United States Department of Agriculture

Final Report

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

Sponsoring Agency	NIFA	**Project Status**	COMPLETE
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Program Code: A5152

Program Name: Global Food Security: Minimizing Losses

Project Director

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Recipient Organization

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Performing Department

Animal and Veterinary Sciences

Co-Project Directors	**Departments**
Koliba, Christopher	Department of Public Administration
Littlefield, Robert	Communications
Bass, Thomas	{NO DATA ENTERED}
Kerr, Susan	CAHNRS-Extension
Tonsor, Glynn	Agricultural Economics
Parker, Jason	SENR
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Merrill, Scott	Plant and Soil Science
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Sellnow, Timothy	

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?

During the no cost extension of the project performance period, the team completed work on several objectives as outlined below.
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.
We have disseminated key findings about determinants of behavior from economic surveys, communication interviews, and digital field experiments in workshops, presentations, proceedings, and publications as well as through our websites (agbiosecurityproject.org and healthyagriculture.org).
Objective 2. Determine economic attractiveness of solutions that enhance biosecurity.
In light of heightened U.S. concerns over the possible introduction of African swine fever (ASF), a study was conducted to model the market-perceived probability of an ASF outbreak as a quantitative measure based on lean hog futures prices and implied volatility from lean hog options to simulate potential future prices. We expect tracking this measure to provide actionable information for industry decision makers and policymakers to mitigate the impacts of ASF.
Data from a 2020 survey allowed us to (a) examine how slightly misleading headlines regarding ASF could impact consumers' purchase intentions for pork, (b) estimate consumers' willingness to pay for pork produced with enhanced biosecurity (participation in the Secure Pork Supply Plan) certified by different entities (no certification vs. USDA vs. industry), and (c) determine consumers' willingness to pay for a pork produced with preventive measures (e.g., enhanced biosecurity vs. vaccination vs. gene-editing technology).
In addition, we benchmarked producer perceptions of adoption and feasibility of enhanced biosecurity and surveillance consistent with the Secure Beef Supply Plan using responses to a 2018 survey of U.S. cow-calf and feedlot producers.
Objective 3. Determine, develop and apply most effective communication strategies (message tactic and wording, channels, and sources).
Interviews were conducted with swine experts, USDA disease response experts, and individuals in three states on the threat of ASF and recent outbreaks of highly pathogenic avian influenza. Having coded and evaluated the data, we are in the process of presenting and publishing papers on "Communities of Practice in the ASF Crisis" and "Model and Anti-Model Biosecurity Practices for Responding to Highly Pathogenic Avian Influenza."
A book entitled, Integrated Marketing Communications in Crisis Contexts: A Culture Centered Approach, has been published by Lexington Books, an imprint of Rowman & Littlefield. This volume addresses risk communication challenges and opportunities, with applications to animal agricultural biosecurity. State animal health officials are to receive copies.
Objective 4. Integrate disease characteristics, human risk perception and socio-economic influences on behavior in a simulated "game" environment.
There are two new modules of the agent-based model: One simulates an agnostic learning process that allows agents to shift their risk attitude during a simulated outbreak between being risk averse, opportunist, or risk tolerant; the other is an economic module that tracks the hog market by adjusting hog sale prices according to a supply-and-demand model and accounts for sales and expenses in hog producers' budgets. We can relate disease spread to biosecurity levels and risk attitudes. Disease incidence and market dynamics in scenarios with different risk attitude distributions can inform communication strategies for biosecurity policies.
There are six new experimental game versions. (1) A multiplayer version of the protocol adoption game (being tested) allows five people to simultaneously make tactical decisions about investing in biosecurity for 10 facilities operated by each participant with different types of information at hand (i.e., neighboring biosecurity allocation and disease status among the supply chain). Experimental game play is dynamic, taking place over multiple months during a disease outbreak. (2 &3) Games based on our compliance game, which examines willingness to comply with biosecurity rules under different disease

