

(b) (4)

March 13, 2023

Dr. Todd See  
North Carolina State University  
Department of Animal Science  
123 Polk Hall  
Campus Box 7621  
Raleigh, NC 27695-7621

Dear Dr. See,

On behalf of the (b) (4) I am writing to express our support of the collaborative National Pork Board project proposal *Enhancing Trust in Pork Production and Products through Strengthening Communications, Research, and Training*. Our association has long valued and sought to focus on communication and research geared towards consumer, societal, and pork production audiences. One of our greatest challenges is educating a public that is increasingly removed from the farm. Our industry is seeking new, highly trained subject matter experts and this joint effort will help fill that void. Using communication, research and training objectives to address sustainability, animal welfare, pork safety and consumer awareness of pork production will help the pork industry meet and address current and future consumer and societal concerns centered around the pork production system.

Further, we value the expertise current universities across the country bring to this effort. With faculty from North Carolina State University, Iowa State University, University of Minnesota, University of Georgia, North Carolina Agricultural and Technical State University, and others, you have compiled a consortium with expertise in all aspects of the pork industry as well as expertise in consumer and societal trends and communication with these audiences. This integrated approach targets producers, processors, retailers and consumers, incorporates training of students and future industry leaders, and it is critical for our industry's long-term success.

(b) (4) looks forward to working with you and the team to help ensure the success of this proposal.

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March 13, 2023

Re: Support of Real Pork Trust and Image Proposal from Iowa State University, North Carolina State University, North Carolina A&T State University, University of Minnesota, and University of Georgia

To Whom It May Concern:

(b) (4) supports the Real Pork Trust and Image strategy adopted by the National Pork Board to develop and share information in a credible, relevant way to resolve gaps in understanding about the pork industry and to enhance the reputation of pork and pork production.

I am writing in support of a proposal being submitted by a transdisciplinary and multi-institutional team from Iowa State University, North Carolina State University, North Carolina A&T State University, University of Minnesota, and University of Georgia.<sup>1</sup> This collective team of subject matter experts in communication, education, sociology, economics, pig welfare, environmental sustainability, health, nutrition, antimicrobial stewardship, pork products and pork production would provide a highly diverse, experienced and cross-disciplinary approach in addressing the issues we face as an industry.

We support their specific objectives to: 1) Create and share communications that break down producer, retailer, consumer and societal concerns into understandable and meaningful messaging to foster greater trust in U.S. pork production; 2) Identify, refine, and conduct scientific research to address gaps in consumer understanding of pork and pork production to enhance trust and sustainability; and 3) develop and implement strategies to support training and education of current and future industry and societal subject matter experts to better understand the U.S. pork industry in order to improve product trust and sustainability. Improved communications messaging, science-based solutions and data, and a future-ready workforce are all useful to our company.

If their proposal is successful, (b) (4) anticipates collaborating with this team and other U.S. industry partners across the pork supply chain by providing active guidance on an Advisory Board

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(b) (4) March 13, 2023

Dr. Todd See, Department Head and Professor  
Department of Animal Science  
North Carolina State University  
Campus Box 7621  
Raleigh NC 27695-7621

Dear Dr. See:

I am writing today to share my support of the proposal coming from the collaborative efforts of faculty teams from Iowa State University, NC State University, NC A&T State University, University of Minnesota, and University of Georgia in response to the National Pork Board's request for communication, research, and training to address consumer questions about pork and pork production.

This year, our family and team here at (b) (4)

(b) (4) we have been pork producers, partnering with local farmers to grow market animals for processors on the East Coast and in the Midwest. We know from these 40 years of experience, there are many questions from consumers across the country and the world about how we grow our pigs, the environmental and public health impacts of our pig farms, and even questions about the safety of some of the products coming from our farms. I am pleased that such a comprehensive effort is being put forth to focus on these types of questions from today's consumers and decision-makers.

The NC State University and NC A&T State University proposals to contribute to the communications and research objectives of this effort will bring much needed resources including a capable and diverse group of collaborators with knowledge and relevant experience to the Spectrum of Concerns as identified by the Pork Checkoff. We need an approach that is beyond just "telling our story;" an approach that is grounded in research with training that is science-backed. I am confident in your efforts in leading and contributing to the objectives of this *Real Pork Trust and Image Consortium*.

If there is any way we can be of assistance as this proposal moves forward, please feel to contact me.

Sincerely,

(b) (4), (b) (6)

(b) (4)

March 13, 2023

Dr. Nicholas K. Gabler  
John F. Patience Professor in Swine Nutrition  
Department of Animal Science  
Iowa State University  
Ames, IA 50011

Dear Dr. Gabler,

(b) (4) is pleased to express our support of the proposal "*Enhancing Trust in Pork Production and Products through Strengthening Communications, Research and Training*" being submitted for funding consideration by the National Pork Board.

As a global food company, (b) (4) has a mission to provide affordable, accessible and nutritious protein while driving food systems that are sustainable and equitable for all. In our role, we understand the importance of nurturing shared values and transparent, meaningful communication that promotes understanding and connection. We believe this strongly aligns to the proposal's overarching goal of fostering enduring trust in - and sustainability of - U.S. pork production.

Through the achievement of the project's objectives:

1. *Creating and sharing communications that break down producer, retailer, consumer and societal concerns into understandable and meaningful messaging to foster greater trust in U.S. pork production.*
2. *Identifying, refining, and conducting scientific research to address gaps in consumer understanding of pork and pork production to enhance trust and sustainability.*
3. *Development and implementation of strategies to support training and education of current and future industry and societal subject matter experts to better understand the U.S. pork industry to improve product trust and sustainability.*

stakeholders from across the industry will have a valuable framework to approach and tackle some of the industry's most challenging obstacles to achieving sustainable and responsible pork production.

In conclusion, (b) (4) is greatly appreciative of these efforts and strongly recommends the proposal "*Enhancing Trust in Pork Production and Products through Strengthening Communications, Research and Training*" for the National Pork Board grant.

Sincerely,

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(b) (4)

March 9, 2023

Nicholas Gabler  
Iowa State University  
201 Kildee Hall  
Department of Animal Science  
Ames, IA 50011

Dear Nick,

On behalf of (b) (4) we are excited to write a supporting letter of endorsement for your trans-disciplinary National Pork Board proposal entitled *“Enhancing trust in pork production and products through strengthening communications, research and training”*. As a large production company, customer and societal trust in our pork product is critical for success. Our company strives to improve communications and training that address the key spectrum of concerns the National Pork Board has identified. These include, but not limited to, environmental stewardship, pork safety, how our production system impacts our neighbors and pig welfare.

The consortium of communications and subject matter experts that you have assembled across multiple States should be effective in addressing your overarching goal of developing and integrating consumer, societal, environmental, and production issues to improve communication, student training, and initiate research to fill critical gaps is essential for the long-term success and sustainability of the U.S. pork industry. As a company, we are excited about the proposal and look forward to working with the products from it. This will help our company continue to build consumer trust in our product. If successfully funded, let us know how we can help.

Good luck with the application.

Sincerely,

(b) (4), (b) (6)

(b) (4)

Your collaborative proposal with faculty from Iowa State University, North Carolina State University, the University of Minnesota, the University of Georgia, North Carolina A & T and others, are all subject matter experts in their fields. (b) (4) are confident the team can deliver on the communications, research and training initiatives proposed. The integrated approaches you have outlined of communication, research and training will only build trust and confidence in the pork supply chain with retailers and consumers.

We strongly support this proposal, and please email me at (b) (4) if you have questions.

Respectfully,

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March 10, 2023

Drs. Nick Gabler and Elisabeth Huff Lonergan, PhD  
Department of Animal Science  
914 Stange Road  
Iowa State University  
Ames, Iowa 50011-1001

Dr. Gabler and Dr. Huff-Lonergan,

The (b) (4) is a broad-reaching organization of individuals that discovers, develops, and disseminates its collective meat science knowledge to provide leadership, education, and professional development. We strive to support meat science students and professionals by fostering a community of scientists, industry partners, thought leaders and other stakeholders who embrace this vision.

(b) (4) is pleased to support the proposal, “Enhancing Trust in Pork Production and Products through Strengthening Communications, Research, and Training” led by your team at Iowa State University along with North Carolina State, Georgia, and Minnesota; all universities who have members in (b) (4). These members and many others have unique expertise in education, economics, animal welfare, environmental sustainability, human nutrition, and the development and enhancement of pork products.

Through efforts already underway in education, outreach, and scientific meetings, (b) (4) will aid the project directors to connect with key subject matter experts in industry and academia to identify critical information to be used in consumer and business messaging. (b) (4) could provide training for industry representatives and subject matter experts to learn about pork marketing, harvest, processing, food safety, nutrition, product development, research, and quality. Many of these resources are well started, including materials from Pork 101 supported by the National Pork Board.

(b) (4) has a large and experienced group of technical experts that encompass professionals from industry, government, and academia. Importantly we also have a large body of student members from a growing number of institutions including land grants, junior and community colleges, historically black colleges, and Hispanic-serving. (b) (4) already works collaboratively with National Pork Board through meat quality and value task forces, pork composition and quality research and through the delivery of information via the Reciprocal Meat Conference.

(b) (4) has a process initiated in 2022 to identify key issues and needs for federal funding in meat quality and value-added research. We provide a forum for presentation of research by graduate students and exposure to the industry for students and instructors including meat production, equipment, ingredients, packaging, and services. I have more than 25 years of experience in the pork industry and would be very pleased to collaborate in an area of such importance.

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March 10, 2023

Drs. Nick Gabler and Elisabeth Huff Lonergan, PhD  
Department of Animal Science  
914 Stange Road  
Iowa State University  
Ames, Iowa 50011-1001

Dr. Gabler and Dr. Huff-Lonergan,

The (b) (4) has a mission of advancing animal welfare through the training and certification of auditors and audits. As such we seek ways to work collaboratively with industry, academia, and government to do so. Our constituents are audit companies/certifying bodies, livestock and meat production companies, and their customers.

(b) (4) is pleased to support the proposal, **“Enhancing Trust in Pork Production and Products through Strengthening Communications, Research, and Training”** led by your team at Iowa State University along with North Carolina State, Georgia, and Minnesota; most of whom have participants as auditors, instructors, or board members of (b) (4)

(b) (4) is well positioned to assist the project directors to connect with animal welfare, handling, and behavior experts and thought leaders from around the world. (b) (4) already provides training for pork processing and production facilities as two of our certification areas. (b) (4) is globally recognized and is well qualified to assist with creation and dissemination of important animal welfare information to consumers and the businesses that supply them with pork products.

(b) (4) has a long association with the National Pork Board through curriculum development projects and is currently creating material to improve the consistency and knowledge of pork welfare auditors. I have more than 25 years of experience in the pork industry and animal welfare and would be very pleased to collaborate on this project!

Sincerely,

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(b) (4)

March 8, 2023

Nicholas K. Gabler  
John F. Patience Professor in Swine Nutrition  
Iowa State University  
201 Kildee Hall, 806 Stange Road  
Ames, IA 50011

Dear Dr. Gabler:

Trust from consumers on the value of pork requires effective communication and leadership about the complex decisions that taken by all actors across the value chain to produce a wholesome product. Consumers are confronted with oversimplified facts, single issue-focused questions, and consumers tend to evaluate concerns surrounding pork products in a binary manner, while the reality is that pork production has evolved to adapt to social, environmental, and economic factors. Connecting consumers with producers through issues requires a multidisciplinary approach.

I look forward to funding of the project with title "Enhancing trust in pork production and products though strengthening communications, research and training". I believe that the objectives addressing concerns, scientific research to cover gaps, and training and education set forth will enhance communication and ultimately trust from consumers.

I look forward to the funding of this project.

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March 10, 2023

Dr. Nicholas K. Gabler  
John F. Patience Professor in Swine Nutrition  
Department of Animal Science  
201 Kildee Hall  
Iowa State University  
806 Stange Road  
Ames, Iowa, USA 50011

Nicholas,

I am writing this letter to express my enthusiasm to contribute to your project *“Enhancing Trust in Pork Production and Products through Strengthening Communications, Research and Training”*. Our team with the (b) (4) works across Universities, departments and partners with other agencies and commercial entities to serve the applied research, educational, and informational needs of the swine industry and its stakeholders. Through the (b) (4) swine producers receive accurate and timely information to make their operations more efficient, sustainable and profitable. (b) (4). Our outreach efforts have been extremely effective and have a national reach covering the majority of the swine industry stakeholders.

The proposed research and educational objectives listed in your proposal are in full alignment with (b) (4) mission. We would be happy to assist in the outreach efforts with multiple stakeholders of the swine industry as well as consumers. I am confident with the team you have assembled. I see an extremely high likelihood of accomplishing the proposed research & outreach goals. We look forward to collaborating with you on this project!

Sincerely,

(b) (4), (b) (6)

## 9. Curriculum Vitae

<b>Personnel</b>	<b>Institution/Organization</b>	<b>Subject Matter Area Expertise</b>
Jason Ross, Professor and Chair	Iowa State University	Swine reproduction and production, administration
Michael Retallick, Professor and Chair	Iowa State University	Ag Education and Communications, administration
Todd See, Professor and Head	North Carolina State University	Pork production, Science Communication, administration
Alexa Lamm, Professor	University of Georgia, Athens, GA	Science Communication
Jerry Shurson, Professor	University of Minnesota, St. Paul MN	Sustainability, life cycle analysis, swine nutrition
Dermott Hayes, Distinguished Professor	Iowa State University	Economics
Elisabeth Lonergan, Distinguished Professor	Iowa State University	Meat Science
Anna Johnson, Distinguished Professor	Iowa State University	Animal welfare
Locke Karriker, DVM, Distinguished Professor	Iowa State University	Swine medicine, pork production and extension, Director of SMEC
Christopher Rademacher, DVM, Professor	Iowa State University	Swine medicine, pork production and extension, Director of IPIC
Stacie Matchan	Iowa State University	Pork production and extension, ag communications
Shuyang Qu, Assistant Professor	Iowa State University	Ag Education and Communications
Fally Masambuka-Kanchewa, Assistant Professor	Iowa State University	Ag Education and Communications
Pedro Urriola, Associate Professor	University of Minnesota	Sustainability, life cycle analysis, swine nutrition
Eric Burrough, DVM, Professor	Iowa State University	Veterinary diagnostic & production animal medicine, enteric disease
Catherine Sanders, Assistant Professor	North Carolina State University	Communications
Mark Knauer, Associate Professor	North Carolina State University	Pork Production, State QPA coordinator
Monique Pairis-Garcia, Associate Professor	North Carolina State University	Animal welfare
Glen Almond, Professor	North Carolina State University	Swine Health, production and animal welfare
Billy Flowers, WNR Distinguished Professor	North Carolina State University	Swine reproduction, production and animal welfare
Suzanne Leonard, Asst. Professor & Ext. Specialist	North Carolina State University	Pork Production and Animal Welfare - PLF
Christian Maltecca, Professor & University Faculty Scholar	North Carolina State University	Genetics & genomics, data visualization, pork production

Mahmoud Sharara, Professor	North Carolina State University	Environmental health and air quality
Sid Thakur, Professor, Executive Director, Global One Health Academy	North Carolina State University	One Health and Antimicrobial resistance
Kelly Zering, Assoc. Head, Professor & Ext. Specialist	North Carolina State University	Pork Production & Environment, Economics
Brian Kerr, Section Leader USDA	USDA-ARS, Ames, IA	Swine nutrition and environment
Sarah Probst Miller, DVM	AgCreate Solutions Inc.	President and Creative Director, Ag Communications, concept learning
Derek Cobel, Assistant Professor	North Carolina Ag. & Tech. State University	Pork production, genetics, education

## NICHOLAS KURT GABLER

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### Degrees Held

Degree	Institution	Year
B. S. Agricultural Science	La Trobe University (Australia)	1999
Ph.D. Agricultural Science	La Trobe University (Australia)	2005

### Summary of Career Employment

2022-Present	<b>J.F. Patience Professor in Swine Nutrition</b> , Department of Animal Science, Iowa State University
2020-Present	<b>Director of Graduate Education and Associate Chair of Research</b> , Department of Animal Science, Iowa State University
2008- 2019	<b>Assistant-Associate Professor</b> , Department of Animal Science, Iowa State University
2005-2008	<b>Postdoctoral Research Associate</b> , Iowa State University
2004-2005	<b>Postdoctoral Research Associate</b> , Department of Animal Science, Purdue University

### Awards and Honors

2022	Growth and Development Research Award from the American Society of Animal Science
2021	Research Impact Award, COVID-19 Exceptional Effort Awards Program, Iowa State University
2021	President's Award, Iowa Pork Producer Association
2019	College of Agriculture and Life Sciences Mid-Career Research Excellence Award from Iowa State University
2015	Early Career Research Award from the Midwest American Society of Animal Science
2013	Iowa State University, College of Agriculture and Life Sciences Team research award
2011	Peter J. Reeds Young Investigator Award from the American Society of Nutrition

### Membership in Professional Societies

American Society of Animal Science (2004-present)

### Selected Grant Leadership roles

1. Gabler et al., (2009) The physiological basis of differences in efficiency, metabolism and energy partitioning between lines of pigs selected for residual feed. USDA-AFRI \$349,421 Role: Lead PI
2. Gabler et al., (2016) Investigation of porcine digestion, muscle and liver metabolism and mitochondria function in the face of immune challenge. USDA-AFRI \$499,972 Role: Lead PI
3. Patience, Gabler, et al., (2010) Enhancing sustainability and competitiveness of the U.S. pork industry by improving nutrient utilization and feed efficiency through innovative scientific and extension approaches. USDA-AFRI \$4,800,000 Role: co-PI, Objective lead
4. Baumgard, Gabler et al., (2010) The physiological impact of heat stress on pig metabolism and performance USDA-AFRI \$2,496,687 Role: co-PI, Objective lead
5. Ross, Gabler et al., (2018) An integrated approach to improve whole herd pig survivability. National Pork Board \$1,999,772 – Role-Lead PI Role: co-PI, Objective lead
6. Gabler et al., (2019) Stress Modulation Of Porcine Intestinal Epithelial Nutrient Transport And Metabolism. USDA-AFRI \$499,999 Role: Lead PI

### Selected Peer Reviewed Publications

1. De Mille C.M., E.R. Burrough, B.J. Kerr, W.P. Schweer and N.K. Gabler(2022) Dietary Pharmacological Zinc and Copper Enhances Voluntary Feed Intake of Nursery Pigs. *Front. Anim. Sci.* 3:874284. doi: 10.3389/fanim.2022.874284

2. Helm, E.T., J.F. Patience, M.R. Romoser, C.D. Johnson, J.W. Ross and N.K. Gabler (2021), Evaluation of increased fiber, decreased amino acids, or decreased electrolyte balance as dietary approaches to slow finishing pig growth rates, *J Anim Sci.* 99(7) doi:org/10.1093/jas/skab164
3. Helm, E.T., Burrough, E.R., Leite, F.L. and N.K. Gabler. Lawsonia intracellularis infected enterocytes lack sucrase-isomaltase which contributes to reduced pig digestive capacity. *Vet Res* 52, 90 (2021). <https://doi.org/10.1186/s13567-021-00958-2>
4. Helm, E.T., N.K. Gabler, E.R. Burrough (2021) Highly Fermentable Fiber Alters Fecal Microbiota and Mitigates Swine Dysentery Induced by Brachyspira hyodysenteriae. *Animals* (Basel) 11(2):396. doi:10.3390/ani11020396
5. Helm, E. T., J. W. Ross, J. F. Patience, S. M. Lonergan, E. Huff-Lonergan, L. L. Greiner, L. M. Reeve, C. W. Hastad, E. K. Arkfeld and N. K Gabler (2021) Nutritional approaches to slow late finishing pig growth: implications on carcass composition and pork quality, *Journal of Animal Science* 99(1) skaa368, doi: <https://doi.org/10.1093/jas/skaa368>
6. Helm, E. T., S. J. Lin, N. K Gabler, and E.R. Burrough. (2020). Brachyspira hyodysenteriae Infection Reduces Digestive Function but Not Intestinal Integrity in Growing Pigs While Disease Onset Can Be Mitigated by Reducing Insoluble Fiber. *Frontiers in Veterinary Science*, 7, 587926. <https://doi.org/10.3389/fvets.2020.587926>
7. Jasper, J. E., O. F. Mendoza, C. M. Shull, W. P. Schweer, K. J. Schwartz and N. K Gabler (2020) Dietary lysine to metabolizable energy ratio impacts pig performance during a viral challenge. *Journal of Animal Science* 98(4), kaa082, doi: <https://doi.org/10.1093/jas/skaa082>
8. Helm E. T., S. M. Curry, C. M. De Mille, W. P. Schweer, E. R. Burrough and N. K. Gabler NK (2020) Impact of viral disease hypophagia on pig jejunal function and integrity. *PloS One* 7;15(1):e0227265. doi: 10.1371/journal.pone.0227265
9. Helm, E. T., S. M. Curry, C. M. De Mille, W. P. Schweer, E. R. Burrough, E. A. Zuber, S. M. Lonergan and N. K. Gabler (2019) Impact of porcine reproductive and respiratory syndrome virus on muscle metabolism of growing pigs. *Journal of Animal Science* 97(8): 3213–3227. doi: 10.1093/jas/skz168.
10. Helm, E. T., S. Curry, J. M. Trachsel, M. Schroyen and N. K. Gabler (2019) Evaluating nursery pig responses to in-feed sub-therapeutic antibiotics. *PloS One* 14(4), e0216070. doi: 10.1371/journal.pone.0216070.
11. Gabler, N. K., A. Ramirez and W. P., Schweer (2019). Efficacy of dietary alternatives to growth promoting antibiotics. *AFMA Matrix*, 28(3), pp.39-43.
12. Burrough, E. R., C. De Mille, and N. K. Gabler (2019) Zinc overload in weaned pigs: tissue accumulation, pathology, and growth impacts. *Journal of Veterinary Diagnostic Investigation*, doi: 1040638719852144.
13. Colpoys, J., D. Van Sambeek, C. Bruns, A. Johnson, J. Dekkers, F. Dunshea, N. Gabler (2019) Responsiveness of swine divergently selected for feed efficiency to exogenous adrenocorticotrophic hormone and glucose challenges. *Domestic Animal Endocrinology* 68: 32-38, doi: <https://doi.org/10.1016/j.domaniend.2018.12.007>.
14. Schweer WP, J. F. Patience, E. R. Burrough, B. J. Kerr BJ, and N. K. Gabler. (2018) Impact of PRRSV infection and dietary soybean meal on ileal amino acid digestibility and endogenous amino acid losses in growing pigs. *Journal of Animal Science* 96(5):1846-1859. doi: 10.1093/jas/sky093.
15. Pearce, S. C., V. Mani, R. L. Boddicker, J. S. Johnson, T. E. Weber, J. W. Ross, R. P. Rhoads, L. H. Baumgard, and N. K. Gabler. (2013) Heat Stress Reduces Intestinal Barrier Integrity and Favors Intestinal Glucose Transport in Growing Pigs. *PloS One* 8: e70215.
16. Mani, V., J. H. Hollis, and N. K. Gabler. (2013) Dietary oil composition differentially modulates intestinal endotoxin transport and postprandial endotoxemia. *Nutrition & Metabolism* (Lond) 10: 6.
17. Gabler, N.K., J.D. Spencer, D.M. Webel and M.E. Spurlock. (2007) *In Utero* and Postnatal Exposure to Long Chain n-3 Polyunsaturated Fatty Acids Enhances Intestinal Glucose Absorption and Energy Stores in Weanling Pigs. *The Journal of Nutrition* 137(11): 2351-2358.

## Biographical Sketch: Jason W. Ross

### Personal Statement:

I am a swine reproductive physiologist and currently serve as the Chair of the department of Animal Science at Iowa State University. Prior to this role, I served as the Director of the Iowa Pork Industry Center (IPIC) for almost 7 years. My specific roles in this project will be to provide administrative support for the principal investigators as they work across departments, colleges, universities and organizations, to ensure overall project progress and success. My current and prior experiences will provide this team exceptional support across the project objectives. Having a track record of facilitating and enabling a consortia focused approach to achieve a common vision requires exceptional communication, accountability, and participation by large groups. My experiences with the Pig Livability consortium ([www.piglivability.org](http://www.piglivability.org)) will be leveraged to the advantage of this team. Further, I will seek opportunities for the Pig Livability consortium to engage and create synergistic outcomes with this group as some areas are prime for cooperation (i.e. the research and farm practices being adopted which focus on pig health and well-being). I am confident that this multidisciplinary team has a solid research, extension and training approach that will enable true impact on behalf of the pork industry and should be expected to create measurable impact.

