing a typology by which stakeholders can be classified for tailoring of risk messages and other incentives to motivate animal health protective behaviors.

Objective 2. Determine economic attractiveness of solutions that enhance biosecurity.
Year 3 efforts will focus on data analysis and results generation based on completed national swine producer and feedlot surveys. These data will be used to update and expand hedonic regression models to provide improved marginal benefit estimates that producers would use to assess the net value of adding or changing various value-added practices including several animal health focused efforts. We are also investigating the marginal value (higher cattle price) associated with adoption of additional animal health protocols. These results will serve as inputs into broader economic assessments.

Additional surveys of cow-calf producers and possibly beef industry experts are planned to explore willingness to participate in broader information sharing efforts, including sharing of animal health information.

Objective 3. Determine, develop and apply most effective communication strategies (message tactic and wording, channels, and sources).

In year 3 we will conduct message testing in a game simulation, publish and present research from the case study of porcine epidemic diarrhea, and further develop theories of ideal messaging and contextual tensions. For the message testing experiment, the "protocol adoption game" described under objective 4 will be hosted in Florida. The explanatory video provided as an introduction to the game will include either a control or treatment news story including visual exemplars that are emotionally arousing. We intend to have between 100 and 200 students play the game. Game play and data collection in eastern Kentucky and the Kansas City, MO, area will help us account for regional variation. A book proposal focusing on risk communication challenges and opportunities in the context of agricultural biosecurity will be submitted to Lexington Books for review.

The survey data of Hutterite swine producers (completed under objective 2) will lead to additional work on cultural considerations in messaging about animal disease protection. As described under objective 5, the research conducted in this and other case studies also provides support for educational modules associated with risk communication best practices. If there is time, we will begin a case study of risk communication associated with Highly Pathogenic Avian Influenza.

In regard to strengthening agricultural communication networks, we will investigate channels and opportunities to reach underserved producers, including niche and hobby producers in the west. Another aspect focuses on engaging with Hutterite (an Anabaptist sect akin to Amish and Mennonite) pork producers to identify strategies and channels appropriate for communicating biosecurity messages to this closed community.

Objective 4. Integrate disease characteristics, human risk perception and socio-economic influences on behavior in a simulated "game" environment.

We will continue to integrate disease characteristics, human risk perception, and socio-economic influences on behavior in a simulated environment. Both an Agent Based Model (ABM, a type of simulation model) and experimental games will be used to fulfill this objective. The main goals related to continued development of the ABM for the coming year are to (1) refine the parameterization of the model with an industry dataset of hog movement records, (2) implement some of the features such as carcass management

(disposal) suggested by stakeholders at the Mankato workshop, (3) integrate economic factors using data generated by the national swine producer and feedlot surveys (conducted under Objective 2) , and (4) make the ABM agents adaptive. Currently agents in the model have fixed decision rules. Adaptive rules would more realistically reflect how people change their attitude and behavior toward biosecurity and risk-taking under different circumstances. This work is expected to lead to three manuscripts.

Experimental game development will involve new versions of the "protocol adoption" games (which investigate decision- making regarding adoption of biosecurity protocols) and "compliance" games (which seek to understand what drives compliance with existing biosecurity protocols). Multiple versions of the online "protocol adoption" game (created in Unity programming language) will allow us to test links between behavioral and decision-making theories and applicability. We also plan to roll out additional versions of the online "compliance" game, for multiple types of players and with the incorporation of message testing. This year we are targeting a minimum of 100 participants for each experimental game. Special efforts will be made to include stakeholders from the swine industry as participants. This work is expected to lead to four manuscripts.

Recruitment of players for the games is promoted on the Social Ecological Gaming and Simulation laboratory website. As results from games and ABM are published, this grant project will be increasingly featured there.

Objective 5. Develop educational and outreach materials and methods that lead to measurable changes in attitude and behaviors at critical control points in cattle, swine and small ruminant production systems.

In year 3 we will finish production of the remaining learning objects and collect evaluation data from peer reviews and pilot tests. The learning objects will be demonstrated at various conferences to promote their use by 4-H leaders and other agricultural educators. We will begin to develop an educational risk assessment tool that feeds into a biosecurity management plan customized for the producer completing the assessment. In addition, the project team's communication experts are assisting in the development of a risk communication education module, which will be tailored for young people who are exploring careers in agriculture. This module will include existing best practices as well as contributions from this project's case study and message testing work. The module will focus on three areas: 1) best practices for risk communication planning, 2) best practices for risk message design, 3) media literacy--the ability to distinguish credible, data-supported information from less credible information, and 4) effective delivery skills for sharing information in public settings.