risk scenarios, were translated into Chinese and Spanish. (4 & 5) Games adapted from our protocol adoption game were also translated into Chinese and Spanish. We conducted foreign language versions of the games domestically and abroad (e.g., mainland China and Mexico) concurrent with English language versions (a) to contrast with data collected by participants of the foreign language versions and (b) to determine if the COVID-19 pandemic influenced the spectrum of risk behavior observed during game play. (6) We conducted another English language version of the protocol adoption game, where purchase of biosecurity information is offered as a treatment. In addition, a training/education experimental game is under development that will help with outbreak response to a foreign animal disease.
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.
Summative evaluation of the online biosecurity learning modules and hands-on activities is underway. We anticipate that FFA, 4-H, and other youth who interact with our learning resources are more likely to implement animal health protective behaviors and communication, which will decrease animal illness and increase productivity and profitability.

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

This project fostered training opportunities for 10 undergraduates, 12 graduate students, two post-doctoral research associates, and two program staff in year 6. We are proud of the diversity of graduate students engaged with the project, including African-American, Asian, and Latinx students. A master's thesis by University of Central Florida (UCF) student America Edwards, based on research conducted with the ADBCAP, was named top thesis in the UCF College of Sciences and one of two theses honored university-wide as the best thesis of the year. (The award was announced in 2021. The citation of the thesis published in 2020 is provided separately.)
Undergraduates
Robby Beattie, Luke Fredrickson, Aislinn O'Keefe, and Johnathan Urbani at the University of Vermont have been mounting experimental games in Unity and developing capabilities for gaming and modeling with augmented and virtual reality. Amber Oerly at Kansas State University and Gemma Del Rossi at the University of Vermont assisted with data analysis and manuscript preparation. Kortnie Wheaton and Antonia DiPreta at the University of Vermont wrote blog posts for the Healthy Farms Healthy Agriculture site. Antonia DiPreta, Keisha Bedor, and Chelsey Patch conducted a pilot test of the biosecurity plan builder tool.
Graduate students
Danielle Farley joined the project in 2019 and completed her master's degree in Communication at the University of Montana where she assisted Joel Iverson and the project team with analyzing communities of practice in biosecurity. She has taken a position with USDA NIFA as a social science specialist.
America Edwards received her M.A. in Communication from UCF in 2020 and is a PhD student in the Department of Communication at the University of California Santa Barbara.
Ronisha Sheppard graduated with her M.A. in Communication from UCF in 2020. She assisted in collecting and coding data about instructional risk communication in the U.S. poultry industry's preparation for avian influenza. She presented this work at a national conference and is lead author on the subsequent published manuscript. She is now in a doctoral program at Wayne State University.
Rebecca Freihaut, a doctoral student in the UCF strategic communication program, plans to graduate in 2024. She assisted in collecting and coding interview data and composing manuscripts focused on the U.S. swine industry's preparation for African swine fever, including the influence COVID-19 has had on the industry's capacity to react.
Rodrigo Augusto Maurico Soares, a doctoral student in the UCF strategic communication program, plans to graduate in 2023. He participated in the development of a message testing experiment using the message convergence framework to test messages shared with consumers via traditional media about African swine fever and its threat to the food supply and food safety.
Darius Lana and Shayla Cannady, doctoral students in the UCF strategic communication program planning to graduate in 2023, helped code and evaluate interview data about avian influenza to assess the relevance of the IDEA Model to the biosecurity risk communication about the spread of this disease.
Tung -Lin Lui is a Ph.D. student in the Food Systems doctoral program and a research assistant with the Social Ecological Gaming and Simulation Lab. He worked with our design team on the development of a foreign-language version of the protocol adoption game.
Ollin Demian Langle Chimal continues his doctoral studies in Complex Systems and Data Science under Nick Cheney at the University of Vermont.
James Mitchell, completed his PhD in Agricultural Economics at Kansas State University. He successfully defended his dissertation, "Three essays on livestock biosecurity and traceability," in June 2020 and accepted a faculty position with University of Arkansas. One essay from his dissertation work was accepted by the European Review of Agricultural Economics.
Christopher Pudenz, PhD student in Economics at Iowa State University, supported by the project since August 2017, plans to defend his dissertation in May 2022.