### Education/Training:

<u>Institution and Location</u>	<u>Degree</u>	<u>Year</u>	<u>Field of Study</u>
Iowa State University	B. Sc.	2000	Animal Science
Oklahoma State University	M. Sc.	2003	Reproductive Physiology
Oklahoma State University	Ph.D.	2006	Reproductive Physiology
University of Missouri	Postdoc	2008	Reproductive Physiology

### Employment History:

<b>2022-Present</b>	Chair, Department of Animal Science, Iowa State University
<b>2019- Present</b>	Professor, Department of Animal Science, Iowa State University
<b>2014-Present</b>	Lloyd L. Anderson Professor in Physiology, Iowa State University
<b>2015-2022</b>	Director of the Iowa Pork Industry Center, Iowa State University
<b>2014-2019</b>	Associate Professor, Department of Animal Science, Iowa State University
<b>2008-2014</b>	Assistant Professor, Department of Animal Science, Iowa State University

### Selected Honors and Awards

2023	Iowa State University College of Agriculture and Life Sciences Outstanding Achievement in Extension Award.
2015	Iowa State University Early Achievement in Research Award
2014	Inaugural holder of the Lloyd L. Anderson Professorship in Physiology
2014	Recipient of the American Society of Animal Science Early Career Achievement Award
2012	Iowa State University College of Agriculture and Life Sciences Early Achievement in Research Award.
2006-2007	Food for the 21 <sup>st</sup> Century Postdoctoral Fellowship, Department of Animal Science, University of Missouri



## **Previous Accomplishments, Related Research Activities and Publications:**

1. Developed and currently lead the Pig Livability consortium funded by the National Pork Board and Leading National Pork Board Funded project focused on identification of putative factors contributing to pelvic organ prolapse in sows.
2. Have led or co-led multiple national and international conferences focused on the swine industry.
3. Led a national effort through the Iowa Pork Industry Center to support pork producers during the COVID-19 pandemic.
4. Completed applied research projects with industry partnerships across the United States related to gilt development and selection strategies, seasonal infertility, and utilization of arginine during gestation to influence reproductive performance of sows and piglet growth and survival.
5. Have provided national leadership in the area of Pelvic Organ Prolapse research for the benefit of the pork industry.
6. Served as Director of the IPIC for seven years leading the swine extension and outreach efforts and facilitating industry and academic collaborations.
7. Career program funding exceeding *\$21 Million (>\$6 Million as Principal Investigator)* for swine related research by commodity groups, federal agencies, and companies.
8. Published more than 128 peer reviewed manuscripts, book chapters and invited reviews along with 175 abstracts presented at scientific meetings, and more than 80 invited presentations across the globe.

# Michael S. Retallick

## Curriculum Vita

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### EDUCATION

Doctor of Philosophy	<b>Iowa State University</b> Agricultural Education	May, 2005
Master's Degree	<b>Kansas State University</b> Master of Agribusiness (MAB)	December, 2002
Bachelor of Science	<b>University of Wisconsin - Platteville</b> Agricultural Education	May, 1993

### Certifications and Specializations

*Lead21*, Association of Public and Land-grant Universities, 2015-16  
*Experiential Education Academy Certification*, National Society for Experiential Education *Affiliate Professor*,  
CASE (Curriculum for Agricultural Science Education) Curriculum  
*Certified Teacher*, Introduction to Agriculture, Food, and Natural Resources, CASE  
*Teacher License*, Agriculture Endorsement, Grades 7-12, Folder Number 319228, State of Iowa  
*Community College Teaching Certificate*, Iowa State University

### PROFESSIONAL EXPERIENCE

2016 to Present	Professor Agricultural Education and Department Chair, Iowa State University.
2005 to 2017	Science With Practice, Director
2012 to 2016	Associate Professor, Iowa State University.
2006 to 2012	Assistant Professor & Director of Undergraduate Programs, Iowa State University.
2001 to 2006	Academic Advising and Undergraduate Admissions, Coordinator, Iowa State University
1993 – 2001	Agricultural Education Instructor and FFA Advisor Maquoketa Community Schools, IA.

### SUMMARY OF TEACHING AND ACADEMIC ADVISING

Teaching (Courses recently taught or currently teaching since last review)

- AgEdS 116 Initial Field Experience in Agricultural Education
- AgEdS 211 Early Field Experience
- AgEdS 312 Science With Practice
- AgEdS 417 Supervised Teaching in Agricultural Education Programs
- AgEdS 550 Foundations of Agricultural Education
- AgEdS 520 Instructional Methods for Adult and Higher Education in Agriculture

Academic Advising

- Advise approximately 25 undergraduates per semester

Service to Graduate Student Research (Committee Service Completed)

- Committee Member – 82
- Major Professor, M.S. and M. of Professional Agriculture - 63
- Major Professor, Ph.D. - 9

## **SUMMARY OF SCHOLARLY PUBLICATIONS AND PRESENTATIONS**

- Refereed Journal Articles - 44
- Refereed Papers, Abstracts, and Presentations - 58
- Refereed Poster Presentations - 59
- Book Chapters -1
- Edited Conference Proceedings -3
- Non-Refereed Publications, Articles, and Posters - 44
- Invited Presentations - 92
- Professional Training and Workshops Conducted - 36

## **SUMMARY OF GRANTS AND PROJECT FUNDING**

- *Science With Practice funding (Actual Expenditures)* - \$876,331
- *Internal funding* - \$72,378
- *External funding* - \$1,188,862 directly attributed to grants totaling \$4,379,883

## **SELECTED SERVICE AND OUTREACH**

- Iowa State University Agricultural Endowment Board, Trustee, 2017-Present
- Iowa State University Faculty Senate, Senator representing AgEdS, 2015-2018
- *ISU CALS Animal Science Department Chair Search Committee*, Chair, 2019
- *ISU CALS Dean's Global Advisory Committee*, Inaugural member, 2014 -Present
- Iowa Council on Agricultural Education, Governor Appointed, 2017-2020
- Association of Career and Technical Education Research, President, 2013-2014
- CASE, Executive Board, 2015-2017
- APLU ESCOP, Social Sciences Subcommittee, 2012-2017, Chair, 2017 and 2018
- The National Council for Agricultural Education, SAE For All, Steering and Oversight Committee, 2016-2018
- American Association of Agricultural Educators
  - National Conference Host, Committee Chair, 2019
  - Teacher Education Caucus Inaugural Planning Committee, 2014
  - Research Conference Chair, 2013
- Indian Hills Community College, Ag Advisory Committee Member, 2005-Present
- Des Moines Area Community College, Agri-Business Advisory Committee, 2003-Present
- Roland-Story Community School District, School Board Director, 2011-2019
  - President, 2014-2017

## **SELECT AWARDS, HONORS AND RECOGNITION**

- *Distinguished Alumni Award*, University of Wisconsin – Platteville, 2019
- *Fellow*, American Association of Agricultural Educators, 2019
- *Distinguished Serve Award*, Association Career and Technical Education Research, 2017
- First Runner-up Journal Article of the Year, Volume 55. *Journal of Agricultural Education*, 56(4), 123-137. doi: 10.5032/jae.2015.04137
- *Teacher Mentor Award*, Region III, National Association of Agricultural Educators, 2015
- *Teacher Mentor Award*, Iowa Association of Agricultural Educators, 2015
- *Distinguished Service Award*, Iowa FFA Association, 2015
- First Runner-up Journal Article of the Year, Volume 54. *Journal of Agricultural Education*, 55(5), 207-221. doi: 10.5032/jae.2014.05207
- *AgOnline 2014 Teacher of the Year*, ISU Brenton Center for Agricultural Instruction and Technology Transfer, 2014

# Miles Todd See

Head and Professor  
Department of Animal Science  
Interim Director  
Animal and Poultry Waste Management Center

(b) (6)  
Raleigh, NC 27610  
(b) (6)  
(b) (6) (cell)

North Carolina State University  
Campus Box 7621; Raleigh NC 27695-7621  
919-515-2755; 919-515-6316 FAX  
[tsee@ncsu.edu](mailto:tsee@ncsu.edu)

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## EDUCATION

December 1992      Doctor of Philosophy, University of Georgia, Athens, GA  
Major: Animal and Dairy Science  
March 1990      Master of Science, University of Georgia, Athens, GA  
Major: Animal and Dairy Science  
June 1987      Bachelor of Science, Michigan State University, East Lansing, MI  
Major: Animal Science

## PROFESSIONAL EXPERIENCE

January 2010 – present      Professor and Head, Department of Animal Science, NCSU  
July 2008 – December 2009      Interim Department Head, Professor, Extension Swine Specialist and Swine Commodity Coordinator, Department of Animal Science, NCSU  
January 2019 – present      Interim Director, Animal and Poultry Waste Management Center, College of Agriculture and Life Sciences, NCSU  
July 2004 - June 2008      Professor, Extension Swine Specialist and Swine Commodity Coordinator, Department of Animal Science, NCSU  
July 1998 – June 2004      Associate Professor, Extension Swine Specialist and Swine Commodity Coordinator, Department of Animal Science, NCSU  
November 1992 – June 1998      Assistant Professor and Extension Swine Specialist  
Department of Animal Science, NCSU

## SELECTED AWARDS

Fellow, American Society of Animal Science - 2002  
Extension Award, American Society of Animal Science Southern Section - 2010  
Swine Industry Award for Innovation, ASAS, Midwestern Section – 2010 & 2003  
Outstanding Extension Service Award, North Carolina State University - 2009  
Academy of Outstanding Faculty Engaged in Extension, North Carolina State University - 2009  
Lois G. Britt Service to the N.C. Pork Industry Award, NC Pork Council - 2006  
Pork Checkoff Service Award, National Pork Board - 2005  
Distinguished Service Award, National Swine Improvement Federation - 2004  
National Pork Board Fellowship, National Pork Board - 2004  
Outstanding Young Animal Scientist – Education, ASAS Southern Section - 2004  
Swine Industry Award for Innovation, ASAS, Southern Section – 1997 & 1995

## SELECTED LEADERSHIP ROLES

Board of Directors, U.S. Pork Center of Excellence (2021-present)  
Board of Directors (Ex-officio), North Carolina Pork Council (2002 - present)  
Curriculum Committee for Swine Online Program, U.S. Pork Center of Excellence (2007 - present)  
Associate Editor Journal of Animal Science and Biotechnology (2014 - 2022)  
Strategic Planning Committee, U.S. Pork Center of Excellence (2021)  
Animal Mortality Task Force, National Pork Board (2021)  
Delegate, National Pork Industry Forum (2007-2011, 2020)

Animal Science Committee, National Pork Board (2004 - 2006, 2011 - 2020)  
 Genetic Advisory Committee, National Swine Registry (1996 - 2020) (Chair 2014 - 2020)  
 Workforce Task Force, National Pork Board (2019)  
 Budget Planning Task Force, National Pork Board (2015 - 2019)  
 Lead Editor, Pork Information Gateway, U.S. Pork Center of Excellence (2004 - 2018)  
 Pork Quality Assurance Task Force, National Pork Board (2011 - 2014)  
 Swine Educators Executive Committee, National Pork Board (1996 – 2008, 2010 – 2013)

**REFEREED PUBLICATIONS AND BOOKS (Selected from a total of 84)**

Trivedi, S., J.C. Clark, D. Deprospero, K. Royal, **M.T. See**. 2021 A novel career development course for animal science students pursuing veterinary college admissions. *Trans. Anim. Sci.* 5(3) <https://doi.org/10.1093/tas/txab106>

Trivedi, S., J.C. Clark, **M.T. See**. 2021. Veterinary Professions Advising Center: an innovative approach to pre-veterinary advising for Animal Science students. *Trans. Anim. Sci.* 5(2) <https://doi.org/10.1093/tas/txab064>

Knauer, M.T., J.P. Cassady, D.W. Newcom, and **M.T. See**. 2012. Gilt development traits associated with genetic line, diet and fertility. *Livestock Sci.* 148(1-2):159-167.

Oh, S.H. and **M. T. See**. 2012. Pork preference for consumers in China, Japan and South Korea. *Asian-Aust. J. Anim. Sci.* 25(1):143-150.

Holt, J. P., van Heugten, E., Graves, A. K., **M.T. See** and W.E.M. Morrow. 2011. Growth performance and antibiotic tolerance patterns of nursery and finishing pigs fed growth-promoting levels of antibiotics. *Livestock Sci.*, 136(2-3), 184-191.

Yoder, C. L., Maltecca, C., Cassady, J. P., Flowers, W. L., S. Price, **M.T. See**. 2011. Breed differences in pig temperament scores during a performance test and their phenotypic relationship with performance. *Livestock Sci.*, 136(2-3), 93-101

Fix, J.S., J.P. Cassady, E. van Heugten, D.J. Hanson, and **M.T. See**. 2010. Differences in lean growth performance of pigs sampled from 1980 and 2005 commercial swine fed 1980 and 2005 representative feeding programs. *Livestock Sci.* 128:108-114.

**INVITED PRESENTATIONS (Selected from a total of 125)**

**See, M.T.** 2021. Structure and recent trends in the U.S. and NC. State swine industry. International Workshop on Swine Production, Jinju, South Korea. October 15, 2021.

**See, M.T.** 2019, Future Programs in Animal Science. Proceedings of 3rd International Symposium on Immunology and Biotechnology. Seoul National University, pp 129-141.

**See, M.T.** 2016. Education research and technology transfer to support world class pork production. September 27, 2016. Institute of Animal Husbandry and Veterinary Science. Shanghai, China.

**121 Contributed Presentations; 387 Other Publications;**

**TEACHING RESPONSIBILITIES**

Science, Policy and Public Perception in Animal Agriculture	3 credits
Animal Science Seminar	1 credit
Animal Science Practicum – NCPC Communicators Fellows	2 credits

**ONGOING RESEARCH SUPPORT**

NC Pork Council	See (PI)	\$50,000	12/15/2021 through 12/14/2023
Training Graduate Students and Addressing Identified Pork Industry Needs through Research Synthesis and Communication			
Golden Leaf Foundation	Ivy (PI)	\$989,419	01/01/2021 through 12/31/2025
Answering the Call from Rural NC: The Agricultural Institute and the Food Animal Industry. Role co-PI			
USDA-NRCS	See (PI)	\$96,000	07/22/2020 through 12/31/2023
Pork Production 101 Handbook			
USDA NIFA	Park (PI)	\$238,500	11/15/2018 through 11/14/2023
Interdisciplinary Doctoral Education Program in Animal Production from Renewable Forest Resources.			

## **Alexa J. Lamm, Ph.D.**

Professor, Department of Agricultural Leadership, Education and Communication  
College of Agricultural and Environmental Sciences, University of Georgia  
132 Four Towers, Athens, GA 30602  
706-542-5598 office | 706-542-0262 fax | [alamm@uga.edu](mailto:alamm@uga.edu)  
ORCID: 0000-0003-1999-8803

### **Research Interests**

My research focuses on the social psychology of decision-making related to the adoption of agricultural science and technology. My research goal is to identify the most effective ways to communicate about agricultural and environmental science with stakeholders and the public.

### **Education and Training**

2011 Ph.D., Agricultural Education and Communication, University of Florida 2000  
M.A., Extension Education, Colorado State University  
1999 B. S., Animal & Equine Science, Colorado State University

### **Professional Experience**

7/2022 – present Professor, Department of Agricultural Leadership, Education and Communication (ALEC Department), University of Georgia  
7/2019 – 6/2022 Associate Professor, ALEC Department, University of Georgia  
6/2018 – 6/2019 Extension Evaluation Specialist & Associate Professor, ALEC Department, University of Georgia  
7/2013 – 6/2018 Associate Director, UF/IFAS Center for Public Issues Education  
7/2017 – 6/2018 Associate Professor, Department of Agricultural Education and Communication, University of Florida  
7/2012 – 6/2017 Assistant Professor, Department of Agricultural Education and Communication, University of Florida  
5/2011 – 7/2013 Director, National Public Policy and Evaluation Center, University of Florida 5/2000 – 7/2008 Agricultural/4-H Extension Agent, Colorado State University

### **Selected Relevant Courses Taught**

AGCM 8700 – *Communicating Agricultural and Environmental Science Innovation* Communicating with other scientists, decision makers and the public about scientific innovation. AGCM 8710 – *Agricultural and Environmental Science Communication Theory*  
Application of communication theory to agricultural and environmental science research. AEC 6552 - *Evaluating Programs in Extension Education*  
Application of evaluation strategies and data analysis in the social sciences. AEC 4500 - *Program Development and Evaluation*  
Theory and strategy of non-formal educational program development.

### **Selected Professional Activities**

Executive Editor, *Journal of International Agricultural and Extension Education*, 2018 – 2022 National Research Chair, American Association for Agricultural Education, 2018 – 2019 LEAD21, Class 8, Leadership for the 21<sup>st</sup> century, 2012-2013

### **Selected Honors and Awards**

2020, Borlaug CAST Communication Award

2020, *Water* Editor's Choice Article

2019, Distinguished Researcher Award, American Association for Agricultural Education 2018,

Fellow Award, Association for International Agricultural and Extension Education 2017,

Distinguished Article, *Journal of International Agricultural and Extension Education* 2017,

Journal Article of the Year, *Journal of Applied Communications*

2014, Top 40 Under 40 in Agriculture Honoree, Vance Publishing

### **Synergistic Activities**

Developed and distributed a survey and conducted two focus groups with specialty crop producers to identify their soilless substrate needs. USDA NIFA Award No. 2020-00337.

Established baseline United States public opinions regarding the use of novel therapies to treat citrus greening. USDA NIFA Award No. 2015-70016-23028 [www.citrussolutions.org](http://www.citrussolutions.org) Conducted 24 interviews with nursery and greenhouse growers throughout the United States to identify opportunities and challenges associated with water conservation and treatment technology adoption. SCRI-Water3 Award #2014-51181-22372 [www.cleanwater3.org](http://www.cleanwater3.org)

Conducted 10 focus groups to determine public latitudes of acceptance associated with specialty crop genetic modification. USDA NIFA Award No. 2015-70016-23028

Developed and distributed a national survey of specialty crop producers to identify pathways for educating and communicating about emerging water conservation and treatment technologies. SCRI-Water3 Award #2014-51181-22372 [www.cleanwater3.org](http://www.cleanwater3.org)

### **Recent Relevant Refereed Publications**

Gibson, K., Lamm, A. J., Masambuka-Kanchewa, F., Fisher, P. R., & Gomez, C. (2020). Identifying indoor plant propagation research and education needs of specialty crop growers. *HortTechnology*, 30(4), 519 - 527. <https://doi.org/10.21273/HORTTECH04622-20>

Lamm, A. J., Lamm, K. W., Rumble, J. N., Ellis, J. D., & Tidwell, A. S. D. (2020). Testing a model to explain how the public makes decisions about genetic modification. *Journal of International Agricultural and Extension Education*, 27(1), 47 - 63. <https://doi.org/10.5191/jiaee.2020.27104>

Ruth, T. K., Rumble, J. N., Lamm, A. J., & Ellis, J. D. (2020). How consumers process complex information related to food biotechnology: A case of citrus greening. *Journal of Food Products Marketing*, 26(2), 103 - 122. <https://doi.org/10.1080/10454446.2020.1736227>

Lamm, A. J., Warner, L. A., Tidwell, A. S. D., Lamm, K. W., White, S. A. & Fisher, P. (2019). Testing an adoption decision-making model of nursery and greenhouse growers' water reuse in the United States. *Water*, 11, 2470. <https://doi.org/10.339/w11122470>

### **Recent and Relevant Grants (\$43,440,940 Total Grant Value).**

Lamm, A. J., Key Personnel. (2018 - 2023). USDA/NIFA CAP. A cover crop network for enhancing sustainability of U.S. cropping systems. \$9,890,000

Lamm, A. J., Co-PI. (2015 - 2020). USDA Specialty Crop Research Initiative. Developing an Infrastructure and product test pipeline to deliver novel therapies for citrus greening disease. \$9,999,042

Lamm, A. J., Co-PI. (2014 - 2019). USDA/NIFA CAP. Clean Water3 - Reduce, remediate, recycle – Enhancing alternative water resources availability. \$8,734,105

## Gerald Carlyle Shurson

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Department of Animal Science, 335d AnSci/Vet Med Bldg., 1988 Fitch Ave.

University of Minnesota, St. Paul, MN 55108

Campus phone: (612) 624-2764

Cell phone : (612) 282-3008

E-mail: shurs001@umn.edu

### Professional Preparation

1986 Ph.D. Michigan State University Major: Animal Science – Swine Nutrition

1983 M.S. Michigan State University Major: Animal Science – Swine Nutrition

1981 B.S. University of Minnesota Major: Animal Science & Ag. Economics

### Appointments

1998-present Professor, Department of Animal Science, University of Minnesota

1998-01 Swine Center Director, University of Minnesota

1992-98 Associate Professor, Department of Animal Science, University of Minnesota

1990-92 Assistant Professor, Department of Animal Science, University of Minnesota

1986-90 Assistant Professor, Department of Animal Science, Ohio State University

### Selected publications - h-index = 35; 4,649 citations

Shurson, G.C., P.E. Urriola, and Y.-T. Hung. 2022. Too much of a good thing: Rethinking feed formulation and feeding practices for zinc in swine diets to achieve One health and environmental sustainability. *Animals* 12:3374. <https://doi.org/10.3390/ani12233374>

Dou, Z., J.D. Toth, D.W. Pitta, J.S. Bender, M.L. Hennessy, B. Vecchiarelli, N. Indugu, T. Chen, Y. Li, R. Sherman, J. Deutsch, B. Hu, G.C. Shurson, B. Parsons, and L. Baker. 2022. Proof of concept for developing novel feeds for cattle from wasted food and crop biomass to enhance agri-food system efficiency. *Scientific Reports* 12:13630 <https://doi.org/10.1038/s41598-022-17812-w>

Shurson, G.C., R.E.O. Pelton, Z. Yang, P.E. Urriola, and J. Schmitt. 2022. Environmental impacts of eco-nutrition swine feeding programs in spatially explicit geographic regions of the United States. *J. Anim. Sci.* <https://doi.org/10.1093/jas/skac356>

Shurson, G.C., and P.E. Urriola. 2022. Invited review: Sustainable swine feeding programs require the convergence of circular agriculture and food systems with One Health. *Animal Frontiers* 12:30-40. <https://doi.org/10.1093/af/vfac077>



- Shurson, G.C., P.E. Urriola, and Y.-T. Hung. 2022. Too much of a good thing: Rethinking feed formulation and feeding practices for zinc in swine diets to achieve One health and environmental sustainability. *Animals* 12:3374. <https://doi.org/10.3390/ani12233374>
- Shurson, G.C., P.E. Urriola, and J.L.G. van de Ligt. 2021. Can we effectively manage parasites, prions, and pathogens in the global feed industry to achieve One Health? *Transbound. Emerg. Dis.* 1-27. <https://doi.org/10.1111/tbed.14205>
- Barnharst, T., X. Sun, A. Rajendran, P. Urriola, G. Shurson, and B. Hu. 2021. Enhanced protein and amino acids of corn ethanol co-product by *Mucor indicus* and *Rhizopus oryzae*. *Bioprocess and Biosystems Engineering* <https://doi.org/10.1007/s00449-021-02580-0>
- Sun, X., D. Devi, P. Urriola, D. Tiffany, J.-C. Jang, G. Shurson, and B. Hu. 2021. Feeding value improvement of corn ethanol co-product and soybean hull by fungal fermentation: fiber degradation and digestibility improvement. *Food and Bioproducts Processing* <https://doi.org/10.1016/j.fbp.2021.09.013>
- Sun, X., Y. Chen, L. Luo, F. Heidari, D. Tiffany, P. Urriola, G. Shurson, and B. Hu. 2021. Feeding value improvement of corn ethanol co-product and agro-industrial residues by *Rhizopus oryzae*. *Process Biochemistry* 111:144-153. <https://doi.org/10.1016/j.procbio.2021.10.029>
- Sun, X., D. Tiffany, P. Urriola, G. Shurson, and B. Hu. 2021. Nutrition upgrading of corn ethanol co-product by fungal fermentation: amino acids enrichment and anti-nutritional factors degradation. *Food and Bioproducts Processing* 130:1-13. <https://doi.org/10.1016/j.fbp.2021.09.004>
- Baltensperger, D, M. Manojit, Z. Dou, S. Flis, D. Galligan, M. Matlock, C. Morgan, D. Reed, C.W. Rice, G. Shurson, J.M. Tricarico, A. Thomson, A.M. Thompson, J.A. Thomasson, and J. Yu. 2021. The Role of Agriculture Science and Technology in Climate 21 Project Implementation. Council for Agricultural Science and Technology, Commentary QTA2021-1, Ames, IA, USA.
- Shurson, G.C., A. Palowski, J.L.G. van de Ligt, D.C. Schroeder, C. Balestreri, P.E. Urriola, and F. Sampedro. 2021. New perspectives for evaluating relative risks of African swine fever virus contamination in global feed ingredient supply chains. *Transbound. Emerg. Dis.* 2021:1-26. doi: 10.1111/tbed.14174
- Shurson, G.C. 2020. "What a waste" – Can we improve sustainability of food animal production systems by recycling food waste streams into animal feed in an era of health, climate, and economic crises? *Sustainability* 12:7071. doi:10.3390/su12177071
- Fung, L., P.E. Urriola, and G.C. Shurson. 2019. Energy, amino acid, and phosphorus digestibility of thermally-treated food waste sources for swine. *Transl. Anim. Sci.* 3:676-691. <https://doi.org/10.1093/tas/txz028>
- Fung, L., P.E. Urriola, L. Baker, and G.C. Shurson. 2019. Estimated energy and nutrient composition of different food waste sources and their potential for use in sustainable swine feeding programs. *Trans. Anim. Sci.* 3:143-152. doi.org/10.1093/tas/txy099

**Dermot J. Hayes**

**Pioneer Chair in Agribusiness**

**Charles F. Curtiss Distinguished Professor in Agriculture and Life Sciences**

**Iowa State University**

**Ames, IA 50010-9802**

**Work: (515) 294-6185**

**Home: (b) (6)**

**EDUCATION:**

UNIVERSITY OF CALIFORNIA, BERKELEY

Ph.D., 1986

Major Field: International Trade

Minor: Comparative Economic Systems

UNIVERSITY OF CALIFORNIA, BERKELEY

Masters in Agricultural Economics, June 1982

Fields: Econometrics, Economic Theory

UNIVERSITY COLLEGE, DUBLIN

First Class Honors in Agricultural Economics, June 1981

**AWARDS:**

Awarded the Title of 2023 “Honorary Master Pork Producer” by the Iowa Pork Producers Association for research done on US Free Trade Agreements

Deans Citation for Extraordinary Contributions to the College of Agriculture and Life Sciences ISU. Fall 2020

Certificate of Distinction for exemplary service as a faculty mentor from Iowa State University. Fall 2020

Winner of the Agricultural & Applied Economics Association’s Bruce Gardner Memorial Prize for Applied Policy Analysis Award for “The Impact of the 2018 Trade Disruptions on the Iowa Economy.”