Participants

Actual FTE's for this Reporting Period

Role	Non-Students or faculty	Students with Staffing Roles			Computed Total by Role
		Undergraduate	Graduate	Post-Doctorate	
Scientist	2.5	0.1	0.5	0	3.1
Professional	0.7	0	2.1	0.6	3.4
Technical	0.2	0	0	0	0.2
Administrative	1	0	0	0	1
Other	0	0	0	0	0
Computed Total	4.4	0.1	2.6	0.6	7.7

Student Count by Classification of Instructional Programs (CIP) Code

Undergraduate	Graduate	Post-Doctorate	CIP Code
1	1	1	11.08 Computer Software and Media Applications.
2			11.02 Computer Programming.
	2		45.06 Economics.
	1		09.09 Public Relations, Advertising, and Applied Communication.
	3		09.01 Communication and Media Studies.
1			45.99 Social Sciences, Other.
	1		11.03 Data Processing.

Target Audience

Team members have presented project-related work to livestock producers, industry leaders, and animal health officials (National Institute for Animal Agriculture), economists and extension personnel (Agricultural and Applied Economics Association, Extension Risk Management Education National Conference), risk communication practitioners (including the National Communication Association and Association for Communication Excellence), students in crisis communication seminar at University of Central Florida, climate change research interns (Vermont EPSCoR), complex systems modelers (Swarmfest hosted at UVM), and other team members at May and November project team meetings.

A focus group of swine industry experts participated in a one-day workshop led by the project's modeling team. Experts in the swine, beef and dairy industries have pre-tested and completed surveys on aspects of biosecurity implementation.
Advisors have received copies of all newsletters. By the end of project year 2,

- Pork producers in Montana, including a significant number of Hutterite producers, will have been invited to participate in a survey that is also being distributed to a cross-section of the hog industry.
- Over one hundred (mostly student) participants will have completed the initial "protocol adoption" game and another hundred will have completed a new version to generate data.
- Extension faculty and staff from several states will have reviewed the first learning objects. These Extension professionals are members of the National Association of Extension 4-H Agents' Animal Science Task Force and work in 14 different states.

Products

Type	Status	Year Published	NIFA Support Acknowledged
Conference Papers	Published	2016	YES

Citation
Sellnow, T. L. "Crisis communication overview." Joint Institute for Food Safety and Applied Nutrition 2016 Annual Symposium, Greenbelt, MD. April, 4 2016.

Type	Status	Year Published	NIFA Support Acknowledged
Conference Papers	Accepted	2017	YES

Citation
Getchell, M. C. "Nimble and Networked: The 2013 PEDv Crisis as a Case Study." International Risk and Crisis Communication Conference, Orlando, FL. March 14, 2017.

Type	Status	Year Published	NIFA Support Acknowledged
Conference Papers	Accepted	2017	YES

Citation

Sellnow, T. L. and D. D. Sellnow. "Crisis Communication in Response to Rapidly Emerging Diseases in the Agriculture Industry: Porcine Epidemic Diarrhea Virus as a Case Study." Central States Communication Association's Annual Conference, Minneapolis, MN. March 18, 2017.

Type	Status	Year Published	NIFA Support Acknowledged
Other	Other	2017	YES

Citation

Smith, J. "Vermont Veterinarian Panel (Panelist)." VT Farm Health Task Force, Winter Quarterly Meeting, Berlin, VT. January 12, 2017.

Type	Status	Year Published	NIFA Support Acknowledged
Conference Papers	Published	2016	YES

Citation

Tonsor, G. "Why Do Producers Partially Implement Biosecurity Recommendations of Experts?" Economics of Animal Health Session. Agribusiness Economics and Management Session, Agricultural and Applied Economics Association Annual Meeting, Boston, MA. August 2, 2016.

Type	Status	Year Published	NIFA Support Acknowledged
Conference Papers	Published	2016	YES

Citation

Tonsor, G. "Animal Welfare Perceptions of U.S. Cow-Calf Producers and Consumers: Economic and Educational Implications." Extension Risk Management Education National Conference, Ft. Worth, TX. April 28, 2016.

Type	Status	Year Published	NIFA Support Acknowledged
Conference Papers	Published	2016	YES

Citation

Tonsor, G. "Understanding Incentives for Livestock Biosecurity Investments & Efforts." National Institute for Animal Agriculture, 2016 Annual Meeting – Closing General Session, Kansas City, MO. April 6, 2016.

Type	Status	Year Published	NIFA Support Acknowledged
Conference Papers	Published	2016	YES

Citation

Tonsor, G. "Assessment of the Economic Impacts of PEDv." National Institute for Animal Agriculture, 2016 Annual Meeting – Swine Committee Meeting, Kansas City, MO. April 5, 2016.