Jiwon Lee, PhD student in Economics at Iowa State University, supported by the project during the summer of 2020, plans to defend her dissertation in May 2021. Her three dissertation chapters (consumer work outlined above) are directly related to the grant.
Post-doctoral researchers
Gabriela Bucini, former post-doctoral assistant at the University of Vermont, has completed integrating an economic model into the pork system agent-based model that integrates spread of PEDv with risk attitudes. She also integrated an agnostic risk behavioral module that allows agents to change their risk attitude and therefore simulates human learning.
Eric Clark, post-doctoral assistant at the University of Vermont, has been instrumental in automating data feeds from experimental games to analysis. He has played an important role in the development of augmented reality agent-based models and the collection and analysis of the associated data.
Staff
Eileen Kristiansen, (80% FTE) project budget manager at the University of Vermont, plans to defend her dissertation and complete her doctoral program in educational leadership.
Joanna Cummings, (100% FTE) communications professional at the University of Vermont, applied her extensive web design and project promotion expertise to the project. Joanna completed an online course, "Animal Disease Emergencies, Understanding the Response," offered by the Center for Food Security and Public Health.

How have the results been disseminated to communities of interest?

The team was especially active in dissemination of our work this past year. Members of the team presented at a variety of national and international meetings, including the International Crisis and Risk Communication Conference and the International Society for Economics and Social Sciences of Animal Health. Several members of the team presented during an animal health symposium session at the online annual meeting of the American Society of Animal Science. The project director presented an abstract at the Conference for Research Workers in Animal Disease as did two other team members. Here we report four graduate projects and theses, one book, 21 conference presentations (including oral or poster abstracts and proceedings), and 11 peer-reviewed manuscripts. Web-hosted products and other presentations are described under other products.

What do you plan to do during the next reporting period to accomplish the goals?

{Nothing to report}

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	2.1	0	0	1.3	3.4000000000000004
Professional	0.1	0	2	0	2.1
Technical	0.9	0.6	1.1	0	2.6
Administrative	0.9	0	0	0	0.9
Other	0	0	0	0	0
Computed Total	4.0	0.6	3.1	1.3	9.0000000000000004

Student Count by Classification of Instructional Programs (CIP) Code

Undergraduate	Graduate	Post-Doctorate	CIP Code
5			01.03 Agricultural Production Operations.
1	7		09.09 Public Relations, Advertising, and Applied Communication.

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Undergraduate	Graduate	Post-Doctorate	CIP Code
4	1		11.02 Computer Programming.
	1	1	11.01 Computer and Information Sciences, General.
		1	11.08 Computer Software and Media Applications.
	3		45.06 Economics.

Target Audience

This past year, the team has leveraged previous relationships and continued to reach a wide variety of audiences virtually.

- Engaged 4-H youth, high school students and teachers, undergraduate students, university research faculty, and crop biosecurity stakeholders in learning how serious games can reveal insights into human decision-making and help solve complex problems when coupled with agent-based models.
- Reached Extension educators, Extension Disaster Education Network delegates, animal health officials, and US and international communicators through conferences and meetings.
- Through Extension contacts, piloted two learning modules with 4-H groups and FFA classes (nine in all, students and teachers/leaders) to complete the online learning series for 6-12 grade students and completed peer reviews of the Teacher's Guides for the modules.
- Conducted web meeting community conversations to promote online biosecurity modules and hands-on activities to youth, agricultural educators, 4-H agents, and animal science faculty.

Products

Type	Status	Year Published	NIFA Support Acknowledged
Theses/Dissertations	Published	2020	YES

Citation

Edwards, A. (2020). Instructional communication as a primary function of communities of practice during crises [Master's thesis, University of Central Florida]. University of Central Florida Showcase of Text, Archives, Research and Scholarship: Electronic Theses and Dissertations, 2020. 39. https://stars.library.ucf.edu/etd2020/39 (citation updated with url)

Type	Status	Year Published	NIFA Support Acknowledged
Theses/Dissertations	Published	2020	YES