Best Paper Award in Applied Risk Analysis, AAEA Applied Risk Analysis Section. “Reference-Dependent Hedging: Theory and Evidence from Iowa Corn Producers,” by Keri L. Jacobs, Ziran Li, and Dermot J. Hayes; American Journal of Agricultural Economics, Vol. 100, Issue 5, 1 October 2018

Outstanding European Review of Agricultural Economics Journal Article Award for 2016 “Intellectual property in plant breeding: comparing different levels and forms of protection by Sergio H. Lence; Dermot J. Hayes; Julian M. Alston; John Stephen C. Smith.

Awarded the Charles F. Curtiss Distinguished Professor in Agriculture and Life Sciences 2017.

2007 Fellow of the American Agricultural Economics Association.

Recipient of 2006 AAEA Publication of Enduring Quality Award for “Valuing Food Safety in Experimental Auction Markets” *American Journal of Agricultural Economics*, 1995 by Dermot Hayes, Jason Shogren, Seung-Youl Shin, and James Kliebenstein.

Recipient of the 2005 ISU J. H. Ellis Award for Excellence in Undergraduate Introductory Teaching, a University level award for excellence in teaching undergraduate introductory classes.

Listed as an outstanding Faculty Member for 2005, 2004, 2003, 2002, 2001.

2000 by the ISU Pan-Hellenic Council and the Inter-fraternity Council  
2003 VEISHA Faculty Member of the Year for the College of Agriculture.

Listed in the 4<sup>th</sup> Edition of *Who's Who in Economics* as one of top 6% of the most cited economists for work published from 1990 to 2000

Approximately 16,000 citations on Google Scholar. !10 index 133, H-index 52.

Ranked number 15 worldwide among those who self-selected as an Agricultural Economist on Google scholar.

Listed by REPEC as among the top 2% of all economists for citations between 1986 and 2023, ranked first among all economists in the State of Iowa for publications in economics journals.

Awarded Pioneer Chair in Agribusiness in 1999.

AAEA Distinguished Extension Program – Group for “Managing Risk and Profits,” 2000

1999 College of Agriculture Team award for “Dollars and Cents”

Farm Foundation’s Outstanding Public Issues Education Program Award for Iowa’s Pork Industry – Dollars and Scents, 1998.

1990 ISU Livestock Service Award, sponsored by Walnut Grove.

Scholarship for 1st place in class of 80 in 1978, 25 in 1979, and 25 in 1980

## Elisabeth Huff-Lonergan

### Degrees Held

<b>Ph.D.</b>	Muscle Biology and Meat Science, Minor in Biochemistry	Iowa State University	1995
<b>M.S.</b>	Meat Science	Iowa State University	1991
<b>B.S.</b>	Food Science and Nutrition Cum Laude	University of Missouri/Columbia	1988

### Summary of Professional Experience

- July 2022-Present** - Iowa State University, Ames, Iowa, University Professor, Meat Science and Muscle Biology, Animal Science Department. Appointment: 70% Research, 25% Teaching, 5% Service
- July 2008-Present** - Iowa State University, Ames, Iowa, Professor, Meat Science and Muscle Biology, Animal Science Department. Appointment: 75% Research, 25% Teaching
- July 2004 – June 2008** - Iowa State University, Ames, Iowa, Associate Professor, Meat Science and Muscle Biology, Animal Science Department. Appointment: 75% Research, 25% Teaching
- Oct. 1998 – June 2004** - Iowa State University, Ames, Iowa, Assistant Professor, Meat Science and Muscle Biology, Animal Science Department. Appointment: 75% Research, 25% Teaching
- 1995 to 1998** - Auburn University, Auburn, Alabama, Assistant Professor, Meat Science and Muscle Biology. Department of Animal and Dairy Sciences. Appointment: 70% research, 30% teaching

### Awards

- University Professor – Iowa State University – effective July, 2022
- Fellow – American Society of Animal Science - 2021
- Distinguished Teaching Award - American Meat Science Association — 2020.
- Iowa State University Regents Award for Faculty Excellence - 2016
- Diversity Award - Iowa State University College of Agriculture and Life Sciences— 2015.
- Signal Service Award –American Meat Science Association – 2014. This award is the *Fellow award for the American Meat Science Association*.
- Institute of Food Technologists (IFT) Fellow – 2013
- University Award for Mid-Career Research Achievement - Iowa State University — 2010
- Distinguished Research Award -American Meat Science Association — 2009.
- Meat Science Research Award (International Career Award) American Society of Animal Science —2007
- Outstanding Young Scientist Award in Research, Midwestern Section – 2005. American Society of Animal Science.
- Achievement Award American Meat Science Association - 2002
- Early Achievement in Research Award, Iowa State University College of Agriculture - 2001

### Relevant Publications

- Melody, J.L., S.M. Lonergan, L.J. Rowe, T.W. Huiatt, M.S. Mayes, and E. Huff-Lonergan. 2004. Early postmortem biochemical factors influence tenderness and water-holding capacity of three porcine muscles. *J. Anim.Sci.* 82: 1195-1205.
- Huff-Lonergan, E., and S.M. Lonergan. 2005. Mechanisms of water-holding capacity of meat: The role of postmortem biochemical and structural changes. *Meat Sci.* 71:194-204
- Gardner, M.A., E. Huff-Lonergan, L.J. Rowe, C.M. Schultz-Kaster, and S.M. Lonergan. 2006. Influence of harvest processes on pork loin and ham quality. *J. Anim. Sci.* 84:178-184.
- Bee, G., C. Biolley, G. Guex, W. Herzog, S.M. Lonergan, and E. Huff-Lonergan. 2006. Effects of available dietary carbohydrate and pre-slaughter treatment on glycolytic potential, protein degradation and quality traits of pig muscles. *J. Anim. Sci.* 84:191-203.
- Cruzen, S.M., Pearce, S.C., Baumgard, L.H., Gabler, N.K., Huff-Lonergan, E., Lonergan, S.M. 2015. Proteomic changes to the sarcoplasmic fraction of predominantly red or white muscle following acute heat stress. *Journal of Proteomics.* 128:141-153.
- Grubbs, J.K., Dekkers, J.C.M., Huff-Lonergan, E., Tuggle, C.K., Lonergan, S.M. 2016. Identification of potential serum biomarkers to predict feed efficiency in young pigs. *Journal of Animal Science.* 94:1482-1492.
- Carlson, K., Prusa, K., Fedler, C., Steadham, E., Outhouse, A., King, D., Huff-Lonergan, E., Lonergan, S. 2017. Proteomic features linked to tenderness of aged pork loins. *Journal of Animal Science.* 95:2533-2546.
- Santos, C.C., Zhao, J., Dong, X., Lonergan, S.M., Huff-Lonergan, E., Outhouse, A., Carlson, K.B., Prusa, K.J., Fedler, C.A., Yu, C., Shackelford, S.D., King, D.A. Wheeler, T. L. 2018. Predicting aged pork quality using a portable Raman device. *Meat Science.* 145:79-85.
- Schulte, M.D., Johnson, L.G., Zuber, E.A. Patterson, B.M., Outhouse, A.C., Fedler, C.A., Steadham, E.M., King, D.A., Prusa, K.J., Huff-Lonergan, E., Lonergan, S.M. 2019. Influence of postmortem aging and post-freezing aging on pork loin quality attributes. *Meat and Muscle Biology.* 3:313-323.
- Zuber, E.A., Helm, E.T., Outhouse, A.C., Gabler, N.K., Prusa, K.J., Steadham, E.A., Huff-Lonergan, E.J., Lonergan, S.M. 2021. Contribution of early postmortem proteome and metabolome to ultimate pH and pork quality. *Meat and Muscle Biology.* (accepted 01/27/2021). DOI: 10.22175/mmb.11709
- Helm, E.T., Ross., J.W., Patience, J.F., Lonergan, S.M., Huff-Lonergan, E.J., Greiner, L.L., Reeve, L.M., Hastad, C.W., Arkefeld, E.K., Gabler, N.K. 2021. Nutritional approaches to slow late finishing pig growth: implications on carcass composition and pork quality. *Journal of Animal Science.* 99: doi:10.1093/jas/skaa368

### Researcher Information

ORCID iD: 0000-0001-5012-3277

ResearcherID: C-7557-2009,

Scopus Author ID: 6701742973,

Loop profile: 773918

Google Scholar Metrics-Accessed

01/13/2021: 9407 citations (3192 since 2016),

h-index = 43,

i10-index=77, Cited 1536 times in 2019-2020.

Research Gate-Accessed 01/13/2021:

ResearchGate Score:36.14, Cited 6014 times,

h-index = 35

ISI Web of Science (based on Core Content only) – Accessed 01/13/2021: 4672 citations,

h-index = 32, Average citations per item =

44.5, Average citations per year = 173

## Resume

**NAME:** Anna K. Johnson

**Rank:** Professor

**Appointment:** 45% Research, 20% Teaching, 25% Extension and 10% Service

### EDUCATION:

Degree	Institution	Year
Ph. D. Animal Science, Animal Welfare	Texas Tech University	2001
MSc. Applied Animal Behaviour and Animal Welfare	University of Edinburgh	1997
BSc. Animal Science with honours	University of Reading	1995

### CERTIFICATIONS:

- Professional Animal Care and Certification Organization. Third party auditor trainer for on-farm swine welfare.
- Professional Animal Care and Certification Organization. Third party auditor trainer for porcine and bovine slaughter auditing.
- Third Party auditor for Smithfield Foods, Hog Production.
- Professional Animal Care and Certification Organization: Third party consultant to review third party audit programs.

### CONTRIBUTIONS IN RESEARCH, 1999-2022:

- Peer review papers – 123
- Published/presented abstracts – 140
- Peer reviewed book chapters – 7
- Editorial & Referee responsibilities – 15
- Currently directly 2 Master students as major professor and 1 as co-major professor
- Currently serving on 7 Masters (1) and Ph.D. (6) POSC
- Directed 10 MS students as major professor
- Directed 1 PhD students as major professor
- Directed 3 Master students as major professor
- Directed 2 PhD student as a co-major professor
- POS member on 41 MS (24) and Ph.D. 17) POSC
- Supervised four post-Doctoral positions
- Mentoring five faculty positions within the Department of Animal Science

### GRANTS AND CONTRACTS, 2005-2022:

PI & CO-PI \$13,488,548

### CONTRIBUTIONS IN EXTENSION, 2002-2021:

- Peer reviewed extension publications – 232
- Non-refereed extension publications – 102
- Regional, national and international meetings – 133
- Extension training activities – 51

## Abbreviated Curriculum Vitae

**Locke A. Karriker**, DVM, MS, DACVPM

Morrill Professor and Director, Swine Medicine Education Center, Veterinary Diagnostic and Production Animal Medicine Department

2227 Lloyd Veterinary Medical Center

Iowa State University College of Veterinary Medicine

Ames, Iowa 50010      515-294-2283      karriker@iastate.edu

### **EDUCATION**

- Executive Veterinary Program, Swine Health. U of Illinois CVM, Champaign, Illinois, 2009.
- Diplomate of the American College of Veterinary Preventive Medicine, 2006.
- MS in Veterinary Science. Mississippi State University, Starkville, Mississippi, 2000. Area of concentration: Swine Production Medicine
- DVM. Mississippi State University College of Veterinary Medicine, Starkville, Mississippi, 1999.
- BS in Biology. University of North Carolina at Chapel Hill, Chapel Hill, North Carolina, 1995.

### **PROFESSIONAL VETERINARY EXPERIENCE AND APPOINTMENTS (Last 10 years of 23 total)**

- Vice President, American Association of Swine Veterinarians. 2023 – Present.
- Morrill Professor with tenure, Veterinary Diagnostic and Production Animal Medicine, College of Veterinary Medicine, Iowa State University. Assigned 50% Teaching, 30% Professional Practice, 20% Research. 2016 – present.
- Scientist, National Institute of Antimicrobial Resistance Research and Education. Iowa State University Research Park, Ames, IA. www.NIAMRRE.org. 2020 - Present
- Animal Care Review Panelist, Center for Food Integrity, Gladstone, MO. 2020.
- Voting Member of the Council, Presidential Advisory Council on Combating Antibiotic-Resistant Bacteria (PACCARB), United States Department of Health and Human Services. Voting Member of the Council. 2019 – Present.
- Department Chair (Interim), Veterinary Diagnostic and Production Animal Medicine, College of Veterinary Medicine, Iowa State University. 2017 – 2018.
- Dr. Douglas and Ann Gustafson Professor of Excellence in Veterinary Education, College of Veterinary Medicine. 2014 – present.
- Director, Swine Medicine Education Center at the College of Veterinary Medicine, Iowa State University. 2010 – present.
- Associate Professor with tenure, Veterinary Diagnostic and Production Animal Medicine, College of Veterinary Medicine, Iowa State University. Assigned 50% Teaching, 30% Professional Practice, 20% Research. 2010 – 2016.

**SELECTED PUBLICATIONS (15 of 654)** “\*\*\*” Denotes a student that Dr. Karriker mentored, served as major professor, served as graduate committee member, or served as professional (DVM) curriculum advisor during the study.

- Rademacher C, Brown J\*\*, **Karriker L**. Impact of human behavior on the spread of African swine fever virus: what every veterinarian should know. J Am Vet Med Assoc. 2022;260(12):1413–1417. doi:10.2460/javma.22.06.0250.
- Patterson G, Brown JT, Almond GW, Ramirez A, Pittman J, Pieters M, Bowman AS, **Karriker LA**, Zhitnitskiy PE. Challenges and opportunities in modern swine veterinary education. J Am Vet Med Assoc. 2022 Mar 3:1-3. doi: 10.2460/javma.21.10.0443.
- Canning P\*\*, Bates J\*\*, Skoland K, Coetzee J, Wulf L, Rajewski S, Wang C, Gauger P, Ramirez A, and **Karriker L**. 2018. Variation in water disappearance, daily dose, and synovial fluid concentrations of tylvalosin and 3-O-acetyltylosin in commercial pigs during five day water medication with tylvalosin under field conditions. J Vet Pharmacol Ther. Mar 23. doi: 10.1111/jvp.12503. [Epub ahead of print]
- Baker K, Thomas P, **Karriker L**, Ramirez A, Zhang J, Wang C and Holtkamp D. 2017. Evaluation of an

accelerated hydrogen peroxide disinfectant to inactivate porcine epidemic diarrhea virus in swine feces on aluminum surfaces under freezing conditions. *BMC Veterinary Research*. Dec 1;13(1):372. doi: 10.1186/s12917-017-1300-4.

- Canning P\*\*, O'Brien K\*\*, Thompson V\*\*, Madson D, Skoland K, Ramirez A, Linhares D, Gauger P and **Karriker L**. 2018 Suitability of four injectable anesthetic protocols for percutaneous synovial fluid aspiration in healthy swine under field conditions and assessment of lameness seven days post procedure. *Journal of Swine Health and Production*. 26(3):130-136.
- Canning P, Bates J, Hammen K, Coetzee J, Wulf L, Sander S, Wang C, **Karriker L**. 2016. Concentrations of tylvalosin and 3-O-acetyltylosin attained in the synovial fluid of swine after administration by oral gavage at 50mg/kg and 5mg/kg. *Journal of Veterinary Pharmacology and Therapeutics*. Dec;39(6):621-624. doi: 10.1111/jvp.12309.
- Sparks J, **Karriker L**, Day D, Wulf L, Zhang J, Stock M, Bates J, Gehring R, Coetzee J. 2016. Vaccination mitigates the impact of PRRSv infection on the pharmacokinetics of ceftiofur crystalline free acid in pigs. *Journal of Veterinary Pharmacology and Therapeutics*. Nov 24. doi: 10.1111/jvp.12369.
- Tapper K, Johnson A, **Karriker L**, Stalder K, Parsons R, Wang C, Millman S. 2013. Pressure algometry and thermal sensitivity for assessing pain and effects of flunixin meglumine and sodium salicylate in a transient lameness model in sows. *Livestock Science* 157 (2013) 245-253.
- Pairis-Garcia M, Johnson A, Millman S, Stalder K, **Karriker L**. 2014. Yohimbine (alpha 2-antagonistic reversal agent) effects on physiological recovery parameters of anesthetized sows. *Journal of Swine Health and Production*. 22:16-23.
- Pairis-Garcia M, Johnson A, Bates J, Stock M, Stock L, Brommel A, Stalder K, **Karriker L**. 2014. Development and refinement of a technique for short-term intravascular ear catheter placement in mature sows. *Laboratory Animals*. 48:78-81.
- Abell C, Johnson A, **Karriker L**, Rothschild M, Hoff S, Sun G, Fitzgerald R, Stalder K. Accepted 2014. Using classification trees to detect lameness in sows induced lame using a transient lameness model. Accepted by *Animal*.
- Pairis-Garcia M, Johnson A, Stalder K, **Karriker L**, Coetzee J, Millman S. Accepted 2014. Measuring the efficacy of flunixin meglumine and meloxicam for lame sows using nociceptive threshold tests. Accepted by *Animal Welfare*.
- **Karriker L**, Abell C, Pairis M, Holt W, Sun G, Coetzee J, Johnson A, Hoff S, and Stalder K. 2013. Validation of a lameness model in sows using physiological and mechanical measurements. *Journal of Animal Science* 91:130-136.

#### PROFESSIONAL MEMBERSHIPS

- Presidential Advisory Council on Combating Antibiotic-Resistant Bacteria, US HHS, 2019-present
- American Association of Swine Veterinarians, 1995-present.
- Iowa Veterinary Medical Association, 2003-present.

#### AWARDS

- Excellence in Remote Instruction Award, Iowa State University COVID-19 Exceptional Effort Awards Program, 2021.
- Iowa State University Award for Outstanding Achievement in Teaching 2015.
- Dr. Douglas and Ann Gustafson Professor of Excellence in Veterinary Education 2014.
- Howard Dunne Memorial Award, American Association of Swine Veterinarians, 2014.



# Christopher J. Rademacher, DVM

**Clinical Professor - Swine Extension Veterinarian - Interim Director, Iowa Pork Industry Center**

Department of Veterinary Diagnostic and Production Animal Medicine

College of Veterinary Medicine, Iowa State University, Ames, IA, 50011

## Education

<u>Institution</u>	<u>Degree</u>	<u>Date</u>	<u>Major</u>
University of Minnesota	DVM	1998	Doctorate of Veterinary Medicine
University of Minnesota	B.S.	1996	Veterinary Science

## Record of Professional Experience

Aug 2022-Present	Interim Director, Iowa Pork Industry Center. Iowa State University Ames, IA.
May 2019-Present	Clinical Professor, Department of Veterinary Diagnostic and Production Animal Medicine. College of Veterinary Medicine, Iowa State University, Ames, IA.
Jun 2018-Present	Associate Director, Iowa Pork Industry Center. Iowa State University Ames, IA.
Jan 2017-April 2019	Clinical Associate Professor, Department of Veterinary Diagnostic and Production Animal Medicine. College of Veterinary Medicine, Iowa State University, Ames, IA.
Dec 2014-Dec 2016	Senior Clinician, Department of Veterinary Diagnostic and Production Animal Medicine. College of Veterinary Medicine, Iowa State University, Ames, IA.
Jun 2009-Nov 2014	Director of Production Improvement, Murphy-Brown Western Operations, LLC. Ames, IA.
Jun 1998-Jun 2009	Director of Health Strategies, New Fashion Pork, Inc., Jackson, MN.