Type	Status	Year Published	NIFA Support Acknowledged
Journal Articles	Submitted	2017	YES

Citation

Wu, Q., L. L. Schulz, G. T. Tonsor, and J. M. Smith. (submitted). Expert views on effectiveness, feasibility, and current implementation of biosecurity measures for mitigating Tier 1 disease risks in the U.S. swine, beef cattle, and dairy industries. Veterinary Medicine and Science.

Type	Status	Year Published	NIFA Support Acknowledged
Conference Papers	Submitted	2017	YES

Citation

Kerr, S., et al. "Living & Growing Biosecurity with a National Youth Livestock Biosecurity Curriculum." International 4-H - Western Region Leaders' Forum, Edmonton, Alberta, Canada. March 17, 2017.

Type	Status	Year Published	NIFA Support Acknowledged
Conference Papers	Published	2016	YES

Citation

Zia, A., S. Merrill, C. Koliba, S. Moegenburg, S. Wiltshire, E. Clark, G. Bucini, J. Parker, and J. Smith. Machine Learning the Effects of Biosecurity State Transitions in a Sequential Decision Game. Annual BayesiaLab Conference and Advanced BayesiaLab Course, Nashville, TN. September 2016.

Type	Status	Year Published	NIFA Support Acknowledged
Other	Published	2016	YES

Citation

Bucini, G., S. Wiltshire, S. Merrill, J.M. Smith, C. Koliba, A. Zia, S. Moegenburg, and E. Clark. Regional U.S. Hog Production Chain Biosecurity Model. Animal Disease Biosecurity Coordinated Agricultural Project (ADB CAP) Annual Meeting, Mankato, MN. November 29 - December 1, 2016.

Type	Status	Year Published	NIFA Support Acknowledged
Other	Published	2016	YES

Citation

Koliba, C., J. Smith, S. C. Merrill, G. Bucini, and S. S. Moegenburg. Mediated-Modeling Workshop. Building towards an Understanding of the Impacts of Human Behavior on Disease in the Swine Industry. Mankato, MN. December 1, 2016. Part of the USDA supported Animal Disease Biosecurity – CAP grant annual meeting.

Type	Status	Year Published	NIFA Support Acknowledged
Conference Papers	Published	2016	YES

Citation

Merrill, S.C., A. Zia, C. Koliba, S. Wiltshire, J. Smith, and S. Moegenburg. Innovation in ABM calibration: Using experimental gaming data to inform agent rule sets. Swarmfest conference. Agent-based Modeling. Burlington, VT. August 1, 2016.

Type	Status	Year Published	NIFA Support Acknowledged
Other	Other	2016	YES

Citation

Merrill, S. C. Experimental Gaming Research, gathering data to understand Social-Ecological Systems. Plant and Soil Science Departmental Seminar. Burlington, VT. March 2016. https://streaming.uvm.edu/media/videos/1289/experimental- gaming-research-talk-by-scott-merrill-phd/

Type	Status	Year Published	NIFA Support Acknowledged
Conference Papers	Published	2016	YES

Citation

Wiltshire, S. "The Regional U.S. Hog Production Chain Biosecurity Model: Using an Agent Based Model to Evaluate the Effect of Producer Specialization on Disease Resilience in a Simulated Livestock Production Chain." Swarmfest, University of Vermont, Burlington, VT. August 2, 2016.

Type	Status	Year Published	NIFA Support Acknowledged
Conference Papers	Published	2016	YES

Citation

Wiltshire, S. "Evaluating the Effect of Producer Specialization on Disease Resilience in a Simulated Livestock Production Chain." Poster Presentation, University of Vermont Student Research Conference, Burlington, VT. April 28, 2016.

Type	Status	Year Published	NIFA Support Acknowledged
Other	Other	2017	YES

Citation

Wiltshire, S. "Using AnyLogic Multimethod Simulation Software to Model Disease Spread in a Complex Livestock Supply Chain." Invited Talk, Montana State University, Bozeman, MT. January 12, 2017.

Other Products

Product Type

Evaluation Instruments

Description

Sero, R., S. Kerr, J. McDonald, J. Rankin, and J. Smith. "Learning Object Peer Review Survey". Available at https://wsu.co1.qualtrics.com/SE/?SID=SV_5dSSzeuGJTftkIl.

Product Type

Educational Aids or Curricula

Description

McDonald, J., J. Rankin, J. Smith, and S. Kerr. 4-H Youth Biosecurity Curriculum Learning Object #1: "What Is Biosecurity? Why Should We Care?" Available at http://dev.fvtclearninginnovations.com/biosecurity/biosecurity01.html.

Product Type

Other

Description

Animal Disease Biosecurity Coordinated Agricultural Project newsletters, May and September 2016, available at: http://blog.uvm.edu/jmsmith/smith-leads-usda-nifa-cap-protecting-animal-health/project-newsletters/

Changes/Problems

{Nothing to report}