Citation

Farley, D. M. (2020). Crisis as a constant: understanding the communicative enactment of communities of practice within the extension disaster education network (EDEN) [Master's thesis, University of Montana]. https://scholarworks.umt.edu/cgi/viewcontent.cgi?article=12734&context=etd

Type	Status	Year Published	NIFA Support Acknowledged
Other	Published	2019	YES

Citation

Kuchenreuther, M. (2019). The IDEA Model as a basis for instructional risk message design in response to the 2013 PEDv outbreak [Master's project poster presentation]. International Crisis and Risk Communication Conference. 8. https://stars.library.ucf.edu/icrcc/2019/posters/8

Type	Status	Year Published	NIFA Support Acknowledged
Other	Other	2019	YES

Citation

Sheppard, R. (2019). Communicating model and anti-model biosecurity strategies in response to outbreaks of Highly Pathogenic Avian Influenza [Master's project, University of Central Florida].

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Type	Status	Year Published	NIFA Support Acknowledged
Books	Published	2021	YES

Citation

Littlefield, R. S., Sellnow, D. D., & Sellnow, T. L. (2021). Integrated marketing communications in risk and crisis communication contexts: A culture centered approach. Lexington Books.

Type	Status	Year Published	NIFA Support Acknowledged
Conference Papers and	Published	2020	YES

Citation

Edwards, A., Sellnow, T., Sellnow, D., Iverson, J., Parrish, A., & Dritz, S. (2020, May 20-26). Instructional communication as a primary function of communities of practice during crises. International Communication Association conference (virtual).

Type	Status	Year Published	NIFA Support Acknowledged
Conference Papers and	Published	2020	YES

Citation

Merrill, S. C., Koliba, C. J., Bucini, G., Clark, E., Trinity, L., Zia, A., Cheney, N., Langle, O., Shrum, T., Sellnow, T., Sellnow, D., & Smith, J. M. (2020). A systems approach to understanding biosecurity decision-making [Invited presentation Animal Health Symposium: ASAS-CSAS-WSASAS Virtual Annual Meeting, July 2020]. Journal of Animal Science, 98 (Supplement 4): 43. https://doi.org/10.1093/jas/skaa278.078

Type	Status	Year Published	NIFA Support Acknowledged
Conference Papers and	Published	2020	YES

Citation

Schulz, L., & Tonsor, G. (2020). Economic perspectives on biosecurity decision-making [Invited presentation Animal Health Symposium: ASAS-CSAS-WSASAS Virtual Annual Meeting, July 2020]. Journal of Animal Science, 98 (Supplement 4): 42. https://doi.org/10.1093/jas/skaa278.077

Type	Status	Year Published	NIFA Support Acknowledged
Conference Papers and	Published	2020	YES

Citation

Iverson, J. (2020, July 21). Communities of practice as preferred sources of biosecurity information in crisis situations [Invited presentation Animal Health Symposium: ASAS-CSAS-WSASAS Virtual Annual Meeting, July 2020]. Journal of Animal Science, 98 (Supplement 4): 44. https://doi.org/10.1093/jas/skaa278.080

Type	Status	Year Published	NIFA Support Acknowledged
Conference Papers and	Published	2020	YES

Citation

McDonald, J., Kerr, S. R., Rankin, J. M., & Smith, J. M. (2020, July 21). Educational tools promoting biosecurity through discovery learning [Invited presentation Animal Health Symposium: ASAS-CSAS-WSASAS Virtual Annual Meeting, July 2020]. Journal of Animal Science, 98 (Supplement 4): 43–44. https://doi.org/10.1093/jas/skaa278.079

Type	Status	Year Published	NIFA Support Acknowledged
Conference Papers and	Published	2020	YES

Citation

Smith, J. M., & Cummings, J. C. (2020, July 22). Healthy Farms Healthy Agriculture: A web hub for biosecurity to protect the herd and flock [Poster presentation ASAS-CSAS-WSASAS Virtual Annual Meeting]. Journal of Animal Science, 98(Supplement 4): 323, https://doi.org/10.1093/jas/skaa278.577 (Program chair

poster pick)