## Professional Organization Membership and Activities

- American Association of Swine Veterinarians, Member (1994-present)
  - American Association of Swine Veterinarians Board of Directors - District 6 Director (2021-present)
  - American Association of Swine Veterinarians Pharmaceutical Issues Committee (2015-present)
    - Chair, American Association of Swine Veterinarians Pharmaceutical Issues Committee (2017-2018, 2020-2022)
  - American Association of Swine Veterinarians Annual Meeting Organizing Committee (2004, 2009, 2012-2022)
  - Session Chair, Research Topics Section, American Association of Swine Veterinarians Annual Meeting (2010-present)
  - American Association of Swine Veterinarians Animal Welfare Committee (2015-present)
    - AASV Subcommittee on Swine Depopulation (2020-present)
  - American Association of Swine Veterinarians Human Health Committee (2015-2020)
- Swine Health Information Center Monitoring and Analysis Working Group (2016-current)
- Swine Health Information Center ASF Boar Stud Risk Assessment Working Group (2020-current)
- United State Swine Health Improvement Plan Pilot Project Organizing Committee (2019-current)
- United State Swine Health Improvement Plan Biosecurity Site Plan Working Group (2021-current)

## Selected Peer Reviewed Publications:

31. Dewell, G. A., **Rademacher, C. J.**, and Sato, Y. 2022. Review of regulations and indications for the use of in-feed antimicrobials for production animals. *Journal of the American Veterinary Medical Association* available from: <<https://doi.org/10.2460/javma.22.07.0300>>

30. **Rademacher, C.**, Brown, J., and Karriker, L. 2022. Impact of human behavior on the spread of African swine fever virus: what every veterinarian should know. *Journal of the American Veterinary Medical Association* 260, 12, 1413-1417, available from: < <https://doi.org/10.2460/javma.22.06.0250>>
28. William E Taylor, Romoser Matthew, Stender David, **Christopher Rademacher**, Jason W Ross, Kenneth J Stalder, 256 Body Condition Association with Production Records and Feed Management Decisions, *Journal of Animal Science*, Volume 100, Issue Supplement\_2, May 2022, Page 118, <https://doi.org/10.1093/jas/skac064.199>
27. Johnson, A., **C. Rademacher**, J. Eggers, N. Gabler, L. Greiner, J. Kaisand, L. Karriker, S. Millman, J. Patience, B. Ramirez, L. Schulz, S. Webb and J. Ross. 2021. Innovative strategies for managing swine welfare during the COVID-19 pandemic in Iowa. *Translational Animal Science*. DOI: <https://doi.org/10.1093/tas/txab225>
26. Magalhães ES, Zimmerman JJ, Thomas P, Moura CAA, Trevisa G, Holtkamp DJ, Wang C, **Rademacher C**, Silva GS, Linhares DCL. Whole-herd risk factors associated with wean-to-finish mortality under the conditions of a Midwestern USA swine production system. *Preventive Veterinary Medicine*. 2021; 198:105545. Online ahead of print. doi: 10.1016/j.prevetmed.2021.105545..
25. Angela Baysinger, Michael Senn, Jordan Gebhardt, **Christopher Rademacher**, and Monique Pairis-Garcia. A case study of ventilation shutdown with the addition of high temperature and humidity for depopulation of pigs. *Journal of the American Veterinary Medical Association* 2021 259:4, 415-424
24. Almeida MN, Rotto H, Schneider P, Robb C, Zimmerman JJ, Holtkamp DJ, **Rademacher CJ**, Linhares DCL. Collecting oral fluid samples from due-to-wean litters. *Prev Vet Med*. 2020 Jan;174:104810. doi: 10.1016/j.prevetmed.2019.104810. Epub 2019 Nov 4. PMID: 31756669
23. Matthew R Romoser, Benjamin J Hale, Jacob T Seibert, Tom Gall, **Christopher J Rademacher**, Kenneth J Stalder, Lance H Baumgard, Aileen F Keating, Jason W Ross, Methods for reproductive tract scoring as a tool for improving sow productivity, *Translational Animal Science*, Volume 4, Issue 1, January 2020, txz160, <https://doi.org/10.1093/tas/txz160>
22. A.K. Johnson, J. D. Colpoys, A. Garcia, C. Jass, S. T. Millman, M. D. Pairis-Garcia, **C. J. Rademacher**, S. L. Weimer and S. Azarpajouh. 2019. A proactive blueprint to demonstrate on-farm animal welfare. *CAB Reviews*. 14(037). 1-8
21. Brown J, **Rademacher C**, Baker S, et al. Efficacy of a commercial porcine epidemic diarrhea virus vaccine at reducing duration of viral shedding in gilts. *J Swine Health Prod*. 2019;27(5):256-264
19. **Rademacher CJ**, Pudenz CC, Schulz LL. Impact assessment of new US Food and Drug Administration regulations on antibiotic use: A post-enactment survey of swine practitioners. *J Swine Health Prod*. 2019;27(4):210–220.
18. Mehling, S., A. Henao-Diaz, J. Maurer, E. Kluber, R. Stika, **C. Rademacher**, J. Zimmerman, L. Giménez-Lirola, C. Wang, D.J. Holtkamp, R. Main, L. Karriker, D.C.L. Linhares, M. Breuer, C. Goodell, and D. Baum, Mortality patterns in a commercial wean-to-finish swine production system. *Vet Sci*, 2019. 6(49): p. 1-11.
17. Buckley, A., Montiel, N., Guo, B., Kulshreshtha, V., van Geelen, A., Hoang, H., **Rademacher, C.**, Yoon, K. J., Lager, K. (2018). Dexamethasone treatment did not exacerbate Seneca Valley virus infection in nursery-age pigs. *BMC veterinary research*, 14(1), 352. doi:10.1186/s12917-018-1693-8

## **Brian J. Kerr**

**USDA-Agricultural Research Service**

**2165 NSRIC, 1015 N. University Blvd., Ames, Iowa, 50011**

**Phone (515) 294-0224; Fax (515) 294-1209; E-mail: [brian.kerr@usda.gov](mailto:brian.kerr@usda.gov)**

### **EDUCATION**

University of Illinois, Animal Science; B.S.—1981; MS—1982; Ph.D.—1988



### **EARLY BACKGROUND**

Raised in rural west central IL on a farming operation that included a cash-grain and a purebred Chester White swine enterprise (250 head/yr).

### **CAREER OBJECTIVES**

Utilize research, management, and industry expertise which advances the knowledge of animal nutrition, management and production in nonruminants.

### **EMPLOYMENT EXPERIENCE**

January 2001 – Present: USDA-ARS-NLAE, Ames, IA 50011-3310

Research Leader 12/01 – 9/09, Lead Scientist 9/09 – Present: At the USDA-ARS (21 years), Dr. Kerr is actively involved in reviewing literature and developing research to improve the utilization of nutrients (largely carbon, nitrogen, and sulfur) in non-ruminants in an effort to reduce the loss of these nutrients into the environment, including odor and gas emissions. Dr. Kerr is active in evaluating biofuel co-products (corn co-products and crude glycerin), enzymes (carbohydrases and phytases), animal protein by-product meals (energy and amino acid digestibility) and lipids (source and quality factors) in an effort to improve nutrient utilization efficiency and reduce feed costs for lean tissue deposition. Impact: Reviews of the literature have been the basis for several invited presentations while research results have shown the caloric value of various biofuel co-products, the ability of enzymes to impact feedstuff digestion, the caloric and digestible amino acid value of animal protein by-product meals, and the impact of lipid quality on energy digestion. Research results have been the basis for invitations to various national and international meetings. In addition, Dr. Kerr's ability to systematically review the literature has been crucial as a committee member in revising the Nutrient Requirements of Swine.

June 1990-December 2000: Nutri-Quest, Inc., Chesterfield, MO 63017

Research Director, 6/97 – 12/01, Sr. Research Manager, 10/94-6/97, Research Manager, 6/90- 10/94: At Nutri-Quest, Inc. (10 years), Dr. Kerr was actively involved in reviewing the peer reviewed literature for non-ruminant animals, subsequently being involved in writing and/or editing 13 technical reviews for understanding amino acid nutrition and the use of crystalline amino acids in feed formulation. During these same years, Dr. Kerr actively developed and funded research projects (130 in total) at various research U.S. and international locations, many of which have been published in peer-reviewed publications. Dr. Kerr assisted in the Kyowa's Amino Acid Annual Conferences (Canada, Mexico, and the U.S.), and traveled world-wide for Kyowa Hakko Kogyo, Inc., Ltd. (parent company of BioKyowa and Nutri- Quest), speaking to scientists (university, industry, and livestock producers) concerning amino acid nutrition and use of crystalline amino acids in non-ruminant species. Impact:

Research conducted and reviews produced were essential to expand the utilization of crystalline amino acids in non-ruminant diets, as well as providing vital information in defining amino acid requirements and ratios at various stages of animal production. Reviews have also been utilized by university staff for teaching purposes and have been used by scientists as a basis for a further understanding of amino acid nutrition, being utilized in peer reviewed literature and as a basis for amino acid understanding in the writing of the Nutrient Requirements of Swine.

October 1987-June 1990: International Multifoods/Supersweet Feeds, Minneapolis, MN 55402 Swine Service and Formulations Manager: At Supersweet Feeds (3 years), Dr. Kerr reviewed

published and 'in-house' research data dealing with protein, amino acid, mineral, and vitamin knowledge for gestating-lactating sows, broilers, laying hens, and turkeys, and subsequently integrated the data into a comprehensive feeding program, including technical, marketing, and training programs; and actively trained field staff on benefits of each feeding program.

Dr. Kerr also produced a variety of research reports dealing with multiple aspects of animal nutrition. Impact: Three new feeding programs were developed based on amino acid nutrition and the entire sales force was trained on key nutritional advantages of each program. These feeding programs were 'new' in the sense that they went beyond typical 'protein' feeding programs and applied knowledge relative to specific amino acids. Five research reports were published for sales and marketing staff for customers dealing not only with product-related information, but also general nutritional information

**RECENT ACCOMPLISHMENTS AND IMPACT:**

Accomplishment: Utilization of biofuel co-products in nonruminants. Research conducted by Dr. Kerr and his colleagues has led to a comprehensive understanding of the energy value of DDGS and crude glycerin in swine and poultry industry. In addition, their research has generated equations based on ingredient composition to predict metabolizable energy to growing pigs and broilers. Impact: Information provided by Dr. Kerr and his colleagues has led to a fuller understanding of the variation associated with biofuel co-products and allowed for a better estimation of their value to swine and poultry producers for use of these produces in feed formulation. This information has also been utilized by the producers of these products to better understand the impact of their industry on the value of the residual product produced.

Accomplishment: Impact of animal production on the environment. Research by Dr. Kerr and collaborators has recently been focusing on the impact of diet composition (DDGS inclusion, protein level and source, fiber level and source, fiber level and ionophore addition, and fiber level and particle size) on manure composition, gas emissions, and the potential for pit foaming. Impact: Although in its infancy, this research has led to a better understanding of dietary effects on manure composition, air quality, and potential for pit foaming, which can subsequently be utilized to reduce the impact of livestock production on the environment.

**CAREER SCIENTIFIC ACCOMPLISHMENTS:**

<u>Career Publications (total)</u>	<u>254</u>		
First-Author Manuscripts	33	Co-Author Manuscripts	145
First-Author Proceedings	14	Co-Author Proceedings	13
First-Author Misc. & Co. Reports	35	Co-Author Misc. & Co. Reports	10
First-Author Book Chapters	1	Co-Author Book Chapters	3



- Ruckman, L.A., A.L., Petry, S.A. Gould, B.J. Kerr and J.F. Patience. 2020. The effects of enzymatically-treated soybean meal on growth performance and intestinal structure, barrier integrity, inflammation, oxidative status, and volatile fatty acid production of nursery pigs. *Transl. Anim. Sci.* 4:txaa170. doi:org/10.1093/tas/txaa170.
- Ruckman, L.A., A.L. Petry, S.A. Gould and J.F. Patience. 2020. The impact of porcine spray-dried plasma protein and dried egg protein harvested from hyper-immunized hens, provided in the presence or absence of subtherapeutic levels of antibiotics in the feed, on growth and indicators of intestinal function and physiology of nursery pigs. *Transl. Anim. Sci.* 4:txaa095. doi.org/10.1093/tas/txaa095.
- Acosta, J.A., A. Petry, S.A. Gould, C.K. Jones, C.R. Stark, A. Fahrenholz and J.F. Patience. 2020. Effects of grinding method and particle size of wheat grain on energy and nutrient digestibility in growing and finishing pigs. *Transl. Anim. Sci.* 4:682-693; doi:org/10.1093/tas/txaa062.
- Li, Q.Y., X. Peng, E.R. Burrough, O. Sahin, S.A. Gould, N.K. Gabler, C.L. Loving, K.S. Dorman and J.F. Patience. 2020. Dietary soluble or insoluble fiber with or without enzymes altered the intestinal microbiota in weaned pigs challenged with Enterotoxigenic *E. coli* F18. *Front. Microbiol.* 11:1110; doi:10.3389/fmicb.2020.01110.
- Becker, S.L., Li, Q.Y., Burrough, E.R., Kenne, D., Sahin, O., Gould, S.A., Patience, J.F. 2020. Effects of direct-fed microbial blends on weaned pigs challenged with F18 enterotoxigenic *Escherichia coli*. Accepted to *J. Anim. Sci.*
- Huntley, N.F., Gould, S.A., Patience, J.F. 2019. Evaluation of the effect of beta-mannanase supplementation and mannans on nursery pig growth performance and serum acute phase protein concentrations. *Can. J. Anim. Sci.* doi.10.1139/CJAS-2018-0248.
- Acosta, J.A., Petry, A., Gould, S.A., Jones, C.K., Stark, C.R., Fahrenholz, A., Patience, J.F. 2019. Enhancing digestibility of corn fed to pigs at two stages of growth through management of particle size using a hammermill or a roller mill. *Transl. Anim. Sci.* doi.org/10.1093/tas/txz146.
- Li, Q., Gould, S.A., Htoo, J.K.K., Gonzales-Vega, C., Patience, J.F. 2019. Bioavailability of L-Lys sulfate relative to L-Lys HCl for growing-finishing pigs. *Transl. Anim. Sci.* doi: 10.1093/tas/txz094.
- Li, Q.Y., Burrough, E.R., Gabler, N.K., Loving, C.L., Sahin, O., Gould, S.A., Patience, J.F. 2019. A soluble and highly fermentable dietary fiber with carbohydrases improved gut barrier integrity markers and growth performance in ETEC challenged pigs. *J. Anim. Sci.* 97:2139-2153.
- Holloway, C.L., Boyd, R.D., Koehler, D., Gould, S.A., Li, Q.Y., Patience, J.F. 2019. The impact of “super-dosing” phytase in pig diets on growth performance during the nursery and grow-out periods. *Trans. Anim. Sci.* 3:419-428.
- Olsen, K.M, Gould, S.A., Walk, C.A., Seroo, N.V.L., Hansen, S.L., Patience, J.F. 2019. Evaluating phosphorus release by phytase in diets fed to growing pigs that are not deficient in phosphorus. *J. Anim. Sci.* 97:327-337.
- Li, Q.Y., Schmitz-Esser, S., Loving, C.L., Gabler, N.K., Gould, S.A., Patience, J.F. 2019. Exogenous carbohydrases added to a starter diet reduced markers of systemic immune activation and decreased *Lactobacillus* in weaned pigs. *J. Anim. Sci.* 97:1242-1253.
- Li, Q.Y., Gabler, N.K., Loving, C.L., Gould, S.A., Patience, J.F. 2018. A dietary carbohydrase blend improved intestinal barrier function and growth rate in nursery pigs fed higher fiber diets. *J. Anim. Sci.* 96:5233-5243.
- Patience, J.F., Gould, S., Koehler, D., Corrigan, B., Elsbernd, A., Holloway, C. 2015. Super-dosed Phytase Improves Rate and Efficiency of Gain in Nursery Pigs. *Animal Industry*

## Shuyang Qu, Ph.D. Assistant Professor

Department of Agricultural Education and Studies Iowa State University, Ames, IA

Email: [squ@iastate.edu](mailto:squ@iastate.edu)

### Education and Training

Institution	Area	Degree	Year
South-Central University for Nationalities, Wuhan, Hubei, China	English Language and Literature	B. A.	2009
Iowa State University	Journalism and Mass Communication	M.S	2012
University of Florida	Agricultural Communication	Ph.D.	2016

### Research and Professional Experience

2017-Current Assistant Professor, member of the Graduate faculty, and member of the Graduate faculty of the Sustainable Agriculture program. Department of Agricultural Education and Studies, Iowa State University, Ames, IA.

2016-2017 Research Associate, Center for Public Issues Education, Institute of Food and Agricultural Sciences, University of Florida, Gainesville, FL.

### Courses Taught at ISU:

AGEDS 311: Presentation and Sales for Agricultural Audiences

AGEDS 412: Agricultural Communication Internship

AGEDS 490E: Agriculture Advocacy through Video Storytelling

AGEDS 511: Professional Agricultural Presentation Practices

AGEDS 615B: Research Ethics Seminar

### Selected Synergistic Activities

Masambuka-Kanchewa, F., **Qu, S.**, & Cline, L. (2022, April). *International graduate students' classroom experience in U.S. agricultural education and extension programs*. Abstract presented at the annual meeting of the Association for International Agricultural and Extension Education, Thessaloniki, Greece.

**Qu, S.**, Rodriguez, L., & Cork, E\*. (2022, February). *Media frames and farmers' support for the U.S. trade dispute with China*. Poster to be presented at the annual meeting of the National Agricultural Communications Symposium (NACS) (a section of the Southern Agricultural Association of Scientists), New Orleans, LA.

Taku-Forchu\*, N., **Qu, S.**, Lambert, M. D., Retallick, M. R. (2022, February). *Access to information about hermetic storage technology by smallholder farmers in Dormaa, Ghana: The Role of Extension in the Dissemination Process*. Poster presented at the annual meeting of the National Agricultural Communications Symposium (NACS) (a section of the Southern Agricultural Association of Scientists), New Orleans, LA. [**Won the first runner-up poster presentation award.**]

Li, M., He, X., Zhang, W., Gbeda, J., **Qu, S.**, Rodriguez, L. (2021, August) *Media exposure and Midwestern farmers' responses to the U.S-China trade war*. Poster abstract accepted to present at the 2021 Agricultural & Applied Economics Association (AAEA) Annual Meeting in Austin, TX, August 1-3. 2021.

Rodriguez, L., Lee, S., **Qu, S.**, Zhang, W., & Li, M. (2020, May). Farmers under threat: Implications for attitudes toward China and perceived risks from the trade dispute. Abstract presented virtually at the annual conference of International Communication Association at Gold Coast, Australia. **Won Top Paper at the Intergroup Communication Session.**

**Qu, S.**, Rodriguez, L., Han, G., Zhang, W., Li, M., & Cork, E. (2020, February). What Midwest farmers think about the trade dispute with China: Concerns, claims, solutions, and information needs. [Poster presentation]. Annual meeting of the National Agricultural Communications Symposium (NACS) (a section of the Southern Agricultural Association of Scientists) at Louisville, KY.

### **Selected Publications**

Masambuka-Kanchewa, F., Lamm, A., & **Qu, S.** (2022). Exploring the impact of agricultural policies on the documentation and sharing of indigenous knowledge in sub-Saharan Africa. *Journal of Agricultural Extension and Rural Development*, 14(4), 173-182. doi.org/10.5897/JAERD2022.1331

Bletscher, C., Gould, M\*, & **Qu, S.** (2022). The exploration of undergraduate attitudes and knowledge about international agricultural issues and US agricultural policy. *Journal of International Agricultural Extension Education*. 29(2), 7-23. doi.org/10.4148/2831- 5960.1010

**Qu, S.**, Fischer, L., & Rumble, J. N. (2019). Building bridges between producers and schools: The role of extension in the Farm-to-School program. *Journal of Extension*, 57(4). Article 4FEA4.

**Qu, S.**, Lamm, A., Rumble, J., & Telg, R. (2018). Predicting consumers' local food attitude with personal values and local food online videos. *Journal of Agricultural Education*, 59(1), 171-188. https://doi.org/10.5032/jae.2018.01171

**Qu, S.**, Irani, T., & Lindsey, A. B. (2018). The communication effectiveness of scientist- stakeholder partnerships addressing agriculture and natural resources issues: A citation analysis of the Florida Water and Climate Alliance. *Journal of Applied Communications*, 102

(1). doi:10.4148/1051-0834.1755

**Qu, S.**, Irani, T. (2018). The communication effectiveness of scientist-stakeholder partnerships addressing agriculture and natural resources issues: An analysis of the media attention and media framing of the Florida Water and Climate Alliance. *Journal of Applied Communications*, 102 (4). doi:10.4148/1051-0834.2230

**Qu, S.**, Bletscher, C., & Lamm, A. (2018). Exploring undergraduate students' attitude toward undocumented immigration: Implications to agricultural education. *Journal of Agricultural Education*, 59(3). doi:10.5032/jae.2018.03124

**Qu, S.**, Lamm, A. J., Rumble, J. N., & Telg, R. W. (2017). The effects of online video on consumers' attitudes toward local food. *Journal of Applied Communications*, 101(4), 1-

20. doi:10.4148/1051-0834.1841

**Qu, S.**, Lamm, A. J., & Rumble, J. N. (2017). Marketing power berries: An Importance- Performance Analysis of blueberry. *Journal of Applied Communications* 101(3). doi:10.4148/1051-0834.1842



**VITA**  
**Fallys Masambuka-Kanchewa** Department of  
Agricultural Education and Studies

**Assistant Professor**

**EDUCATION**

Degrees Held	Institution	Date
Ph.D.	The Ohio State University	May, 2019
M.S	Purdue University	May, 2013
B.S	Bunda College of Agriculture	August, 2009

**PROFESSIONAL EXPERIENCE**

August 2021-Present	Assistant Professor, College of Agriculture and Life Sciences, Department of Agricultural Education and Studies, Ames, Iowa, USA
September 2019 – August 2021	Post-Doctoral Research Associate, University of Georgia, College of Food, Agriculture and Environmental Sciences, Department of Agricultural Leadership, Education and Communication, Athens, Georgia, USA
May 2017-May 2019	Teaching Assistant, The Ohio State University, College of Food, Agriculture and Environmental Sciences, Department of Agricultural Communication, Education and Leadership, Columbus, Ohio
Fall 2017-2019	Research Assistant, The Ohio State University, College of Food, Agriculture and Environmental Sciences, Department of Agricultural Communication, Education and Leadership, Columbus, Ohio
October 2014-January 2019	Chief Agricultural Communication Officer, Ministry of Agriculture and Food Security: Department of Agricultural Extension Services, Agricultural Communications Branch, Malawi
May 2009 -September 2014	Agricultural Communication Officer, Ministry of Agriculture and Food Security: Department of Agricultural Extension Services, Agricultural Communications Branch, Malawi

**TEACHING RESPONSIBILITIES**

*Courses taught or currently teaching*

Spring 2021-Present	AgEds 533 Learning Theory in Agricultural Education.
Fall 2021- Present	AgEds 311 Presentation & Sales Strategies for Agricultural Audiences
Fall	AgEds 561/461 Technology Transfer and the Role of Agricultural Extension Education
Fall 2020	AGCM 8710 Agricultural and Environmental Science Communication Theory

**PUBLICATIONS**

**Refereed journal articles.** (Published, in press or in the review process).

\*Denotes graduate students mentored

- Masambuka-Kanchewa, F.** Lamm, A.J. & Lamm, K (In review). Religiosity or Sound Science? American Public Online Information Seeking Behaviors during the Coronavirus Pandemic. *Journal of Media and Religion*
- Oyugi, M., **Masambuka-Kanchewa, F** & Lamm A.J. (In Review). Informing Science and Health Communication During Crisis by Exploring Social Media Information Seeking During the COVID-19 Pandemic. *Journal of Applied Communication*
- Mayfield-Smith, K. \*, Lamm, A. J., **Masambuka-Kenchewa, F.**, Borron, A., & Holt, J. (In review). Determining How Chosen Online Connections and Information Seeking Behaviors on Social Media Influence Climate Beliefs and Knowledge. *Sage Open*.
- Masambuka-Kanchewa, F.** Lamm, A. & Qu. S. (2022). Exploring the Impact of Agricultural Policies on the Documentation and Sharing of Indigenous Knowledge in Sub-Saharan Africa. *Journal of Agricultural Extension and Education*
- Masambuka-Kanchewa, F.**, & Lamm, A. (2022). Using Body Mapping to Assess Doctoral Students' Preparedness to Serve as Science Communicators. *NACTA Journal*
- Masambuka-Kanchewa, F.**, Rumble, J. & Buck, E. (2021). Exploring Differences in Communication Behaviors Between Organic and Conventional Farmers *Journal of Agriculture, Food Systems and Community Development* 10(3).205-219 <https://doi.org/10.5304/jafscd.2021.103.018>
- Masambuka-Kanchewa, F.**, & Lamm, A. (2022). CAES Graduate Students' Perceptions of Scientists before and after Taking a Science Communication Course. *Nacta Journal*
- Lamm, K. W., **Masambuka-Kanchewa F.**, Lamm, A. J., Davis, K., Nahdy, S., & Oyugi, M.A. (2021). A case study analysis of extension service provision in Malawi. *African Journal of Agricultural Research*. <https://doi.org/10.5897/AJAR2021.15781>
- Dobbins, C.E.\*, **Masambuka-Kanchewa, F.**, & Lamm, A. J., (2021). A Systematic Literature Review of the Intersection between social media and Cultural Identity: Implications for Agricultural and Environmental Communication. *Journal of Applied Communications*.105(2). <https://newprairiepress.org/jac/vol105/iss2/6/>
- Mayfield-Smith, K.\*, **Masambuka-Kanchewa, F.**, Lamm, A. J., Borron, A., & Holt, J. (2021). Arguing for Argument's Sake? Exploring Public Conversations around Climate Change on Twitter. *Journal of Applied Communications*, 105(4). <https://doi.org/10.4148/1051-0834.2382>
- Lamm, K.W., Mulvaney, C., Lamm, A.J. Davis, K., **Masambuka-Kanchewa F.** & Nahdy, S. (2021). Model of success: Extension Services helping Ugandan youth find a career in Agriculture. *Journal of International Agricultural and Extension Education*. 28(3), 7-13 <https://doi.org/10.5191/jiaee.2021.28307>

## **Pedro E. Urriola, Research Associate Professor**

Department of Animal Science, CFANS and Department of Population Medicine, CVM  
University of Minnesota  
335F Anim. Sci./Vet. Med. 1988 Fitch Ave St. Paul, MN 55108  
Office: (612)624 1244/ urrio001@umn.edu

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**Overall interest:** my professional goal is the improvement of sustainable production and use of pigs and their products for the benefit of humankind.

### **A) Professional Preparation**

Universidad Central de Venezuela; Maracay, Venezuela; Veterinarian, 2003.  
University of Minnesota, St. Paul, MN; Animal Science, M.S. 2006  
University of Illinois, Urbana, IL; Animal Science, Ph.D. 2010

### **B) Appointments**

**Research objectives:** to increase utilization of abundant and sustainable sources of feed ingredients through evaluation of nutritional and physiological requirements.

- **Research Associate Professor:** Department of Animal Sciences (CFANS) and Department of Population Medicine (CVM). University of Minnesota, St. Paul, MN. From April 2019 to the present.
- **Research Assistant Professor:** Department of Animal Sciences (CFANS) and Department of Population Medicine (CVM). University of Minnesota, St. Paul, MN. From April 2014 to 2019.
- **Research Associate:** Department of Animal Sciences. University of Minnesota, St. Paul, MN. From August 2012 to March 2014.
- **Research and Development Manager:** Cargill Animal Nutrition. Elk River, MN. From February 2010 to April 2012.

### **C) Products From projects funded by the National or Minnesota Pork Board:**

Shurson, G. C., R. E. O. Pelton, Z. Yang, P. E. Urriola, and J. Schmitt. 2022. Environmental impacts of eco-nutrition swine feeding programs in spatially explicit geographic regions of the United States. *J. Anim. Sci.* 100:1–17. doi:10.1093/jas/skac356.

Lozinski, B. M., B. Frederick, Y. Li, M. Saqui-Salces, G. C. Shurson, P. E. Urriola, M. L. Wilson, and L. J. Johnston. 2022. Effects of water quality on growth performance and health of nursery pigs, *Transl. Anim. Sci.* 6:1-9 doi.org/10.1093/tas/txac002Holen, J. P., P. E. Urriola, M. Schwartz, J. C. Jang, G. C. Shurson, and L. J. Johnston. 2020. Effects of supplementing late gestation sow diets with zinc on pre-weaning mortality of pigs under commercial rearing conditions. *Transl. Anim. Sci.* 4:1-12. doi.org/10.1093/tas/txaa010

Zeng, Z., J. C. Jang, B. J. Kerr, G. C. Shurson, and P. E. Urriola. 2019. In vitro unfermented fiber is a good predictor of the digestible and metabolizable energy content of corn distillers dried grains with solubles in growing pigs. *J. Anim. Sci.* 97:3460–3471. doi: 10.1093/jas/skz221

Saqui-Salces, M., Z. Luo, P. E. Urriola, B. J. Kerr, and G. C. Shurson. 2017. Effect of dietary fiber and particle size on nutrient digestibility and gastrointestinal secretory function in growing pigs. *J. Anim. Sci.* E-2016-1249 doi. 10.2527/jas2016.0947

#### **Other projects of benefit to pork producers funded from other sources:**

Urriola, P. E. 2022. Optimizing resource utilization for future feeds. Evaluation of agricultural resources for optimal upcycling in pigs. *Animal - Science Proceedings*, 13(2), 123–126.  
<https://doi.org/10.1016/j.anscip.2022.03.165>

Hung, Y. T., J. Zhu, G. C. Shurson, P. E. Urriola, and M. Saqui-Salces. 2021. Decreased nutrient digestibility due to viscosity is independent of the amount of dietary fibre fed to growing pigs. *Br. J. Nutr.* 1-27  
doi.org/10.1017/S0007114521000866

- Chen, C., M. Pérez de Nanclares, J. F. Kurtz, M. P. Trudeau, L. Wang, D. Yao, M. Saqui-Salces, P. E. Urriola, L. T. Mydland, G. C. Shurson, and M. Overland. 2018. Identification of redox imbalance as a prominent metabolic response elicited by rapeseed feeding in swine metabolome. *J. Anim. Sci.* 96:1757–1768. doi: 10.1093/jas/sky080
- Chen, H., L. Peng, M. P. De Nanclares, M. P. Trudeau, D. Yao, Z. Cheng, P. E. Urriola, L. T. Mydland, G. C. Shurson, M. Overland, and C. Chen. 2019. Identification of sinapine-derived choline from rapeseed diet as a source of serum trimethylamine N-oxide in pigs. doi: 10.1021/acs.jafc.9b02950
- Jang, J.-C., Z. Zeng, G. C. Shurson, and P. E. Urriola. 2019. Effects of gas production recording system and pig fecal inoculum volume on kinetics and variation of in vitro fermentation using corn distiller's dried grains with solubles and soybean hulls. *Animals* 9:773. doi: 10.3390/ani9100773.

#### **D) Synergistic Activities**

**Education and outreach:** to improve transfer and adoption of research by increasing skills and knowledge among future users. This objective is achieved by use of classroom, online technologies to reach greater target audiences, and organization of conferences.

- **University of Minnesota:** CFANS Graduate students of swine nutrition. Support all activities and be the first in line for questions from students. From Fall 2012 to present.
- **University of Minnesota:** CVM. The major task in CVM is organize in coordination with a committee the Allen D. Leman Swine Conference. Guest lecturer at veterinary student rotations. The objective was to give a brief overview of swine nutrition to veterinary medicine students.

#### **Collaborators:**

UMN: Jennifer Schmitt, Lee Johnston, Bo Hu, Andres Perez, Declan Schroeder, Jennifer van de Ligt, Milena Saqui-Salces, Andres Gomes, Chris Faulk, Erin Cortus, Melissa Wilson, Maria Pieters

Others: Moonn-Suhn Riu (Yonsei University, South Korea), Brian J Kerr (USDA, Ames IA), Margareth Overland (NMBU, Norway).

Pork production companies with past collaborative research: New Fashion Pork (Project on feed additives), Chr Farms (Project on Water Quality), Schwartz Farms (Projects on Zinc for sows).

Allied industry partner in projects: United Soybean Board, Biozyme (PhD and MS student projects), Land O' Lakes Purina (PhD student research projects), Novus International, Qualitech, Zinpro (PhD student and research collaboration in two projects).

PhD thesis advisor: Hans H. Stein (University of Illinois, Urbana IL)  
<https://experts.umn.edu/en/persons/pedro-e-urriola>

**Degrees Held**

Degree	Institution	Year	
D.V.M.	Veterinary Medicine	Iowa State University	1997
Ph.D.	Veterinary Pathology	Iowa State University	2011

**Summary of Career Employment**

- 2021 - present **Professor**, Diagnostic Pathologist, Pathology Section Leader  
Dept. of Vet Diagnostic and Production Animal Medicine (VDPAM) and Veterinary Diagnostic Laboratory (VDL), Iowa State University (ISU), Ames, IA  
Appointment: 20% Research, 15% Instruction, 55% Professional Practice, 10% ISU Service
- 2011 - 2021 **Assistant/Associate Professor**, Diagnostic Pathologist, VDPAM/VDL, ISU
- 2011 - 2016 **Assistant Professor**, Diagnostic Pathologist  
Dept. of Veterinary Diagnostic and Production Animal Medicine, Iowa State University
- 2007 - 2011 **Adjunct Instructor**, Anatomic Pathology Resident  
Department of Veterinary Pathology, Iowa State University, Ames, IA
- 2000 - 2007 **Assistant / Associate Professor**, Animal Health Technology  
Department of Agricultural Sciences  
Kirkwood Community College, Cedar Rapids, IA
- 1997 - 2000 **Associate Veterinarian**, Ottumwa Veterinary Clinic, Ottumwa, IA

**Board Certification**

2010 Diplomat, American College of Veterinary Pathologists (Anatomic Pathology)

**Honors and Awards**

- 2017 - 2018 Iowa State University Emerging Leaders Academy
- 2013 Iowa State University CVM Award for Early Achievement in Research
- 2012 - 2017 Boehringer Ingelheim Vetmedica Professorship in Food Animal Infectious Diseases

**Membership in Professional Societies**

- American College of Veterinary Pathologists (2010-present)
- American Association of Veterinary Laboratory Diagnosticians (2011-present)
- American Association of Swine Veterinarians (2011-present)
- American Veterinary Medical Association (1997-present)

**Invited Presentations (Selected)**

- Annual Meeting of the Midwest Association of Veterinary Pathologists, 2021. *Porcine neurological disease: thinking beyond strep and salt*. August 28, Delivered virtually via Zoom.
- Davis-Thompson Foundation Day Seminar on Pig Diseases (2 hours RACE CE approved), 2020. *Enteric diseases of pigs*. December 15, Delivered virtually via Zoom.
- Annual Veterinary Diagnostics Conference, 2019. *The role of pathology in the diagnosis of veterinary infectious disease*. June 4, Shanghai, China.
- International Pig Veterinary Society Congress, Elanco Satellite Seminar, 2016. *Looking into the future: The ecology and occurrence of porcine enteric pathogens*. June 8. Dublin, Ireland.
- Italian Society of Pig Health Management (SIPAS) Annual Meeting, 2015. *The epidemiology of swine dysentery in the US and recent research in risk factors, diet, and diagnostic assays*. March 19-20. Montichiari, Italy.
- International Conference on Colonic Spirochaetal Infections in Animals and Humans, 2013. *Swine dysentery – Re-emergence in the United States and Canada*. September 5-6. Guildford, UK.

### **Refereed Publications (Selected from 82)**

- De Mille CM, **Burrough ER**, Kerr BJ, Schweer WP, Gabler NK. Dietary pharmacological zinc and copper enhances voluntary feed intake of nursery pigs. *Front Anim Sci* 2022;3:874284.
- Hau SJ, Lantz K, Stuart KL, Sitthicharoenchai P, Macedo N, Derscheid R, **Burrough ER**, Robbe-Austerman S, Brockmeier SL. Replication of *Streptococcus equi* subspecies *zooepidemicus* infection in swine. *Vet Microbiol* 2022;264:109271.
- Chen Y-M, Gabler NK, **Burrough ER**. Porcine epidemic diarrhea virus infection induces endoplasmic reticulum stress and unfolded protein response in jejunal epithelial cells of weaned pigs. *Vet Pathol*; 2022;59(1):82-90.
- Helm ET, **Burrough ER**, Leite FL, Gabler NK. Lawsonia intracellularis infected enterocytes lack sucrose-isomaltase which contributes to reduced pig digestive capacity. *Vet Res* 2021; 52:90.
- Lin J-H, Arruda BL, **Burrough ER**. Alteration of colonic mucin composition and cytokine expression in acute swine dysentery. *Vet Pathol* 2021; 58(3):531-541.
- Helm ET, Gabler NK, **Burrough ER**. Highly fermentable fiber alters fecal microbiota and mitigates swine dysentery during *Brachyspira hyodysenteriae* challenge. *Animals* 2021; 11:396.
- Chen YM, Helm ET, Groeltz-Thrush JM, Gabler NK, **Burrough ER**. Epithelial-mesenchymal transition of absorptive enterocytes and depletion of Peyer's patch M cells after PEDV Infection. *Virology* 2021; 552:43-51.
- Helm ET, Lin J-H, Gabler NK, **Burrough ER**. *Brachyspira hyodysenteriae* infection reduces digestive function but not intestinal integrity in growing pigs while disease onset can be mitigated by reducing insoluble fiber. *Front Vet Sci* 2020; 7:587926.
- Chen YM, Helm ET, Gabler N, Hostetter JM, **Burrough ER**. Alterations in intestinal innate mucosal immunity of weaned pigs during porcine epidemic diarrhea virus infection. *Vet Pathol* 2020; 57(5):642-652.
- Helm ET, Curry SM, De Mille CM, Schweer WP, **Burrough ER**, Gabler NK. Impact of viral disease hypophagia on pig jejunal function and integrity. *PLoS One* 2020; 15(1):e0227265.
- Arruda BL, **Burrough ER**, Schwartz KJ. *Salmonella enterica* I 4,[5],12:i:- associated with lesions typical of swine enteric salmonellosis. *Emerg Infect Dis* 2019; 25(7):1377-1379.
- Burrough ER**, De Mille C, Gabler NK. Zinc overload in weaned pigs: tissue accumulation, pathology, and growth impacts. *J Vet Diagn Invest* 2019; 31(4):537-545.
- Curry SM, Schwartz KJ, Yoon KJ, Gabler NK, **Burrough ER**. Effects of porcine epidemic diarrhea virus infection on nursery pig intestinal function and barrier integrity. *Vet Microbiol* 2017; 211:58-66.
- Burrough ER**: Swine dysentery: etiopathogenesis and diagnosis of a re-emerging disease. *Vet Pathol*; 2017; 54(1):22-31
- Wilberts BL, Arruda PHE, Kinyon JM, Frana TS, Wang C, Magstadt DR, Madson DM, Patience JF, **Burrough ER**. Investigation of the impact of increased dietary insoluble fiber through the feeding of distillers dried grains with solubles (DDGS) on the incidence and severity of *Brachyspira*-associated colitis in pigs. *PLoS ONE* 2014; 9(12): e114741.
- Wilberts BL, Arruda PH, Kinyon JM, Madson DM, Frana TS, **Burrough ER**. Comparison of lesion severity, distribution, and colonic mucin expression in pigs with acute swine dysentery following oral inoculation with "*Brachyspira hamptonii*" or *Brachyspira hyodysenteriae*. *Vet Pathol* 2014; 51(6): 1096-1108.
- Warneke HL, Kinyon JM, Bower LP, **Burrough ER**, Frana TS. Matrix-assisted laser desorption ionization time-of-flight mass spectrometry for rapid identification of *Brachyspira* species isolated from swine, including the newly described "*Brachyspira hamptonii*". *J Vet Diagn Invest* 2014; 26(5): 635-639.
- Burrough ER**, Wilberts BL, Bower LP, Jergens AE, Schwartz KJ. Fluorescent in situ hybridization for detection of "*Brachyspira hamptonii*" in porcine colonic tissues. *J Vet Diagn Invest* 2013;25(3):407-12.
- Burrough ER**, Strait EL, Kinyon JM, Bower LP, Madson DM, Wilberts BL, et al. Comparative virulence of clinical *Brachyspira* spp. isolates in inoculated pigs. *J Vet Diagn Invest* 2012; 24(6): 1025-1034.

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# CATHERINE E. SANDERS

<https://orcid.org/0000-0001-5787-8752> • [Research Gate](#) • [LinkedIn](#) • [Lab Website](#)

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## EDUCATION

- Doctorate of Philosophy**, Agricultural Leadership, Education and Communication May 2023  
*University of Georgia*
- Master of Science**, Agricultural and Extension Education August 2019  
*University of Arkansas*
- Bachelor of Arts**, Spanish, Biology (Minor) May 2017  
*Hendrix College*

## PROFESSIONAL APPOINTMENTS

- Assistant Professor and Extension Specialist of Food Systems Communication** March 2023 - present  
*North Carolina State University*

## SELECTED HONORS & AWARDS

### 2023

- *Journal of Nutrition Education and Behavior*, Editor's Choice Article – Randall, N., **Sanders, C. E.**, Lamm, A. J., & Berg, A. (2023). Qualitative exploration of cultural influence on a rural health promotion initiative. <https://doi.org/10.1016/j.jneb.2022.10.011>
- Georgia Agricultural Experiment Station E. Broadus Brown Research Award for Outstanding Graduate Student Research – Nominee

### 2022

- Distinguished Research Presentation – **Sanders, C. E.**, & Lamm, A. J. (2022, April 4-7). *Poetic transcription for identity exploration: Engaging arts-based analyses for community-based program evaluation*. Association of International Agricultural and Extension Education, Thessaloniki, Greece.
- College of Agricultural and Environmental Sciences Outstanding Graduate Student Scholar Award - Nominee

### 2019

- Bumpers College Distinguished Master of Science Award – Nominee
- Outstanding Departmental M.S. Student for the Department of Agricultural Education, Communications, and Technology at the University of Arkansas

## SELECTED PEER-REVIEWED PUBLICATIONS

- Lamm, K. W., Lamm, A. J., Davis, K., **Sanders, C. E.**, Powell, A., & Park, J. (2023). Development and validation of an empirical instrument to measure professionalization capacity within international extension networks. *Horticulturae*, 9(2), 245. <https://doi.org/10.3390/horticulturae9020245>
- Randall, N. L., **Sanders, C. E.**, Lamm, A. J., & Berg, A. C. (2023). Qualitative exploration of cultural influence on a rural health promotion initiative. *Journal of Nutrition Education and Behavior*. <https://doi.org/10.1016/j.jneb.2022.10.011>
- Gibson, K. E., **Sanders, C. E.**, Lamm, A. J., & Lamm, K. W. (2022). Examining the impact of media use during the COVID-19 pandemic on environmental knowledge and engagement. *Frontiers in Environmental Science*. <https://doi.org/10.3389/fenvs.2022.789361>
- Sanders, C. E.**, & Lamm, A. J. (2022). Artful engagement with the concept of identity: Using poetic transcription to reimagine participant voices. *International Journal of Qualitative Methods*, 21. <https://doi.org/10.1177/16094069221091662>

- Sanders, C. E.,** Gibson, K. E., & Lamm, A. J. (2022). Rural broadband and precision agriculture: A frame analysis of United States federal policy outreach under the Biden administration. *Sustainability*, *14*(1). <https://doi.org/10.3390/su14010460>
- Gibson, K. E., **Sanders, C. E.,** & Lamm, A. J. (2021). News source use and social media engagement: Examining their effects on origin of COVID-19 beliefs when mediated by critical thinking style. *SAGE Open*, *11*(4), 1-12. <https://doi.org/10.1177/21582440211061324>
- Sanders, C. E.,** Mayfield-Smith, K. A., & Lamm, A. J. (2021). Exploring Twitter discourse around the use of artificial intelligence to advance agricultural sustainability. *Sustainability*, *13*, 12033. <https://doi.org/10.3390/su132112033>
- Dobbins\*, C. E.,** Gibson, K. E., & Lamm, A. J. (2021). Promoting environmental communication and policy formation: A utilization-focused evaluation approach. *Environmental Communication*, *15*(7), 857-869. <https://doi.org/10.1080/17524032.2021.1938629>
- Dobbins\*, C. E.,** Edgar, L. D., Dooley, K. E. (2021). Facilitating the scholarship of discovery: Utilizing the mini-ethnographic case study design. *Journal of Experiential Education*, *44*(4), 395-408. <https://doi.org/10.1177/1053825921999685>
- Dobbins\*, C. E.,** Cox, C. K., Edgar, L. D., Graham, D. L., & Philyaw Perez, A. G. (2020). Developing a local definition of urban agriculture: Context and implications for a rural state. *Journal of Agricultural Education and Extension*, *26*(4), 351-364. <https://doi.org/10.1080/1389224X.2020.1726779>
- CONFERENCE PARTICIPATION**
- Sanders, C. E.,** Markosyan, T., & Lamm, A. J. (2023, February). *An Extension needs assessment for improving food access to build resilient rural communities*. [Oral presentation]. Southern Rural Sociological Association, Oklahoma City, OK, USA.
- Sanders, C. E.,** Lamm, A. J., Berg, A. C., Padilla, H. M., Gibson, K. E., Garner, C. T., Hubbard, R., Southall, H., Longenecker, D., Loedding, E., Markosyan, T., Ashley, S., Johnson, L. P., & Davis, M. (2022, November). *Hybrid evaluation approaches for promoting equity in rural obesity interventions*. [Roundtable discussion]. American Public Health Association Annual Meeting, Boston, MA, USA.
- Sanders, C. E.,** Fortner, A. R., Gibson, K. E., Lamm, K. W., & Lamm, A. J. (2022, June 26-30). *Systems thinking hypothetical case scenarios: An innovative teaching method for environmental and natural resource education* [Conference panel discussion]. International Association for Society and Natural Resources International Conference, San José, Costa Rica.
- Sanders, C. E.,** Lamm, A. J., & Borron, A. (2022, May 19-21). *Approaching a preliminary theory of identity-oriented evaluation: A constructivist grounded theory approach* [Conference presentation]. Agriculture, Food, and Human Values Society, Athens, GA, USA.
- Sanders, C. E.,** Fortner, A. R., Gibson, K. E., Lamm, K. W., & Lamm, A. J. (2022, May 16-18). *Teaching systems thinking using hypothetical case scenarios: An exploration in agricultural and natural resource education* [Conference presentation]. American Association for Agricultural Education, Oklahoma City, OK, USA.
- Sanders, C. E.,** Randall, N. L., Lamm, A. J., & Lamm, K. W. (2022, April 4-7). *Utilizing a community capitals framework to evaluate a community-based intervention: Application of the CD+SI toolkit* [Conference presentation]. Association of International Agricultural and Extension Education, Thessaloniki, Greece.
- GRANT PARTICIPATION**
- Sanders, C. E.,** Graduate Assistant. (2018-2023). Center for Disease Control. *Healthier Together: High Obesity Program in Georgia*. CDC High Obesity Program (HOP) Cooperative Agreement # NU58DP006568. \$4,528,885
- Dobbins\*, C. E.,** Graduate Assistant. (2016-2020). United States Department of Agriculture (USDA) National Institute of Food and Agriculture (NIFA). *Higher Education Challenge: Graduate Education at the Nexus of Global Horticulture and Human Nutrition to Enhance Community Resilience and Food Security*. USDA-NIFA Award No.2016-07259. \$750,000.



## **Mark Thomas Knauer**

Associate Professor & Extension Swine Specialist Department of  
Animal Science  
North Carolina State University  
Campus Box 7621; Raleigh NC 27695-7621  
919-515-8797; 919-515-6316 FAX  
mtknauer@ncsu.edu

### **EDUCATION:**

**Doctor of Philosophy**, Animal Science, December 2009; North Carolina State University  
“**Genetics of Gilt Estrous Behavior**” Advisors - M. Todd See and Joe Cassady  
**Master of Science**, Animal Breeding & Genetics, May 2006; Iowa State University  
“**Factors Influencing Sow Longevity**” Advisor - Kenneth J. Stalder  
**Bachelor of Science**, Agriculture Education, August 2002; Iowa State University

### **PROFESSIONAL EXPERIENCE:**

*Associate Professor and Extension Swine Specialist*, July 2017 – present, NCSU, Animal Science Department, Raleigh, NC  
*Assistant Professor and Extension Swine Specialist*, July 2011 – 2017, NCSU, Animal Science Department, Raleigh, NC  
*Director of Animal Science*, April 2010 - June 2011, National Pork Board, Des Moines, IA  
*Postdoctoral Fellow*, January 2010 - April 2010, *Institute for Pig Genetics*, Beuningen, Netherlands  
*Graduate Teaching and Research Assistant*, August 2006 - December 2009, Animal Science Department, North Carolina State University  
*Graduate Teaching and Research Assistant*, August 2003 - May 2006, Animal Science Department, Iowa State University  
*Interim Geneticist*, August 2008 - August 2009, Genetic Improvement Services, Newton Grove, NC  
*Partner*, Knauer Purline Swine, Family operation, youth - present, Avalon, Wisconsin  
*Employee*, August 2001 - January 2004, Gencore Breeder Services, Nevada, Iowa

### **SCHOLARLY AND PROFESSIONAL HONORS:**

2023 Excellence in Innovation Award, North Carolina Pork Council  
2007 National Swine Improvement Federation Outstanding Graduate Student Award 2002  
Academic All-American Division I Wrestling

### **SELECTED PROFESSIONAL SERVICE ROLES:**

National Pork Board Swine Educators Committee  
Swine Educators Executive Committee (2013 – 2018) Swine Educators  
Executive Committee Chair (2015 – 2018)  
National Pork Board Swine Research and Education Experience Grant Reviewer (2014) National Swine  
Improvement Federation; Director (2011 – 2020); Program committee (2012 – present) National Swine Registry;  
Genetic Advisory Committee (2013 – present)  
North Carolina Pork Council Producer Education Committee (2013 – present)  
US Pork Center of Excellence; Statistics domain leader (2011 - 2012); Reproduction domain leader (2012 – present)

### **REFEREED PUBLICATIONS (Selected from a total of 27)**

Nguyen, A., J. Holt, **M. Knauer**, V. Abner, E. Lobaton, and S. Young. Towards rapid weight assessment of finishing pigs using a handheld, mobile RGB-D camera. 2023. *Biosystems Engineering*. 226:155-168  
<https://doi.org/10.1016/j.biosystemseng.2023.01.005>  
Wiegert, J., **M. Knauer**, and S. B. Shah. 2022. Evaporative pad cooling impacts on barn environment and finishing pig performance. *Appl. Eng. Agric.* Vol. 38(2):351-359.  
Harlow, K., A. N. Renwick, S. L. Shuping, J. R. Sommer, C. A. Lents, **M. T. Knauer**, and C. C Nestor. 2021. Evidence that pubertal status impacts kisspeptin/neurokinin B/dynorphin neurons in the gilt. *Biol Reprod*. 105(6):1533-1544.  
Yu, L., S. B. Shah, **M. T. Knauer**, M. D. Boyette, and L.F. Stikeleather. 2021. Comprehensive evaluation of a landscape fabric based solar air heater in a pig nursery. *Energies*. 14:7258.  
See, G., and **M. T. Knauer**. 2019. Associations with four generations of divergent selection for age at puberty in swine. *J. Anim.*

Sci. 97:2320-2328.