Type	Status	Year Published	NIFA Support Acknowledged
Conference Papers and	Published	2020	YES

Citation

Pudenz, C. C., & Schulz, L. L. (2020, July). Quantifying the U.S. market response to the African swine fever outbreak in China. 2020 Agricultural and Applied Economics Association Annual (Virtual) Meeting. https://ageconsearch.umn.edu/record/304298?ln=en

Type	Status	Year Published	NIFA Support Acknowledged
Conference Papers and	Published	2020	YES

Citation

Farley, D., & Iverson, J. (2020, September 24). Crisis as a constant: understanding the communicative enactment of communities of practice within the extension disaster education network (EDEN). EDEN 2020 Annual Meeting (Virtual). Available at: https://www.youtube.com/watch?v=z83xcBnrgqg

Type	Status	Year Published	NIFA Support Acknowledged
Conference Papers and	Published	2020	YES

Citation

Sellnow, T., & Sellnow, D. (2020, October 7-8) Communicating during crises. Swine Talks: First online conference of the global swine industry, https://swinetalks.mykajabi.com/

Type	Status	Year Published	NIFA Support Acknowledged
Conference Papers and	Published	2020	YES

Citation

Pudenz, C. C., Mitchell, J. L., Schulz, L. L., & Tonsor, G. T. (2020, November 11-13). Adoption of secure beef supply plan biosecurity by U.S. cow-calf and feedlot producers. 2020 International Society for Economics and Social Sciences of Animal Health (ISESSAH) Conference (virtual).

Type	Status	Year Published	NIFA Support Acknowledged
Conference Papers and	Published	2020	YES

Citation

Sheppard, R., Sellnow, T. L., Sellnow, D. D., & Parrish, A. J. (2020, November 19-22). Instructional crisis communication for an industry: model and anti-model biosecurity standards for the prevention and control of Highly Pathogenic Avian Influenza. 106th Annual Convention of the National Communication Association (virtual).

Type	Status	Year Published	NIFA Support Acknowledged
Conference Papers and	Published	2020	YES

Citation

Bucini, G., Merrill, S.C., Clark, E.M., Koliba, C., Zia, A., Langle-Chimal, O., Tonsor, G., Schulz, L., Wiltshire, S., Trinity, L., Sellnow, D., Sellnow, T.L., Cheney, N., & Smith, J.M. (2020, December). Connecting livestock disease and market dynamics to human biosecurity decisions. Conference of Research Workers in Animal Disease, Chicago, IL.

Accession No. 1005877 **Project No. VT-0071CG**

Type	Status	Year Published	NIFA Support Acknowledged
Conference Papers and	Published	2020	YES

Citation

Clark, E., Merrill, S.C., Trinity, L., Bucini, G., Cheney, N.A., Langle-Chimal, O., Shrum, T., Koliba, C., Zia, A., & Smith, J.M. (2020, December). Harnessing emergent digital tools for quantifying agricultural disease risk preferences. Conference of Research Workers in Animal Disease, Chicago, IL.

Type	Status	Year Published	NIFA Support Acknowledged
Conference Papers and	Published	2020	YES

Citation

Smith, J. M., Bass, T. M., Bucini, G., Cheney, N. A., Clark, E., Cummings, J., Getchell, M. C., Greene, E. A., Hiney, K. M., Iverson, J. O., Kerr, S. R., Koliba, C. J., Littlefield, R. S., Martin, J. M., McDonald, J., Merrill, S. C., Parker, J. S., Rankin, J. M., Schulz, L., Sellnow, D., Sellnow, T. L., Sero, R., Shrum, T., Tonsor, G., and Zia, A. (2020, December). Interactions and innovations generate insights for influencing biosecurity adoption in agricultural animal systems [Poster presentation]. Conference of Research Workers in Animal Disease, Chicago, IL.

Type	Status	Year Published	NIFA Support Acknowledged
Conference Papers and	Published	2021	YES

Citation

Getchell, M. C. (2021, March 9). A costly mis-steak: The meat processing industry, COVID-19 and type three errors [Poster presentation]. The International Crisis and Risk Communication Conference, Orlando, FL.

Type	Status	Year Published	NIFA Support Acknowledged
Conference Papers and	Published	2021	YES

Citation

Iverson, J. O., Farley, D., Smith, J. M., Edwards, A., Cummings, J., Sellnow, D., & Sellnow, T. (2021, March 9). Collectively communicating biosecurity: Recapping CoP theory as framework and method for ADBCAP projects. The International Crisis and Risk Communication Conference, Orlando, FL.

Type	Status	Year Published	NIFA Support Acknowledged
Conference Papers and	Published	2021	YES

Citation

Merrill, S. C., Bucini, G., Clark, E. M., Koliba, C. J., Trinity, L., Zia, A., Langle-Chimal, O., Cheney, N., Shrum, T. R., Sellnow, T. L., Sellnow, D. D., & Smith, J. M. (2021, March 9). Why we need to account for human behavior and decision-making to effectively model the non-linear dynamics of livestock disease. The International Crisis and Risk Communication Conference, Orlando, FL.

Type	Status	Year Published	NIFA Support Acknowledged
Conference Papers and	Published	2021	YES

Citation

Merrill, S. C., Bucini, G., Clark, E. M., Koliba, C. J., Trinity, L., Zia, A., Langle-Chimal, O., Cheney, N., Shrum, T. R., Sellnow, T. L., Sellnow, D. D., & Smith, J. M. (2021). Why we need to account for human behavior and decision-making to effectively model the non-linear dynamics of livestock disease. Proceedings of the International Crisis and Risk Communication Conference, Volume 4 (pp. 23-28). Nicholson School of Communication and Media. https://doi.org/10.30658/icrcc.2021.06

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Type	Status	Year Published	NIFA Support Acknowledged
Conference Papers and	Accepted	2021	YES

Citation

Greene, B., Smith, J. M., Hiney, K., Cummings, J., & Kerr, S. (accepted). Youth biosecurity education community conversations [Abstract], 2021 Annual Meeting and Professional Improvement Conference, National Association of County Agricultural Agents, Philadelphia, PA.

Type	Status	Year Published	NIFA Support Acknowledged
Conference Papers and	Submitted	2021	YES

Citation

Edwards, A. L., Freihaut, R., Sellnow, T. L., Sellnow, D. D., Getchell, M. C., & Parrish, A. (submitted). Transforming an industry through engaged learning: Addressing failures in the swine industry's COVID-19 animal culling crisis. 107th Annual Convention of the National Communication Association, Seattle, WA.

Type	Status	Year Published	NIFA Support Acknowledged
Conference Papers and	Submitted	2021	YES

Citation

Soares, R., Jin, X., Spence, P., & Sellnow, T. L. (submitted). Interacting arguments in crisis communication: The influence of message convergence on risk and crisis communication. 107th Annual Convention of the National Communication Association, Seattle, WA.

Type	Status	Year Published	NIFA Support Acknowledged
Journal Articles	Published	2020	YES

Citation

Sheppard, R. J., Sellnow, T. L., Sellnow, D. D., Parrish, A. J., & Brand, J. D. (2020). Instructional crisis communication for an industry: Model and anti-model biosecurity standards for the prevention and control of Highly Pathogenic Avian Influenza. Journal of Applied Communications, 104(3), Article 7. https://doi.org/10.4148/1051-0834.2330 (based on Ronisha Sheppard's master's project)

Type	Status	Year Published	NIFA Support Acknowledged
Journal Articles	Published	2021	YES

Citation

Edwards, A. L., Sellnow, T. L., Sellnow, D. D., Iverson, J. Parrish, A., & Dritz, S. (2021). Communities of practice as purveyors of instructional communication during crises. Communication Education, 70(1): 49-70. https://doi.org/10.1080/03634523.2020.1802053

Type	Status	Year Published	NIFA Support Acknowledged
Journal Articles	Published	2020	YES

Citation

Tonsor, G. T., & Schulz, L. L. (2020). Will an incentive?compatible indemnity policy please stand up? Livestock producer willingness to self?protect. Transboundary and Emerging Diseases, 67(6): 2713-2730. https://doi.org/10.1111/tbed.13626