**Knauer, M. T.**, and J. Wiegert. 2018. Evaluating replacement gilts for feet and leg soundness. October, 2018. VID 06-02-01. Available at U.S. Pork Center of Excellence - Pork Information Gateway: <https://porkgateway.org/resource/evaluating-replacement-gilts-feet-leg-soundness/>

Putz, A. M., F. Tiezzi, C. Maltecca, K. A. Gray and **M. T. Knauer**. 2017. A comparison of accuracy validation methods for genomic and pedigree-based predictions of swine litter size traits using Large White and simulated data. *J Anim Breed Genet.* 00:1-9.

Putz, A. M., F. Tiezzi, C. Maltecca, K. A. Gray and **M. T. Knauer**. 2015. Variance component estimates for alternative litter size traits in swine. *J. Anim. Sci.* 93:5153-5163.

**Knauer, M. T.**, and D. J. Baitinger. 2015. The sow body condition caliper. *Appl. Eng. Agric.* 31(2):175-178.

**Knauer, M. T.**, C. E. Hostetler. 2013. US swine industry productivity analysis, 2005 to 2010. *J. Swine Health Prod.* 21:248-252.

**Knauer, M.**, K. Stalder, T. Baas, C. Johnson, and L. Karriker. 2012. Physical conditions of cull sows associated with on-farm production records. *Open J. Vet. Med.* 2:137-150.

**Knauer, M. T.**, J. P. Cassady, D. W. Newcom, and M. T. See. 2012. Gilt development traits associated with genetic line, diet and fertility. *Livest. Sci.* 148:159-167.

**Knauer, M. T.**, J. P. Cassady, D. W. Newcom, and M. T. See. 2011. Phenotypic and genetic correlations between gilt estrus, puberty, growth, composition, and structural conformation traits with first litter sow reproductive measures. *J. Anim. Sci.* 89:935-942.

**Knauer, M. T.**, J. P. Cassady, D. W. Newcom, and M. T. See. 2010. Estimates of variance components for genetic correlations among swine estrus traits. *J. Anim. Sci.* 88:2913-2919.

**Knauer, M.**, K. J. Stalder, T. Serenius, T. J. Baas, P. J. Berger, L. Karriker, R. N. Goodwin, R. K. Johnson, J. W. Mabry, R. K. Miller, O. W. Robison, and M. D. Tokach. 2010. Factors associated with sow stayability in six genotypes. *J. Anim. Sci.* 88:3486-3492.

**Knauer, M.**, L. A. Karriker, T. J. Baas, C. Johnson, and K. J. Stalder. 2007. An evaluation of the precision of farm reported data used to make health decisions about sows. *J. Am. Vet. Med. Assoc.* 231:433-436. (Collected data, analyzed data, wrote paper for M.S.)

**Knauer, M.**, K. J. Stalder, L. Karriker, T. J. Baas, C. Johnson, T. Serenius, L. Layman, and J. D. McKean. 2007. A descriptive survey of lesions from cull sows harvested at two Midwestern U.S. facilities. *Prev. Vet. Med.* 82:198-212.

#### **INVITED PRESENTATIONS (Selected from a total of 77)**

**Knauer, M. T.** 2022. Technology to efficiently and effectively evaluate body condition. 2022 Midwest ASAS Billy Day Symposium. March 2022. Omaha, NE.

**Knauer, M. T.** 2022. Manage your sow herd with uniform body-condition technique. 2022 Pork Industry Conference. September 2022. Fort Wayne, IN.

**Knauer, M. T.** 2021. Considerations for producing replacement gilts. 2021 Leman China Conference. October 2021. Online.

**Knauer, M. T.** 2019. Technologies to measure sow condition. Manitoba Swine Seminar. February 2019. Winnipeg, Manitoba.

**Knauer, M. T.** 2019. The sow caliper - a paradigm change in sow management. XI FARM FAES Swine Nutrition Forum. May, 2019. Madrid, Spain.

**Knauer, M. T.** 2018. Sow body condition for breeding success. London Swine Conference. March 2018. London, Ontario.

**Knauer, M.** 2018. Technologies to enhance sow farm/system profit. APC Swine Industry Advisory Meeting - Sow Focus. April 2018. Ankeny, IA.

**Knauer, M. T.** 2018. The sow caliper – a paradigm shift in sow gestation management. Solla S. A. Conference. June 2018. Medellin, Colombia.

**Knauer, M. T.** 2018. Body condition management. 2018 PIC Nutrition Seminar. August 2018. Des Moines, IA.

**Monique D Pairis-Garcia, BS, DVM, PhD, DACAW**  
**Associate Professor; Global Production Animal Welfare**  
**Department of Population Health and Pathobiology,**  
**1060 William Moore Drive, Raleigh, NC 27607**  
**North Carolina State University**  
**Phone: (919) 513-7720 Email: [pairis-garcia@ncsu.edu](mailto:pairis-garcia@ncsu.edu)**

### **Appointments**

July 2019- Present Associate Professor- Global Production Animal Welfare. North Carolina State University, College of Veterinary Medicine, Population Health and Pathobiology, Raleigh, North Carolina, United States

April 2018 – June 2019 Assistant Professor- Courtesy appointment. The Ohio State University, College of Veterinary Medicine, Veterinary Preventive Medicine, Columbus, Ohio, United States

August 2014- June 2019 Assistant Professor- Animal Welfare and Behavior. The Ohio State University, College of Food, Agricultural, and Environmental Sciences, Animal Sciences, Columbus, Ohio, United States

### **Degrees**

May 2014 PhD, Iowa State University, Animal Physiology

May 2011 DVM, Cum Laude, Iowa State University

May 2007 BS, Grinnell College, Biology

### **Awards**

July 2019 ADSA/ASAS- Outstanding Young Extension Award

September 2017 American College of Animal Welfare Foundation Scholarship

April 2017 James Siddens Award for Faculty Advising

### **Certifications**

July 2018- Present Diplomate: American College of Animal Welfare Board Certification

May 2016 - Present Meat Plant Welfare Auditor: Professional Animal Auditors Organization PAACO

May 2016 - Present Swine Welfare Auditor: Professional Animal Auditors Organization PAACO

### **Peer-Reviewed Journal Articles (selected)**

1. **Pairis-Garcia, MD**, Johnson, AK, Millman, ST, Stalder, KJ, Karriker, LA, "Effects of yohimbine, an alpha 2-antagonistic reversal agent, on physiological recovery parameters of anesthetized sows". Journal of Swine Health and Production. Vol. 22, no. 1: 16-23. 2014.
2. **Pairis-Garcia, MD**, Johnson, AK, Bates, JL, Stock, ML, Barth, LA, Brommel, AS, Stalder, KJ, Karriker, LA, "Development and refinement of a technique for short-term intravascular auricular vein catheter placement in mature sows". Laboratory Animals. Vol. 48, no. 1: 78-81. 2014.

3. Mullins, CR, **Pairis-Garcia, MD**, George, K, Anthony, R, Johnson, AK, Coleman CJ, Rault, J-L, Millman, ST, "Determination of swine euthanasia criteria and analysis of current approaches to on-farm euthanasia decision-making aids in the United States using expert opinion". *Animal Welfare*. 26: 449-459. 2017
4. Mullins, CR, **Pairis-Garcia, MD**, Campler, MR, Anthony, R, Johnson, AK, Coleman CJ, Rault, J-L, " Teaching Tip: The development of an interactive computer-based training program for timely and humane on-farm pig euthanasia". *Journal of Veterinary Medical Education*.5: 1-8. 2018
5. Campler, MR, **Pairis-Garcia, MD**, Rault JL, Coleman, G, Arruda AG, "Caretaker attitudes towards swine euthanasia". *Translational Animal Science*. 2(3): 254-262. 2018
6. Campler, MR, Pairis-Garcia, MD, Arruda, AG, Rault JL, Coleman G. "Interactive euthanasia training program for swine caretakers; a pilot study on program implementation and perceived caretaker knowledge". 2020 *Journal of Swine Health and Production*. In press.

### **Research Funding (selected)**

11/2014. Optimizing on-farm management of non-infectious sow lameness during the farrowing and lactation period. National Pork Board. (\$71,989, Total Award)  
**PI: MD Pairis Garcia**; Co-I: AK Johnson, KJ Stalder

12/2014. Validating postures to assess drug efficacy in lame sows. National Pork Board. (\$5,000, Total Award) **PI: MD Pairis-Garcia**

08/2015. Development of an interactive training app for timely and humane on-farm euthanasia in pigs. National Pork Board. (\$182,695, Total Award)  
**PI: MD Pairis-Garcia**; Co-I: JL Rault, G Coleman, AK Johnson, ST Millman, R Anthony, K George

05/2017. Piglet training and self-medication. Swine Research and Education Experience, National Pork Board and US Pork Center of Excellence. (\$5,000, Total Award)  
**PI: MD Pairis-Garcia**

06/2017. Timely on-farm euthanasia of cattle: Exploring caretaker decision-making and training methods. U.S. Department of Agriculture, Agriculture and Food Research Initiative; Animal well-being. (\$499,999, Total Award)  
**PI: MD Pairis-Garcia**; Co-I: K Proudfoot, J Shearer, A Diestch

08/2018. Identifying barriers and implementing solutions to practical on-farm pain management during castration. National Pork Board. (\$49,050, Total Award)  
**PI: MD Pairis-Garcia**; Co-I: K Royal

07/2019. Validation of scan sampling techniques for pain behaviors in castrated piglets. (\$41,564, Total Award)  
**PI: MD Pairis-Garcia**; Co-I: MC Cramer, J Coetzee, A Viscardi

01/2020. Identifying practical pharmaceutical approaches to mitigate castration pain on commercial swine farms. Veterinary Pharmacology Research Foundation (\$29,992, Total Award).  
**PI: MD Pairis-Garcia**; Co-I: R Baynes, K Messenger, RM Park, E Nixon, B Wagner

## BIOGRAPHICAL SKETCH

**NAME:** Almond, Glen William

**ORCID:** 0000-0003-3210-6718

**POSITION TITLE & INSTITUTION:** Professor, Pig Health & Production, College of Veterinary Medicine, North Carolina State University

### (a) PROFESSIONAL PREPARATION

INSTITUTION	LOCATION	MAJOR/AREA OF STUDY	DEGREE	YEAR
Univ. of Guelph	Guelph, Can.	Wildlife Biology	B.Sc.	1976
Ont. Vet. College	Guelph, Can.	Veterinary Medicine	D.V.M.	1980
Ont. Vet. College	Guelph, Can.	Reprod. Physiology	M.Sc.	1983
NC State Univ.	Raleigh, NC	Reprod. Physiology	Ph.D.	1988

### (b) APPOINTMENTS

2008 – present	Profesor Vistante. Facultad de Ciencias Veterinarias. Departamento de Salud Pública y Patobiología de la Escuela de Medicina Veterinaria. Universidad de Concepción. Chillán, Chile
2010	Visiting Scientist. Institut National de la Recherche Agronomique.
1998 – present	Visiting Professor. Ecole Nationale Vétérinaire de Toulouse. Toulouse France
1998 – present	Professor. Pig Health & Production Medicine, Department of Population Health & Pathobiology, College of Veterinary Medicine, North Carolina State University.
1995 – present	Associate Faculty Member. Department of Animal Science. College of Agriculture & Life Sciences, North Carolina State University.
1991 – 1998	Associate Professor. North Carolina State University.
1988 - 1991	Assistant Professor. North Carolina State University.
1987 - 1988	Visiting Assistant Professor. North Carolina State University.
1984 - 1987	Graduate Research Assistant. North Carolina State University.
1983 - 1984	Large Animal Veterinarian. Lethbridge Animal Clinic. Lethbridge, Alberta, Canada.
1982 - 1983	Graduate Research Assistant. Ontario Veterinary College, Guelph, Canada.
1982 - 1983	Ontario Ministry of Agriculture & Food. SPF Swine Monitoring Program. (Part-time).
1980 - 1982	Large Animal Veterinarian, Lethbridge Animal Clinic, Lethbridge, Canada.

### (c) PRODUCTS

1. Muro BBD, Carnevale RF, Andretta I, Leal DF, Monteiro MS, Poor AP, Almond GW, Garbossa CAP, Effects of uterotonics on farrowing traits and piglet vitality: a systematic review and meta-analysis, *Theriogenology*, <https://doi.org/10.1016/j.theriogenology.2020.12.003>.
2. Muro BBD, Leal DF, Carnevale RF, Torres MA, Mendonça MV, Nakasone DH, Martinez CHG, Ravagnani GM, Martins SMMK, Viau P, Oliveira CA, Castro RVG, Bessi BW, Bressan FF, Pulz LH, Strefezzi RF, Almond GW, de Andrade AFC. Altrenogest supplementation during early pregnancy modulates uterine glandular epithelium and endometrial growth factor expression at the time implantation in pigs. *Animal* 14(6):1234-1240. 2020.
3. Castevens K, Bonin Ferreira J, Almond GW. Anemia in the sow: Influence of parity and reproductive stage. *J Swine Health & Prod.* 28(5):254-257. 2020.
4. Oliveira RA, Neves JS, Castro DS, Lopes SO, Santos SL, Silva SVC, Araujo VO, Vieira MFA, Muro BBD, Leal DF, Carevale R, Almond GW, Garbossa CAP. Supplying sows extra energy around parturition improves farrowing kinetics, newborn piglet performance and sow behavior. *Animal.* 2020;11; 2271–2276. <https://doi.org/10.1017/S1751731120001317>
5. Kick AR, Amaral AF, Cortes LM, Fogle JE, Almond GW, Käser T. The T-cell response to type-2 porcine reproductive and respiratory syndrome virus (PRRSV). *Viruses* 2019, 11, 796; doi:10.3390/v11090796

6. Fogle JE, Scott JA, Almond GW. Immuno-modulatory influence of antibiotic therapy on the humoral immune response to vaccination in weaned pigs. *Vet Sci.* 6: 2019.
7. Leal DF, Garbossa CAP, Muro BBD, Almond GW, Viana CHC, Vioti G, Carevale R, Nichi M. The effect of post-insemination feed allowance on swine embryonic survival: A systematic review. *Anim Reprod Sci.* 205:70-77. 2019
8. Moran K, Klis JD, Almond G, van Heugten E. Evaluation of essential oils and short-medium chain fatty acids in vitro and in-vivo on performance of nursery pigs. *J Animal Sci* 97:207. 2019.
9. Almond GW, Boyer PE, Byers E, Seate J. Supplemental iron dextran injections: influence on hemoglobin concentrations and piglet growth. *Journal of Swine Health & Production.* 25:308-312, 2017.
10. Rochon K, Baker RB, Almond GW, Gimeno IM, Perez de Leon AA, Watson DW. Persistence and retention of porcine reproductive and respiratory syndrome virus in *Stomoxys clacitrans*. *J Med & Vet Entomol.* 52(5):1117-1123. 2015.
11. Hough S, Jennings SH, Almond GW. Thiamine responsive neurological disorder of swine. *Journal of Swine Health & Production.* 23:143-151, 2015.
12. Fuscso WG, Choudhary N, Routh PA, Ventevogel MS, Almond GW, Orndorff PE, Sempowski GD, Leduc I. *Haemophilus ducreyi* trimeric autotransporter DsrA is an effective vaccine in the experimental swine model of chancroid. *Vaccine.* 32(30):3752-3758, 2014.
13. Boyer P, Almond GW. Use of altrenogest (Matrix™) at weaning in primiparous sows: effect on the following parity. *Journal of Swine Health & Production* 22:134-137, 2014.

#### **(d) SYNERGISTIC ACTIVITIES**

Currently serve on several international review boards including:

- Invited Reviewer for Innovation Fund Denmark. State of Green Vesterbrogade 1E DK – 1620 Copenhagen, Denmark. Reviewer for the Christian Doppler Forschungsgesellschaft/Research Association. Austria.
- Eurostars-Experts – Eureka Technical Review Program.
- Journal of Swine Health and Production – Editorial Board.
- Ontario Ministry of Agriculture, Food and Rural Affairs – University of Guelph Research Program.

Major advisor or committee member for 68 graduate students, mentor for 41 veterinary students since 2005, and served as faculty member for 14 junior faculty members.

Presented over 118 invited scientific/professional presentations in several countries, co-authored 20 book chapters/books, and gave over 80 continuing education presentations.

**Name:** William Lucas Flowers

**Position Title:** William Neal Reynolds Distinguished and  
Alumni Distinguished Professor of Animal  
Animal Science & Physiology

## **EDUCATION**

B.S., Animal Science	1982	Virginia Tech
M.S., Animal Science	1984	University of Missouri
Ph.D., Animal Science	1987	University of Missouri

## **PROFESSIONAL EXPERIENCE**

1987-1992 Assistant Professor, Department of Animal Science, North Carolina State University  
1993-1998 Associate Professor, Department of Animal Science, North Carolina State University  
1999-present Professor, Department of Animal Science, North Carolina State University  
(60% Teaching / 40% Research)

## **SCHOLARLY & PROFESSIONAL HONORS (Selected from 141)**

National Pork Board Distinguished Service Award, 2019  
Associate Editor, Reproduction in Domestic Animals, 2019 – present  
Diplomate, American College of Animal Sciences, Animal Physiology, ARPAS, 2018 - present  
American Society of Animal Science Distinguished Teacher Award, 2017  
William Neal Reynolds Distinguished Professor, North Carolina State University, 2015 – present  
Editorial Board, Domestic Animal Endocrinology, 2014 - present  
Swine Industry Master, National Hog Farmer, 2011  
Organizing Committee, International Conference on Pig Reproduction, 2009 – present  
U.S.D.A. Food and Agricultural Sciences Excellence in Teaching Award, 2005  
Editorial Board, Animal Reproduction Science, 2005 - present  
Panel Manager, USDA-SBIR Program, Animal Production and Protection, 2002  
Alumni Distinguished Professor, North Carolina State University, 1999 - present  
N.P.P.C. Research Award, Southern Section, American Society of Animal Science, 1996

## **TEACHING RESPONSIBILITIES**

ANS 105 – Swine Production and Management	4 credits
ANS 150/151 - Introduction to Animal Science Lecture and Laboratory	4 credits
ANS 262 – Swine Breeding and Gestation Management (Swine On-Line)	2 credits
ANS 403 – Swine Production	3 credits

## **RESEARCH ACCOMPLISHMENTS**

Artificial insemination, semen quality standards, and management of boars  
Real-time ultrasonography for pregnancy diagnosis in swine  
Neonatal management of gilts and boars for lifetime productivity

### **PEER REVIEWED PUBLICATIONS (Selected from a total of 225)**

- Flowers, W.L. 2021. Factors affecting production of quality ejaculates in boars. *Anim. Reprod. Sci.* <https://doi.org/10.1016/j.anireprosci.2021.106840>.
- Flowers, W.L. 2019. Reproductive management of swine. In: *Animal Agriculture: Sustainability, Challenges and Innovations*, F.W. Bazer, G.C. Lamb, and G.Wu (eds). Elsevier, Amsterdam, The Netherlands, pp. 283- 298.
- Knox, R.V., Stewart, K.R., Flowers, W.L., Swanson, M.E., Webel, S.K., and Kraeling, R.R. 2017. Design and biological effects of GnRH as an in situ gelling vaginal formulation for ovulation induction in swine. *Theriogenology* 112, 44 - 52.
- Flowers, W.L. 2015. Factors affecting the efficient production of boar sperm. *Reprod. Dom. Anim.* 50(suppl. 2), 25-30.
- Parrish, J.J., Smith, M.F., Geisert, R.D., Davis, D.L., Wilson, M.E. and Flowers, W.L. 2015. How to communicate with undergraduate students that lack an animal science or agricultural background. *Animal Frontiers* 5, 54-59.
- Flowers, W.L., Stewart, K.R., Gall, T., Novak, S., Dyck, M.K., and Kirkwood, R.N. 2013. Boar seminal plasma proteins and their relevance to reproductive technologies. In: *Control of Pig Reproduction IX*, H. Rodriguez- Martinez, N. Soede, W.L. Flowers (eds.). Context Publishing, Ltd., Nottingham, U.K., pp. 33-45
- Flowers, W.L. 2013. Sperm characteristics that limit success of fertilization. *J. Anim. Sci.* 91, 3022-3029. Flowers, W.L. 2009. Selection for boar fertility and semen quality – the way ahead. In: *Control of Pig Reproduction VIII*, H. Rodriguez-Martinez, A.J. Ziecik, J. Vallet (eds.). University of Nottingham Press, Nottingham, U.K., pp. 67-78.
- Flowers, W.L. 2008. Genetic and phenotypic variation in reproductive traits of A.I. boars. *Theriogenology* 70, 1297-1303.

### **INVITED PRESENTATIONS (Selected from a total of 307)**

- Flowers, W.L. 2023. Litter of origin and lifetime productivity in sows and boars. 11<sup>th</sup> International Conference of Pig Reproduction. Ghent, Belgium.
- Flowers, W.L. 2019. Managing sows and boars for lifetime productivity: Recent developments in reproduction and A.I. Ensminger International Swine Conference, Johannesburg, South Africa
- Flowers, W.L. 2019. Neonatal management and sow longevity. London Swine Conference, London, Ontario, Canada
- Flowers, W.L. 2019. Trouble shooting reproductive problems using records and observations. London Swine Conference, London, Ontario, Canada
- Flowers, W.L. 2016. Gilt Management – Birthweight Influence on Lifetime Reproductive Performance. At the Meeting with the Morrison Group. Truffle Media.  
<http://www.swinecast.com/swinecast-0929-atm-gilt-managemen-series-episode-one-birthweight-influence-lifetime-reproductive-performance>
- Flowers, W.L. 2016. Recent advances in boar management. Physiology Symposium, ASAS Midwest Section Annual Meeting, Des Moines, IA

### **PROFESSIONAL ORGANIZATIONS**

American Society of Animal Science



American Registry of Professional Animal Scientists

**Suzanne M. Leonard, PhD**  
ORCID: 0000-0003-3808-8469

**Education**

North Carolina State University	Biological Engineering	BS, 2016
Iowa State University	Agricultural Engineering	PhD, 2020

**Professional Experience**

Dec 2020 – present	Assistant Professor Department of Animal Science North Carolina State University, Raleigh, NC
May 2020 – Dec 2020	Postdoctoral Research Assistant Agricultural and Biosystems Engineering Department Iowa State University, Ames, IA
June 2016 – May 2020	Graduate Research Assistant Agricultural and Biosystems Engineering Department Iowa State University, Ames, IA

**Select Honors**

- 2020 American Society of Agricultural and Biological Engineers Boyd Scott Award, 2<sup>nd</sup> Place
- 2019 Iowa State University Research Excellence Award

**Teaching Experience**

- Instructor of record, Precision Livestock Farming Systems, ANS 495/590. North Carolina State University. 3 cr undergraduate/graduate
- Instructor of record, Agricultural and Life Sciences Honors Seminar, ALS 398. North Carolina State University. 2 cr undergraduate

**Synergistic Activities**

- Currently serving Animal Science students as major professor for 1 MAS, 1 MS, and co-major professor for 1 PhD student; committee member for 1 PhD student
- Mentored 9 undergraduate research assistants
- Project advisor for Biological and Agricultural Engineering Senior Design Team
- American Society of Agricultural and Biological Engineers (ASABE) Plant, Animal, and Facility Systems (PAFS-40) - Chair (2022-23)
- Assistant Guest Editor, *AgriEngineering*, Special Issue of Ventilation in Agricultural Structures (2021)
- Journal Reviewer: Transactions of the ASABE, International Journal of Agricultural and Biological Engineering, Applied Engineering in Agriculture

**Professional Membership**

- American Society of Agricultural and Biological Engineers
- American Society of Animal Science
- North Carolina Association of Cooperative Extension Specialists

**Grants Received**

1. Leonard, S.M. Developing ventilation teaching tools for swine producers. US Pork Center of

- Excellence. \$5,000. 08/2022-05/2023.
2. Knauer, M.T., Leonard, S.M. Cross training animal science students in engineering. National Pork Board. \$60,000. 05/2022-04/2024.
  3. Leonard, S.M., Knauer, M.T., Almond, G.W. Impact of finishing facility environment on feed efficiency. National Pork Board. \$80,509. 07/2021-06/2024.
  4. Shah, S., Knauer, M.T., Leonard, S.M., Saveliev, A. Proof-of-concept cooling mat to improve sow welfare and performance. \$25,000. 02/2022-09/2023.
  5. Leonard, S.M. Evaluating UHF RFID as a research and management tool for swine producers. NC Agricultural Foundation, Inc. \$15,496. 07/2022-12/2023.
  6. Leonard, S.M., and van Heugten, E. Investigating tail biting causes in grow-finish swine. NCSU Animal Health and Nutrition Consortium. \$28,800. 07/2021-06/2022.
  7. Leonard, S.M. Evaluation of stall width on sow space usage and turning. NC Agricultural Foundation, Inc. \$26,570. 07/2021-06/2023.
  8. Leonard, S.M. Testing a computer vision system for automatically detecting piglet interbirth interval. U.S. Pork Center for Excellence. \$4,999. 09/2021-05/2022.