Type	Status	Year Published	NIFA Support Acknowledged
Journal Articles	Published	2021	YES

Citation

Lee, J., Schulz, L. L., & Tonsor, G. T. (2021). Swine producer willingness to pay for Tier 1 disease risk mitigation under multifaceted ambiguity. Agribusiness. https://doi.org/10.1002/agr.21694

Accession No. 1005877 **Project No. VT-0071CG**

Type	Status	Year Published	NIFA Support Acknowledged
Journal Articles	Published	2021	YES

Citation

McKendree, M. G. S., Tonsor, G. T., & Schulz, L. L. (2021). Management of multiple sources of risk in livestock production. Journal of Agricultural and Applied Economics, 53(1), 75-93. https://doi.org/10.1017/aae.2020.31

Type	Status	Year Published	NIFA Support Acknowledged
Journal Articles	Published	2021	YES

Citation

Mitchell, J. L., Tonsor, G. T., & Schulz, L. L. (2021). The market for traceability with applications to U.S. feeder cattle. European Review of Agricultural Economics, 48(3): 447-476. https://doi.org/10.1093/erae/jbaa027 (lead article and editor's choice)

Type	Status	Year Published	NIFA Support Acknowledged
Journal Articles	Published	2021	YES

Citation

Merrill, S. C., Trinity, L., Clark, E. M., Shrum, T. R., Koliba, C. J., Zia, A., Bucini, G., Sellnow, T. L., Sellnow, D. D., and Smith, J. M. (2021). Message delivery strategy influences willingness to comply with biosecurity. Frontiers in Veterinary Science, 8: Article 667265. https://doi.org/10.3389/fvets.2021.667265

Type	Status	Year Published	NIFA Support Acknowledged
Journal Articles	Published	2021	YES

Citation

Clark, E. M., S. C. Merrill, L. Trinity, G. Bucini, N. Cheney, O. Langle-Chimal, T. Shrum, C. Koliba, A. Zia, and J. M. Smith. (2021). Emulating agricultural disease management: Comparing risk preferences between industry professionals and online participants using experimental gaming simulations and paired lottery choice surveys. Frontiers in Veterinary Science, 7 Article 556668. https://doi.org/10.3389/fvets.2020.556668

Type	Status	Year Published	NIFA Support Acknowledged
Journal Articles	Awaiting Publication	2021	YES

Citation

Pudenz, C. C., Mitchell, J. L., Schulz, L. L., & Tonsor, G. T. (accepted). U.S. cattle producer adoption of Secure Beef Supply Plan enhanced biosecurity practices and foot-and-mouth disease preparedness. Frontiers in Veterinary Science. https://www.frontiersin.org/articles/10.3389/fvets.2021.660857/abstract

Type	Status	Year Published	NIFA Support Acknowledged
Journal Articles	Accepted	2021	YES

Citation

Higgins, L., & J. M. Smith. (accepted). Documenting development of interdisciplinary collaboration among researchers by visualizing connections. Research Evaluation

Type	Status	Year Published	NIFA Support Acknowledged
Journal Articles	Submitted	2021	YES

Citation

Zia, A., Delgado, A. H., Bucini, G., Merrill, S. C., Koliba, C., Del Rossi, G., Norby, B., & Smith, J. M. (submitted). Socio-psychological determinants of cattle producers' intent to comply with animal disease control measures: A structural equation modeling approach. PLOS One

Other Products

Product Type
Audio or Video

Description
Edited captions have been published with all video recordings of presentations from the 2019 Animal Disease Biosecurity Coordinated Agricultural Project symposium and workshop. These recordings and additional materials will be available on the project website for five years beyond the end of the funding period. The recordings are available at: https://agbiosecurityproject.org/2019-adbcap-symposium/video-gallery/

Product Type
Audio or Video

Description
To promote the Healthy Farms Healthy Agriculture (HFHA) website and resources, we hosted a number of Healthy Farms Healthy Agriculture Biosecurity Community Conversations over Zoom. We completed the first series of HFHA Community Conversations on mortality composting in late spring (2020). In the summer, we held a special One Health Community Conversation series bringing together plant, animal, and human health stakeholders to discuss commonalities in protecting health. In the fall, we held a Community Conversation series on youth biosecurity education, featuring the HFHA site, online biosecurity learning modules, and hands-on Science Creates Real Understanding of Biosecurity (SCRUB) activities. SCRUB kits materials have been ordered for use with youth in Arizona and Montana. Recordings are available on the Healthy Farms Healthy Agriculture YouTube channel: https://www.youtube.com/channel/UC16U_rL9dlU4y4AQ-WXIXCQ
•March 19 – Livestock Mortality Composting (recording not available)
•April 23 – Livestock Mortality Composting
•May 14 – On-Farm Mortality Composting on the High Plains
•July 14 – Cross-Pollinating Biosecurity I
•July 23 – Cross-Pollinating Biosecurity II
•October 1 – Youth Biosecurity Education I
•October 8 – Youth Biosecurity Education II
•October 15 – Youth Biosecurity Education III
•October 22 – Youth Biosecurity Education IV
•November 12 – Biosecurity and Zoonotic Disease Prevention

Product Type
Educational Aids or Curricula

Description
Revisions to the biosecurity learning modules are being published in summer 2021. The six online modules for youth (grades 6-12) cover: What is ‘Animal Biosecurity’ and Why Should I Care; Routes of Infection and Means of Transmission; Finding Sources of Disease Transmission Risk; Biosecurity Strategies; and Public Speaking for Biosecurity Advocates I and II. These highly interactive, problem- and evidence-based modules are available free of charge through the Healthy Farms Healthy Agriculture website and Wisc-Online. A comprehensive Teacher’s Guide provides: an overview of the biosecurity modules; correlation of the modules with the National FFA curriculum content standards; supplemental teaching ideas for each module; a bank of questions for homework and testing; an overview of jobs and careers where knowledge of biosecurity is an asset, if not a requirement; suggested community service and leadership opportunities for youth; and a list of other science-based biosecurity resources and teaching materials. Also a set of hands-on biosecurity learning activities and train-the-trainer videos have been published. These are known as SCRUB kits, short for “Science Creates Real Understanding of Biosecurity.” These are available at: https://www.healthyagriculture.org/training/youth-4h-ffa/biosecurity-learning-modules/scrub-biosecurity/

Product Type

Other

Description

Project leader Smith chaired an Animal Health Symposium during the ASAS-CSAS-WSASAS Virtual Annual Meeting on July 21, 2020. Collaborators Merrill, Schulz, Iverson, and Iverson (on behalf of McDonald) presented on project-related work. Presentations and our discussion with Industry Service Award recipient Jason Woodward were recorded. The citations for the published symposium presentation abstracts are listed separately.

Product Type

Other

Description

Presented a session to Vermont 4-H youth.
Koliba, C. J., & Merrill, S.C. (2020). Playing games to prevent diseases on farms: an introduction to the serious games and simulations of the SEGS Lab. QuaranTEEN Virtual Science Café, University of Vermont Extension. Recording available at: https://youtu.be/jTvvaaUotIQ

Product Type

Other

Description

Presented a guest lecture to an undergraduate course at the University of Vermont.
E. Clark, Bucini, G., Merrill, S. C., Zia, A., Koliba, C. J., Trinity, L., Wiltshire, S., & Smith, J. M. (2020, September 17). Biosecurity and herd health: digital tools for quantifying behavioral risk [Guest Lecture]. Introductory Animal Sciences, University of Vermont.

Changes/Problems

COVID restrictions went into effect just before the beginning of year 6; this diverted effort of PIs at KSU and ISU. We were unable to hold any in-person project team meetings. Progress on the risk communication book manuscript was temporarily suspended, but later completed. We postponed but anticipate data collection with a virtual reality experimental game if and when it can be conducted safely in regards to the COVID-19 pandemic. On the positive side, the publication of the online biosecurity series for youth gave teachers and parents free access to high quality internet-based educational resources.