### Refereed Publications

1. Boston TE, Wang F, Xi L, Leonard SM, Kim SW, McKilligan D, Fellner V, Odle J. (2022). Gruel creep feeding accelerates growth and alters intestinal health of young pigs. *Animals*. 12(18), 2408. doi: 10.3390/ani12182408.
2. Ramirez, B.C., Hayes, M.D., Condotta, I.C.F.S., Leonard, S.M. (2022). Impact of housing environment and management on pre-/post-weaning piglet productivity. *Journal of Animal Science*. 100(6):1-12. doi: 10.1093/jas/skac142
3. Leonard, S.M., Xin, H., Ramirez, B.C., Brown-Brandl, T.M., Johnson, A.K., Dutta, S. (2021). Effects of farrowing stall layout and number of heat lamps on sow and piglet behavior. *Applied Animal Behavior Science*. 105334. doi: 10.1016/j.applanim.2021.105334
4. Leonard, S.M., Xin, H., Ramirez, B.C., Stinn, J.P., Dutta, S., Liu, K., Brown-Brandl, T.M. (2021). Static and dynamic space usage of late gestation sows. *Transactions of the ASABE*. 64 (1):151-159. doi: 10.13031/trans.14002
5. Leonard, S.M., Xin, H., Brown-Brandl, T.M., Ramirez, B.C., Dutta, S., Rohrer, G.A. (2020). Effects of farrowing stall layout and number of heat lamps on sow and piglet productivity. *Animals*. 10(2):348. doi: 10.3390/ani10020348
6. Leonard, S.M., Xin, H., Brown-Brandl, T.M., Ramirez, B.C. (2019). Development and application of an image acquisition system for characterizing sow behaviors in farrowing stalls. *Computers and Electronics in Agriculture*. doi: 10.1016/j.compag.2019.104866

### Select Conference Presentations

1. Hodges, R.N., Leonard, S.M. (2023). Feasibility of a UHF RFID system to identify nursery pigs moving through a doorway. 2<sup>nd</sup> U.S. Precision Livestock Farming Conference. Knoxville, TN.
2. Martinez, G., Leonard, S.M., Rosero, D., Wilcock, P., van Heugten, E. (2023). Impact of amount and solubility of dietary fiber fed during late gestation and during the pre-farrowing period on sow serum chemistry and piglet vitality index. American Society of Animal Science Midwest Section Meeting, Madison, WI.
3. Kittle, O.J., Leonard, S.M., Knauer, M.T., Almond, G.W. (2023). Comparison of ammonia concentrations between flush and pull-plug waste management systems in wean-finish barns. American Society of Animal Science Southern Section, Raleigh, NC. Presentation 6.
4. Peppmeier, Z.C., Leonard, S.M., Knauer, M.T. (2023). Effect of temperature and humidity on daily feeding behavior in swine. American Society of Animal Science Southern Section, Raleigh, NC. Presentation 181.

# Christian Maltecca, Ph.D.

Suite 251 Polk Hall Campus box 7621  
Raleigh 27695 North Carolina, USA  
Voice: +1 919-515-0812  
e-mail: cmaltec@ncsu.edu

## Education background:

2008 University of Wisconsin-Madison Ph.D. Dairy Science.  
2005 Università degli studi di Milano Ph.D. Animal Science  
2000 Università degli studi di Milano BSc Animal Science

## Professional experience:

2021– CSIRO Brisbane McMaster Fellow visiting scientist  
2019 – Present North Carolina State University, Professor, Department of Animal Science  
2017 – Present CGIL. University of Guelph (CAN), Adjunct Faculty  
2017 – Present North Carolina State University, Member of Bioinformatic Research Program  
2015 – Present North Carolina State University, Member of Comparative Medicine Institute  
2015 – Present North Carolina State University, Member of Genetics Genomics Academy  
2014 Dep. of Economic Development, Jobs, Transport and Resources (AUS) Visiting Scientist  
2014 –2019 North Carolina State University, Associate Professor, Department of Animal Science  
2008 – 2014 North Carolina State University, Assistant Professor, Department of Animal Science  
2003 – 2008 University of Wisconsin-Madison Research Assistant, Dairy Science Department.  
2000 – 2003 Università degli studi di Milano Research Assistant, VSA Department.

## Membership in professional organizations:

2006–Present Member American Society of Dairy Science (ADSA)  
2009–Present Member American Society of Animal Science (ASAS)  
2002–2009 Member Italian Society of Animal Science (ASPA)

## Scholarly and professional honors:

2022 LeClerg Rotary Lecture University of Maryland  
2021 Recipient of the Rockefeller Prentice Award in Animal Breeding  
2020 Recipient of the J.L Lush Award in Animal Breeding  
2020 Recipient of the NCSU CALS Outstanding Graduate Teacher Award  
2021 Recipient of the CSIRO (AUS) McMaster Fellowship  
2017-present Appointed adjunct faculty at U. of Guelph, 2017-present  
2015-present North Carolina State University. University Faculty Scholar  
2010 Appointed as Full member of the NCSU Graduate Faculty  
2009-present Adjunct member of the PhD school of Animal Science University of Padova (Italy)  
2009-present Adjunct member of the PhD school of Animal Science University of Milan (Italy)

Activity	Total
Supervision of post-doctoral scholars	4
PhDs completed	8
PhDs in progress	2
PhDs completed as Committee Member	13
PhDs in progress as committee member	8
Masters completed	2
Masters in progress	1
Masters completed as Committee Member	6
Supervision of visiting graduate students from other institutions	12 (from 9 institutions)
Invited Talks and Seminar	57 (32 International)
Books and books Chapters	6
Refereed Journal Articles	128
Proceeding Papers	12
Abstracts	>120

## Courses taught:

*Genetic Data analysis for Animals and Plants (short course):*  
2019 (Italy); 2017 (Canada); 2014 (Sweden); 2012 (Czech Republic); 2010 (United States)  
*Introduction to R for animal Breeders (short course)*  
2009 (Italy)  
*Quantitative genetics and Breeding (2009-2022)*

*Linear Mixes Models* (2010-2015)  
*Genetic Data analysis for Animals and Plants* (2016-2022)  
*Growth and Development of domestic animals* (2010-2020)

**Professional service (last 5 years):**

Member of the DSEC group, NAAB.

Member of the genetic evaluation methods group, Council of Dairy Cattle Breeding USA (Chair).

Member of the genetic advancement committee, Holstein Association USA.

Scientific advisory Board DNA Genetics.

Chair of Annual Meeting Symposia Program Committee for the Association of Dairy Science national meeting ADSA 2018

Chair of six animal breeding and genetics sessions for the Association of Dairy Science national meeting ADSA 2016-2018

Member of the Joint Annual Meeting Symposia Program Committee for the National Joint annual meeting of ADSA and ASAS 2016-2018

**Funding:**

**Ongoing**

2023-2026 Understanding the role of the genome, microbiome, and epigenome on the transgenerational effects of in utero heat stress in pigs. **USDA NIFA. PI. \$650,000**

2023-2026 A Unified Mixed-Model Method for Integrating Functional Annotations into Genome-to-Phenome Analysis. **USDA NIFA. CO-I. \$300,000**

2022-2023 Methods & Model Comparisons for Genomic Selection in Auto-Tetraploid Chipping Potato. Pepsico. **PI. \$76,000.**

2022-2025 Elucidating the biology of sow tolerance to heat stress at the intersection of the genome, microbiome and metabolome **USDA NIFA. PI. \$650,000**

2021-2022 Microbiome Characterization of the Sow-piglet Relationship. Elanco. **PI. \$60,094**

2022-2026 Optimizing Breeding Strategies for Native Korean Pigs at the Interface Between Host Genome and Its Microbiome. **NIAS. PI. \$552,000**

2021-2023 Genetic Mechanism of Reproductive Heterosis in Dairy Cattle. USDA NIFA. **PI (Subcontract) \$47,714.**

2021-2023 Big-data Genomic Investigation to Improve Dairy Cattle Health. USDA NIFA. **PI (Subcontract). \$71,529.**

2020-2023 Genomic Breeding Strategies to Preserve Genetic Diversity and increase robustness. Select Sires. **PI. \$105,000**

**Completed**

Twenty-two grants for a total of **\$1,639,455**

**Gift and Miscellaneous**

2010-2022 **>\$1,200,000** from various sources.

**Mahmoud Sharara, Ph.D.** Curriculum Vitae (2-page)

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Assistant Professor  
Biological and Agricultural Engineering  
Department (BAE)  
North Carolina State University  
202 Weaver Administration  
Raleigh, NC 27695-7625

Tel: (b) (6)  
E-mail: [m\\_sharara@ncsu.edu](mailto:m_sharara@ncsu.edu)

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**EDUCATION**

- 
- |   |                    |
|---|--------------------|
| <b>Ph.D., Biological and Agricultural Engineering</b>   | <b>May 2015</b>    |
| University of Arkansas - Fayetteville   |                    |
| Dissertation title: <i>Transformation of Swine Manure and Algal Consortia to Value-Added Products</i> |                    |
| <b>M.S., Biological and Agricultural Engineering</b>  | <b>August 2010</b> |
| University of Arkansas - Fayetteville   |                    |
| Thesis title: <i>Biodrying-gasification of dairy manure-wheat straw mixture</i>                       |                    |
| <b>B.Sc., Agricultural Engineering</b>  | <b>May 2003</b>    |
| Faculty of Agriculture, Alexandria University, Egypt  |                    |

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**PROFESSIONAL EXPERIENCE**

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- |   |                            |
|---|----------------------------|
| <b>Assistant Professor &amp; Extension Specialist</b> , Animal Waste Management<br>Biological & Agricultural Engineering Department, North Carolina State<br>University (NCSU), Raleigh, NC | <b>Aug 2018 – Present</b>  |
| <b>Assistant Research Scientist</b> , Agricultural Waste Management<br>Biological Systems Engineering Department,<br>University of Wisconsin-Madison  | <b>May 2015 – Aug 2018</b> |
| <b>Graduate Research Assistant</b> , Biological and Agricultural Engineering<br>Department, University of Arkansas - Fayetteville   | <b>Jan 2008 – May 2015</b> |
| <b>Teaching Assistant</b> , Agricultural Engineering<br>Faculty of Agriculture, Alexandria University, Egypt  | <b>Sep 2004 – Jan 2008</b> |

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**GRANTS**

- **FACT: Pigs, Poultry, the Planet, and Data-driven Problem Solving (P4)**, U.S. Dept. of Agriculture (USDA) - National Institute of Food and Agriculture (2/15/19 - 2/14/24).
  - **CARE: Improving Lagoon Sludge Management in Lagoon-Sprayfield Swine Production Facilities**, U.S. Dept. of Agriculture (USDA) - National Institute of Food and Agriculture (7/01/19 - 6/30/22)
  - **A Framework to Enhance North Carolina Natural Resources Through Sustainable Manure Nutrient Cycling and Export** – N.C. Department of Justice (1/1/2022 – 12/31/2024)
  - **Removing Ammonia Contamination from Biogas Feedstock**, U.S. Department of Energy (DOE) (8/27/21 – 8/26/23)
  - **Optimizing Greenhouse Drying of Swine Lagoon Sludge to Support Implementation in NC and VA** - Virginia Pork Council (VPC) (4/15/2021 – 10/14/2022)
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**STUDENT MENTORING** I currently serve on or previously served as major or active committee member for 11 graduate MS and PhD program at North Carolina State University. I

am also research mentor for 3 Senior Design teams (2021, and 2022) and four (4) undergraduate funded projects.

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### **SELECT RECENT PUBLICATIONS**

- Patil, P. S., & **Sharara, M.** (2022). Impacts of sonication on biomethane potential (BMP) and degradation kinetics of pig lagoon sludge. *Biosystems Engineering*, 223, 129-137.
- Graves, C., Kolar, P., Shah, S., Grimes, J., & **Sharara, M.** (2022). Can Biochar Improve the Sustainability of Animal Production?. *Applied Sciences*, 12(10), 5042.
- Sharara, M.**, Kolesch, R.K., Cortus, E.L., Larson, R.A., Classen, J.J. and Janni, K.A., 2022. Addressing Nutrient Imbalance in Animal Agriculture Systems. *Journal of the ASABE* (2022): 0.
- Montefiore, L. R., Nelson, N. G., Dean, A., & **Sharara, M.**, 2022. Reconstructing the historical expansion of industrial swine production from Landsat imagery. *Scientific Reports*, 12(1), 1-12.
- Harris, A.R., Fidan, E.N., Nelson, N.G., Emanuel, R.E., Jass, T., Kathariou, S., Niedermeyer, J., **Sharara, M.**, de los Reyes III, F.L., Riveros-Iregui, D.A. and Stewart, J.R., 2021. Microbial Contamination in Environmental Waters of Rural and Agriculturally-Dominated Landscapes Following Hurricane Florence. *ACS ES&T Water*.
- Deviney, A., Classen, J., Bruce, J., & **Sharara, M.** (2021). Sustainable Swine Manure Management: A Tale of Two Agreements. *Sustainability*, 13(1), 15.
- Owusu-Twum, M. Y., & **Sharara, M. A.** (2020). Sludge management in anaerobic swine lagoons: A review. *Journal of Environmental Management*, 271, 110949.
- Sharara, M.**, Sahoo, K., Reddy, A. D., Kim, S., Zhang, X., Dale, B.....& Runge, T. M. (2020). Sustainable feedstock for bioethanol production: Impact of spatial resolution on the design of a sustainable biomass supply-chain. *Bioresource technology*, 302, 122896.
- Sharara, M.**, Kim, D., Sadaka, S., & Thoma, G. (2019). Consequential Life Cycle Assessment of Swine Manure Management within a Thermal Gasification Scenario. *Energies*, 12(21), 4081.
- Sharara, M. A.**, Runge, T., Larson, R., & Primm, J. G. (2018). Techno-economic optimization of community-based manure processing. *Agricultural systems*, 161, 117-123.
- Sharara, M. A.**, & Sadaka, S. S. (2018). Opportunities and Barriers to Bioenergy Conversion Techniques and Their Potential Implementation on Swine Manure. *Energies*, 11(4), 957.
- Sharara, M.**, Sampat, A., Good, L. W., Smith, A. S., Porter, P., Zavala, V. M.,.....& Runge, T. (2017). Spatially explicit methodology for coordinated manure management in shared watersheds. *Journal of environmental management*, 192, 48-56.
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### **HONORS AND AWARDS**

- ASABE Blue Ribbon Award for Outstanding Educational Aid – “Sludge Sampling in Anaerobic Treatment Swine Lagoons“
- Goodnight Early Career Innovators Award Recipient 2021-2022
- Outstanding Extension Faculty 2021 – NC State University – Biological & Agricultural Engineering
- Outstanding Young Faculty 2019 – NC State University – Biological & Agricultural Engineering

NAME: Thakur, Siddhartha

eRA COMMONS USER NAME (credential, e.g., agency login): sid\_thakur

POSITION TITLE: Professor

EDUCATION/TRAINING (*Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.*)

INSTITUTION AND LOCATION	DEGREE	Completion Date	FIELD OF STUDY
G.B. Pant University Ag. & Tech.	BS	05/1998	Veterinary Science
Indian Veterinary Research Institute	MS	08/2000	Veterinary Public Health
NC State University, North Carolina	PHD	08/2005	Population Medicine
Center for Veterinary Medicine, FDA, Maryland	Postdoctoral Fellow	07/2007	Molecular Epidemiology

#### A. Personal Statement

My research focus is to fill critical knowledge gaps that exist in the complex chain of events leading to the development, dissemination and persistence of antimicrobial resistant (AMR) bacterial foodborne pathogens at the interface of human, animal, and the environment. The lab research is centered on two predominant themes. The first revolves around understanding the phenotypic and genotypic similarity and/or diversity of AMR bacterial strains reported in animals and humans. This involves characterizing and elucidating the mechanisms of AMR at the molecular level, analyzing DNA fingerprint patterns, and determining the risk factors that predispose the animals and humans to infections by these strains. The second theme focuses on using phylogenetics to study the evolution of drug-resistant bacterial strains at the population level. In this, molecular approaches are undertaken to analyze pathogen evolution on an evolutionary scale.

#### B. Positions and Honors

##### Positions and Employment

2007 - 2012 Assistant Professor, College of Veterinary Medicine, NC State University, Raleigh, NC

2013 - 2018 Associate Professor, College of Veterinary Medicine, NC State University, Raleigh, NC

2018 - Professor, College of Veterinary Medicine, NC State University, Raleigh, NC

##### Honors and Awards

2003 Hans-Dieter Alhusen Graduate Research Fellow Award, NC State University

2005 Nancy G. Pollock Graduate School Dissertation Award, NC State University

2006 Oak Ridge Associated Universities Reserach Fellowship Award, FDA

2012 Sigma Xi Faculty Research Award, Sigma Xi - Raleigh NC State Chapter

2012 Larry Beuchat Young Investigator Award, International Association for Food Protection

2014 Chancellor University Faculty Scholar, NC State University

#### C. Contributions to Science



1. My earlier research work improved our understanding of the dynamics of bacterial pathogens along the “farm to fork” pathway. To understand these dynamics, I used a systems-based approach and followed animals all the way from their birth to slaughter. This research and subsequent publications clearly showed that unique strains are dominant in different phases of production, which is in turn dependent on selective pressures existing within a particular system. Our goal was to identify the role of the environment as a source of transmission of drug resistant strains to food animals, and we confirmed a direct link between environmental sources and animals. We targeted multiple pathogens including *Salmonella*, *Campylobacter* and *Clostridium difficile* in these studies. I served as PI in all these studies.

- a) **Thakur S**, and Gebreyes WA. 2005. *Campylobacter coli* in swine production: antimicrobial resistance mechanisms and molecular epidemiology. *Journal of Clinical Microbiology*. 43(11):5705- 14.
- b) **Thakur S**, Morrow WE, Funk JA, Bahnson PB, and Gebreyes WA. 2006. Molecular epidemiologic investigation of *Campylobacter coli* in swine production systems, using multilocus sequence typing. *Applied Environmental Microbiology*. 72(8):5666-9.

2. It was clear from my early work that bacterial pathogens are strongly impacted by the selection pressures that act on them through the environment. Since my major interest was in understanding AMR mechanisms, I conducted a longitudinal study to study the molecular epidemiology of *Salmonella* in Conventional and Antimicrobial Free Swine Production Systems. Other pathogens including *Campylobacter* and *Clostridium* were also studied. In association with my collaborators, we showed that identical AMR profiles were observed in the pigs and their environment at farm and slaughter, irrespective of whether the animals were exposed to antimicrobials or not.

- a) Fry PR, **Thakur S**, Abley M, Gebreyes WA. 2002. Antimicrobial resistance, toxinotype, and genotypic profiling of *Clostridium difficile* isolates of swine origin. *Journal of Clinical Microbiology* 50(7):2366-72.
- b) **Thakur S**, Putnam M, Fry P, Abley M, and Gebreyes W. 2010. Prevalence of antimicrobial resistance and association with toxin genes in *Clostridium difficile* in commercial swine. *American Journal of Veterinary Research*. 71:1189-1194.

3. I espouse the concepts of “One Health” and use its principals to study the impact of interplay between animals, humans and their environment on the dissemination and persistence of AMR bacterial strains. As such, I have conducted multiple collaborative studies to investigate the transmission of AMR bacterial pathogens between humans, animals and their environment. I have also been active in conducting AMR studies at the global level. These studies are still in the preliminary phase but the outcome will be interesting and productive.

- a. Aworh M, Kwaga J, Okolocha E, Harden L, Hull D, Hendriksen R, and **Thakur S**. Extended-spectrum  $\beta$ -lactamase-producing *Escherichia coli* among Humans, Chickens and Poultry Environments in Abuja, Nigeria. ***BMC-One Health Outlook***. <https://doi.org/10.1186/s42522-020-00014-7>.
- b. Monte DF, Lincopan N, Berman H, Cerdeira LT, Keelara S, **Thakur S**, Cray PF and Landgraf M. Genomic Features of High-Priority *Salmonella enterica* Serovars Circulating in the Food Production Chain, Brazil, 2000-2016. ***Nature Scientific Reports*** 9(1):11058. doi:10.1038/s41598-019-45838-0

#### **D. Additional Information: Research Support and/or Scholastic Performance**

##### Ongoing Research Support

US Food & Drug Administration	Thakur (PI)	09/01/2020-08/31/2025
Monitoring antimicrobial resistance (AMR) in enteric pathogens isolated from retail meats and seafoods in North Carolina,” U01 FD007145-01. <u>Role: PI</u>		
US Food & Drug Administration	Thakur (PI)	09/01/2020-08/31/2025
Enhance the surveillance of foodborne bacterial pathogens isolated from food and environmental samples using whole genome sequencing (WGS) to prevent foodborne outbreaks and promote public health,” U19 FD007113-01. <u>Role: PI</u>		
National Institute of Food and Agriculture-FACT:	Callahan (PI)	09/01/2019-06/30/2023
Rapid detection and Tracking of Foodborne Pathogens with Long-read Amplicon Sequencing. <u>Role: co-PI</u>		
USDA-National Institute of Food and Agriculture:	Kumar (PI)	09/01/2020-08/31/2025

Systems-based integrated program for enhancing the sustainability of antibiotic-restricted poultry production.

Role: co-PI

NAME: Kelly Zering	Contact info
ORCID: : 0000-0001-6822-6733	Department of Agricultural and Resource
Institution: North Carolina State University	Economics, Campus Box 8109
	NC State University; <a href="mailto:kzering@ncsu.edu">kzering@ncsu.edu</a>

**EDUCATION and TRAINING** (in chronological order)

INSTITUTION AND LOCATION	DEGREE	YEAR(s)	FIELD OF STUDY
University of Manitoba	B.Sc.Ag.	1977	Agricultural Economics
University of Manitoba	M.S.	1980	Agricultural Economics
University of California, Davis	Ph.D.	1984	Agricultural Economics

**Research and Professional Experience**

- 2020 – present Interim Associate Department Head, Department of Agricultural and Resource Economics (ARE), North Carolina State University (NCSU), Raleigh, NC
- 2016 - present Professor and Extension Specialist, Department of Agricultural and Resource Economics, North Carolina State University, Raleigh, NC
- 1992 – 1993 Visiting Scholar, Fuqua School of Business, Duke University
- 1990 - 2016 Associate Professor and Extension Specialist, North Carolina State University, Raleigh, NC
- 1984-1990 Assistant Professor and Extension Specialist, North Carolina State University, Raleigh, NC

**Research Emphasis:** economics of bio-based systems including: evaluation of new technology; evaluation and design of supply chains; evaluation of bio-based production systems including social, environmental and resource interactions; assessment and design of human production and consumption systems and associated markets and policy.

**Teaching Experience:** Since 2018, taught undergraduate courses ARE370 Agribusiness New Venture Development and ARE470 Advanced Clinical Skills in Agribusiness Entrepreneurship, team taught a graduate course GES591 Socioecological systems analysis and modeling of agricultural biotechnologies, and taught Swine Markets and Risk in Swine Science Online.

**Professional Service:**

1. Member of USDA S-1032 Sustainable Livestock and Poultry Systems multi-state research committee: July 2007 to 2014. Chairman, June 2010 through May, 2011.
2. Member of the Biofuels Southern Extension and Research (SERA-38) planning group: August, 2007 to 2012. Chairman of SERA-38 July, 2008 through June, 2009.
3. Served on the “Value of Manure” Issue Team for the National Livestock and Poultry Environmental Learning Center (a webcast based extension program): 2006 to 2012.
4. National Pork Board Swine Educators Advisory Committee: 2003 to 2020.
5. State representative and economist on the National Center for Manure and Animal Waste Management: 2001 through 2004
6. N.C. representative on the Southern Extension Farm Management Committee, 1988-1994

### **Honors and Awards**

1. S-1032 Multi-State Research Committee, National Excellence in Multi-State Research Award, ESCOP Science and Technology Committee, 2011. K. Zering, Chairman.
2. Council on Agricultural Science and Technology, invited lead author for Water and Land Issues Associated with Animal Agriculture: A U.S. Perspective. 2010.
3. National Academy of Sciences ad hoc committee on Air Emissions from Livestock Operations: 2001 through 2002.
4. American Agricultural Economics Association National Task Force on Recommendations for Commodity Costs and Returns Measurement Methods, 1992.

### **Synergistic Activities**

Dr. Zering is an international expert in the economics of swine production systems through his extension and research work applied to the pigs and pork sector since 1984. He has co-authored extension and research publications addressing most aspects of pig and pork production from genetics to nutrition, from meat quality to food safety, from pig production systems to manure management, environmental emissions, economic impacts, and through markets and risk.

Dr. Zering has 39 years of experience working in diverse teams to develop economic models of biological and engineered systems. Work covers analysis of emerging technology, production decisions of the firm, risk, contracts, the supply chain, markets, laws and policy related to environmental and resource effects of technology and production systems. Zering is author or co-author of 47 refereed publications including journal articles, book chapters, monographs, and research reports. He is author or co-author of more than 140 additional published abstracts, papers in proceedings, monographs, research reports, extension publications, and trade publications. He has mentored 5 postdoctoral researchers, chaired or co-chaired 7 PhD dissertation committees, served on 12 additional PhD committees, and chaired or served on 7 masters thesis committees for students in economics, engineering, animal science, and plant and microbial biology. Zering has been PI or co-PI on more than 60 grants with total awarded amounts over \$18 million.

### **SELECTED PUBLICATIONS**

1. Zering, K.D. Hog Farming, Past, Present, and Future: An Economist's View. Journal of Land Use and Environmental Law, 34(2):313-324. Florida State University. Spring 2019.  
[https://law.fsu.edu/sites/g/files/upcbnu1581/files/JLUEL/jluel\\_34n2\\_%285%29%20Zering%20Article.pdf](https://law.fsu.edu/sites/g/files/upcbnu1581/files/JLUEL/jluel_34n2_%285%29%20Zering%20Article.pdf)
2. Natelson, R., Wang, W-C., Roberts, W.L., and Zering, K.D., Technoeconomic Analysis of Jet Fuel Production from Hydrolysis, Decarboxylation, and Reforming of Camelina Oil, Biomass and Bioenergy 75(2015): 23-34. Elsevier.
3. Zering, Kelly. "Economic Sustainability of Cellulosic Energy Cropping Systems," chapter 15 in "Cellulosic Energy Cropping Systems," editor Douglas Karlen. John Wiley and Sons. 2014. Pages 281 – 297.  
[http://www.agrifs.ir/sites/default/files/Cellulosic%20Energy%20Cropping%20Systems%2C%20Wiley%20Series%20in%20Renewable%20Resource%20%7BDouglas%20L.%20Karlen%7D%20%5B9781119991946%5D%20%282014%29\\_2.pdf](http://www.agrifs.ir/sites/default/files/Cellulosic%20Energy%20Cropping%20Systems%2C%20Wiley%20Series%20in%20Renewable%20Resource%20%7BDouglas%20L.%20Karlen%7D%20%5B9781119991946%5D%20%282014%29_2.pdf)
4. Zering, Kelly, T.J. Centner, D. Meyer, G.L. Newton, J.M. Sweeten, and S. Woodruff, Water and Land Issues Associated with Animal Agriculture: A U.S. Perspective. Issue Paper 50, Council for Agricultural Science and Technology. Ames, Iowa. August, 2012.

# Sarah Probst Miller, D.V.M.

## Education and Career Development:

- 2009 **University of Illinois**  
Executive Veterinary Program
- 2001 **University of Illinois**, College of Veterinary Medicine  
Doctor of Veterinary Medicine
- 1999 **University of Illinois**  
Bachelor of Science in Veterinary Science
- 1997 **Eastern Illinois University**  
Bachelor of Science in Zoology, Chemistry & English Minor

## Professional Experience:

- 2011-Present **AgCreate Solutions, Inc.**, President and Creative Director  
Training, Communication, and Research: Curriculum and Training Material Developer and Designer, Communication and Teamwork Consultant, Pig Veterinarian, Production Ag Training Consultant, Public speaker, Speaking Trainer, Scientific Research Designer, Research Principal Investigator, Corporate Executive
- 2011-Present **AgriSchool Pty Ltd**, Director  
Over 180 learning experiences in English and Spanish across all aspects of pork production  
2500+ subscribers representing 30+ companies at 250+ farm locations
- 2001-2011 **Carthage Veterinary Service, Ltd.**, Carthage, IL
- 1997-2000 **Writer for Continuing Education and Public Service at U of IL CVM**
- 1998-2001 **Research on changing relationship of food animal veterinarians and the producers they Serve**--Designed, researched, and wrote an extensive report which impacted U of IL CVM curriculum
- 1997-1998 **PRRS and Salmonella Swine Research Assistant**
- 1995-1996 **Malaria Research in Bolivia--Curriculum and Course Development**
- 1987-2022 **JV Probst Pork**, Sigel, IL--Aided in management and labor of pork and grain farm in rural Illinois

## Professional Organizations:

- American Veterinary Medical Association (past advisor on Clinical Practitioners Advisory Board)
- American Association of Swine Veterinarians (writer and producer of Heritage Videos)
- International Pig Veterinary Society (member and speaker)
- Illinois State Veterinary Medical Association
- University of Illinois College of Veterinary Medicine Alumni Association (Past President)
- National Pork Board Operation Main Street Speaker
- President University of Illinois College of Veterinary Medicine Alumni Association—(2009-2010)
- Monticello Area Education Foundation (Past President)

## Sampling of Educational Projects (over 500+ innovative training projects completed for animal ag)

Pork Avenue Training Portal—Over 180 online learning experiences in English and Spanish across all aspects of pork production including farrowing, breeding, gestation, wean to market, biosecurity, and leadership development  
Science Speak™ - live training to bring the science to life while engaging the audience  
AQUA CARE365 Produced and delivered over 60 learning experiences  
DAIRY CARE365 Dry Cow Therapy and Owner/Manager Modules  
CATTLE CARE365 Creation and deliver of simulations of desired end skills  
Partner Training365 Small and large animal product implementation training developed and distributed for Merck Animal Health  
LMS branding development for AQUA CARE365, DAIRY CARE365, CATTLE CARE365, Partner Training365  
LMS technical support for AQUA CARE365, 1,400+ subscribers, DAIRY CARE365, 4,200+ subscribers, CATTLE CARE365, 700+ subscribers, Partner Training365, 3,000+ subscribers  
Mortality management through composting trainings –USDA NIFA Grant  
2014 TQA—rewrite

NPB--Safety in the Pork Industry Project—Needle Safety, Human Safety  
Elanco Animal Health Global Welfare and Sustainability Training Initiative (>7000 learners targeted and reached)  
Virtual Walking the Pens and Walking the Pens 2.0—Zoetis  
Open Your Mind to Agriculture— Novus International video for kids  
Reproduction 101 training for Merck Animal Health  
Curriculum design--Writer and Event Coordinator and Host of the *Individual Pig Care Certification Course* for Zoetis—delivered in North America, Australia, Japan, Thailand, China  
Writer and Co-Coordinator for the Swine Business Acumen Course

### Select Publications and Presentations

Probst Miller, S. “To Get To The Top You Have To Start At The Bottom. Training your team to compost is well worth your pile.” AASV Annual Meeting, March 4-7, 2023. ISU James D. McKean Swine Disease Conference, November 4, 2022. Poster.

Hood, M., Probst Miller, S. et al. “The Competency Impact After Initiating a New Training Program in the Boar Stud.” September 17-20, 2022. Presentation.

Probst Miller, S., Hutchinson, M. “Proving competency-based educational strategies to create measurable carcass management competencies in farm labor.” February 26-March 1, 2022. Presentation.

Probst Miller, S. “Culture of Care Longevity Measurements Post Training.” AASV, February 27-March 2, 2021.

Probst Miller, S. “Creating and Nurturing a Culture of Care.” Purina Swine Summit & Calf and Heifer Summit

Probst Miller, S. “Ensuring that a Company’s Vision and Mission and Core Values are Living on Farm via Pre-training, Targeted Training and Post-training Animal Care Competency Measurements.” AASV Annual Meeting, March 7-10, 2020, Atlanta, GA. Presentation.

Probst Miller, S. “See it. Do it. Teach it.” Iowa Select, 2022

Probst Miller, S, Krantz, S. “Inspiring a Verified Culture of Care Post-Identification of Abuse on an Undercover Video Using a Baseline Assessment of Expressed Competencies Compared to Post-Training Measurement of Expressed Competencies.” <https://porkavenuetraining.com/site/wp-content/uploads/2020/12/Inspiring-a-verified-culture.pdf>.

Probst Miller, S. “Inspiring and Motivating Your Team to Delivery a Day One Culture of Care.” IL Pork Congress

Probst Miller, S. “Producing Safe Food for the World.” Tosh Pork, 2019

Probst Miller, S. “The Science of How Adults Learn.” 100 Year Anniversary of the UICVM Fall Conference, 2019. Keynote Presentation.

Probst Miller, S. “Be a Better Manager by Applying the Science of How Adults Learn.” JBS, 2019.

Implementing Change on Farm, PIC Roadshow, 2019, 2018

Probst Miller, S, Krantz, S. “Inspiring a Verified Culture of Care.” AASV Annual Meeting, March 9-12, 2019, Orlando, FL. Presentation.

Probst Miller, S. “Impact of Two Training Implementation Plans on Post-Training Competency Expression of Personnel on Farm.” AASV Annual Meeting, March 3-6, 2018, San Diego, CA. Presentation.

Probst Miller, S. “Impact of Trained and Un-Trained Personnel on Product Implementation and Subsequent Pig Health.” AASV Annual Meeting, February 27-March 1, 2016, New Orleans, LA. Presentation.

Probst Miller, S. “Evaluation of a Novel Electrocutation Device for Suckling Piglets.” AASV Annual Meeting, March 5-8, 2011, Phoenix AZ. Presentation.

Probst Miller, S. *Determine and Validate the Optimal Requirements and Duration of Time to Achieve Unconsciousness and Euthanasia in Pigs in Lactation with a Novel Electrocutation Device*. Final Report to the US National Pork Board, Des Moines, IA, 2011.

Probst Miller, S, Oliviera, S, Stanford, S. “Experiences with A *suís* – Part I: Case Study: Elimination or Reduction?” AASV Annual Meeting, March 7-10, 2009, Dallas, TX. Presentation.

Probst Miller, S. “Day 1 Critical Care: How to Get Pigs Out Alive and Started Right.” AASV Annual Meeting, March 3-6, 2007, Orlando, FL. Presentation.

Probst Miller, S. “Monitoring Personnel Understanding of Training via Pre- & Post-Training Testing (and Impact on Specific Production Parameters.” AASV Annual Meeting, March 5-8, 2005, Toronto, Canada. Presentation.

Knox, R, Probst Miller, S (2004) Evaluation of Transrectal Real-Time Ultrasound for Use in Identifying Sources of Reproductive Failure in Weaned Sows. *Journal of Swine Health and Production* 12.2: 71-74.

Probst Miller, S. “A Survey of the Changing Relationship between Midwest Food Animal Veterinarians and the Producers They Serve.” AASV Annual Meeting, February 24-27, 2001, Nashville, TN. Presentation.

<b>NAME</b> <b>Coble, Derrick Jamaal</b>	<b>POSITION TITLE</b> Swine Specialist/Geneticist
---	--

#### EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE	YEARS	FIELD OF STUDY
Iowa State University, Ames, IA	PhD	2013	Genetics
North Carolina A&T State University, Greensboro, NC	MS	2007	Animal Health
North Carolina A&T State University, Greensboro, NC	BS	2005	Animal Science

#### PERSONAL STATEMENT

My research involves characterizing the effects of environmental stressors on physiological function in livestock. More specifically, I correlate the effects stressors on specific functions in livestock with the gene expression of metabolic and immunological tissues responsible for these functions. My research provides a platform for understanding the metabolic and stress response in livestock. My ultimate research goals are to improve the performance of production animals and the profitability of producers.

#### RESEARCH AND PROFESSIONAL EXPERIENCE

<i>YEARS</i>	<i>POSITION</i>
2021- Current	Swine Specialist/Geneticist, Department of Animal Sciences, North Carolina A&T State University, Greensboro, N.C.
2017 - 2020	Assistant Professor, Animal Science Program, Florida A&M University, Tallahassee, FL
2014 - 2017	Assistant Professor, Biology Department, Bennett College, Greensboro, N.C.
2007- 2013	Graduate Research Assistant, Department of Animal Science, Iowa State University, Ames, IA
2005 - 2007	Graduate Research Assistant, Department of Animal Sciences, North Carolina A&T State University, Greensboro, N.C.

#### SYNERGISTIC ACTIVITIES

##### Journal Reviewer

1. Avian Biology Science (2017– Current)

##### Grant Reviewer

1. USDA-NIFA Reviewer, Travel Grant (2022)
2. USDA-NIFA Reviewer, Animal Health and Production and Animal Products: Animal Health and Disease (2022)

##### Grants

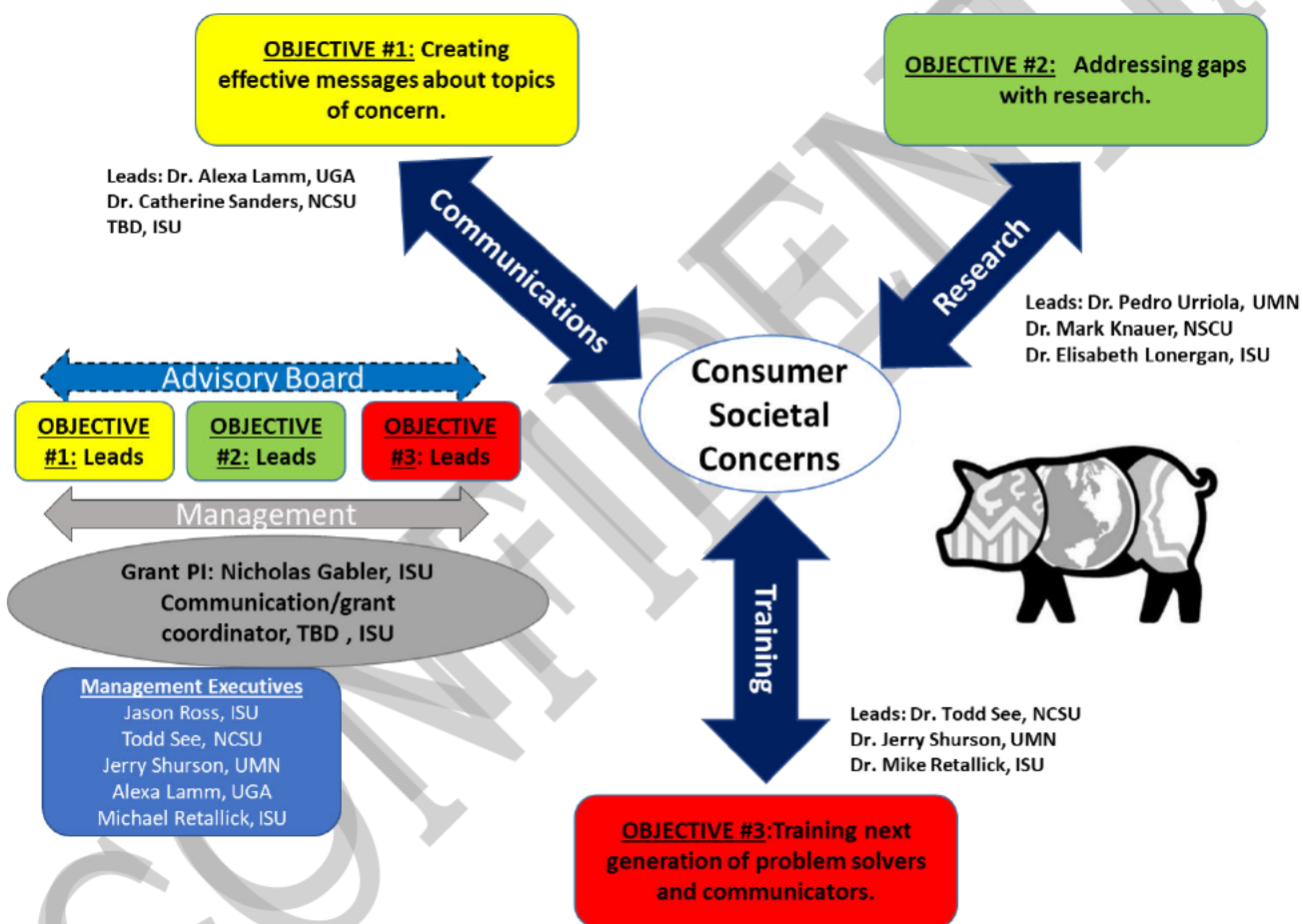
1. Partnership to Improve Beef Cow-Calf Development and Management in North Florida: Focusing on Limited-Resource Beef Cow-Calf Producers, USDA-NIF-CBG 2020-11037 (Co-PI, 05/16/2021 – 05/15/2023)- \$594,924.00.
2. North Carolina Pork Council Graduate Student Education Grant (PI, 01/01/2021 –12/31/2022)- \$12,000.00
3. North Carolina Pork Council Graduate Student Education Grant (PI, 01/01/2022 –12/31/2023)- \$12,000.00
3. The Response of Outdoor-Managed Berkshire Pigs to Alternative Feeds, USDA-NIFA-Evans-Allen (PI, 10/01/2022 – 09/30/2025)- \$767,688.77
4. From Bright Leaf to Berkshires: An Alternative Swine Production Course and Outreach Program, North Carolina Tobacco Trust Fund Commission (PI, 11/01/2022 – 10/31/2024)- \$210,152.00

#### SELECTED PEER-REVIEWED PUBLICATIONS

1. Odhiambo, J. F., K. A. Elder, R. Fernandez, R. Dunn, K. Green, and D. J. Coble. 2022. Effects of Hurricane-Related Prenatal Growth and Development of Steers and Heifers in a Limited Resource Beef Cow-calf System. *J. Anim. Sci.* **100** (Suppl. 3):38-39.
2. Elder, K. A., R. Fernandez, R. Dunn, K. Green, J. F. Odhiambo, and D. J. Coble. 2022. Effects of Prenatal Stress on Beef Steer Development. *J. Anim. Sci.* **100** (Suppl. 3):37-38.
3. Elder, K.A., Gay, C., Hernandez, R., Coble, D.J, and J.F. Odhiambo. (2020). Development of Feasible Pre-Conditioning Programs for Limited Resource Cow-Calf Producers in North Florida. *Journal of Animal Science*, **98**: 132.
4. Schmid, M., Smith, J., Burt, D. W., Aken, B. L., Antin, P. B., Archibald, A. L., ... Zhou, H. (2015). Third Report on Chicken Genes and Chromosomes. *Cytogenetic and Genome Research*, **145** (2): 78-179.
5. Coble, D.J., Fleming, D., Persia, M.E., Ashwell, C.M., Rothschild, M.F., Schmidt, C.J., and S.J. Lamont. (2014). RNA-seq analysis of broiler liver transcriptome reveals novel response to high ambient temperature. *BMC Genomics*, **15**:1084.
6. Coble, D.J., Sandford, E.E., Ji, T., Abernathy, J., Fleming, D., Zhou, H., and S.J. Lamont. (2012). Impacts of *Salmonella* Enteritidis Infection on Liver Transcriptome in Broilers. *Genesis*, **51**:357-364.
7. Coble, D.J., Redmond, S.B., Hale, B., and S.J. Lamont. (2011). Distinct lines of chickens express different splenic cytokine profiles in response to *Salmonella* Enteritidis challenge. *Poultry Science*, **90**:1659-1663.
8. Redmond, S.B., Tell, R., Coble, D., Mueller, C., Palic, D., Andreasen, C.B., and S.J. Lamont. (2010). Differential splenic cytokine responses to dietary immune modulation by diverse chicken lines. *Poultry Science*, **89**:1635-1641.

## 10. Management Plan

Our goal for the management plan is to support the integrated efforts of communication, research and training to address consumer and societal concerns and strengthen trust in the U.S. pork production system. The organizational chart below describes the project's management/coordination functions and the flow of information between the project and the stakeholders. The Project Director (PD) will oversee all aspects of the project, including communication, training/outreach, and research. Due to the size and diversity of the grant's activities and themes, co-Primary Investigators (PI) has been assigned across and within specific objectives to provide more direct management at the operational level. A program coordinator with a background in communications will assist the PD and PIs in all aspects of the grant that include coordinating budgeting, communication and reporting. These duties will also include organizing meetings and podcasts, directly assisting in public relations, consolidating and distributing education and extension materials and information output from the project. These interlinking levels add accountability and credibility.





## 11. References

- Langdrige, D. (2007). *Phenomenological psychology: Theory, research and method*. Harlow: Pearson Education, UK.
- Roininen, K., Arvola, A., & Lähteenmäki, L. (2006). Exploring consumers' perceptions of local food with two different qualitative techniques: Laddering and word association. *Food Quality and Preference*, 17:20–30.
- Abrams, K. M., Meyers, C. A., & Irani, T. A. (2010). Naturally confused: Consumers' perceptions of all-natural and organic pork products. *Agriculture and Human Values*, 27, 365-374.
- Aggleton, P. (1997). Behavior change communication strategies. *AIDS Education and Prevention*, 9:111-123.
- Brune, S., Knollenberg, W., Stevenson, K. T., Barbieri, C., & Schroeder-Moreno, M. (2021). The influence of agritourism experiences on consumer behavior toward local food. *Journal of Travel Research*, 60(6), 1318-1332.
- Carlson, J., & Harris, K. (2020). Quantifying and contextualizing the impact of bioRxiv preprints through automated social media audience segmentation. *PLoS Biology*, 18(9), e3000860.
- Che, D., Veeck, G., & Veeck, A. (2005). Agritourism and the selling of local food production, family and rural American traditions to maintain family farming heritage. In *Rural change and sustainability: Agriculture, the environment and communities* (pp. 107-121). CABI Publishing.
- Coleman, G. J., Rohlf, V., Toukhsati, S. R., & Blache, D. (2017). Public attitudes predict community behaviours relevant to the pork industry. *Animal Production Science*, 58(3), 416-423.
- Füchslin, T., Schäfer, M. S., & Metag, J. (2018). A short survey instrument to segment populations according to their attitudes toward science. Scale development, optimization and assessment. *Environmental Communication*, 12(8), 1095–1108.
- Fuster, M., Weindorf, S., Mateo, K. F., Barata-Cavalcanti, O., & Leung, M. M. (2019). “It’s sort of, like, in my family’s blood”: Exploring Latino pre-adolescent children and their parents’ perceived cultural influences on food practices. *Ecology of Food and Nutrition*, 58(6), 620-636.
- Jensen, K. B., & Rosengren, K. E. (1990). Five traditions in search of the audience. *European Journal of Communication*, 5(2), 207-238.
- Ki, C.-W., & Kim, Y.-K. (2019). The mechanism by which social media influencers persuade consumers: The role of consumers’ desire to mimic. *Psychology & Marketing*, 36(10), 905-922.
- Kim, S., Lee, S. K., Lee, D., Jeong, J., & Moon, J. (2019). The effect of agritourism experience on consumers’ future food purchase patterns. *Tourism Management*, 70, 144-152.
- Neff, R. A., Edwards, D., Palmer, A., Ramsing, R., Righter, A., & Wolfson, J. (2018). Reducing meat consumption in the USA: A nationally representative survey of attitudes and behaviours. *Public Health Nutrition*, 21(10), 1835-1844.
- Peterson, R. A. (1992). Understanding audience segmentation: From elite and mass to omnivore and univore. *Poetics*, 21(4), 243-258.
- Revella, R. (2015). *Buyer personas: How to gain insights into your customer’s expectations, align your marketing strategies, and win more business*. Wiley, UK.
- Sato, P., Hötzel, M. J., & Von Keyserlingk, M. A. (2017). American citizens’ views of an ideal pig farm. *Animals*, 7(8), 64.
- Sellnow, T. L., Ulmer, R. R., Seeger, M. W., & Littlefield, R. S. (2009). *Effective risk communication: A message-centered approach*. Springer, New York, NY.

- Tyson, C. C., Svetkey, L. P., Lin, P. H., Granados, I., Kennedy, D., Dunbar, K. T., ... & Fish, L. J. (2023). Self-Perceived Barriers and Facilitators to Dietary Approaches to Stop Hypertension Diet Adherence Among Black Americans With Chronic Kidney Disease: A Qualitative Study. *Journal of Renal Nutrition*, 33(1), 59-68.
- Marshall, A. M., J. Heemstra, J. J. Classen, E. Cortus, J. Koziel, D. Meyer, A. Padmanabhan, S. P. Reed, and R. Walters. (2022). Developing Cohort Challenges: An Innovative Program for Training Graduate Students to Work in Transdisciplinary Teams. ASEE, editor. ASEE Annu. Conf. Expo. Conf. Proc.1–34. (Abstr.).
- Ragland, E. C., S. Radcliffe, and E. L. Karcher. (2023). A review of the application of active learning pedagogies in undergraduate animal science curricula. *J. Anim. Sci.* 101:1–6.
- Rasater, A. (2022). Framing agricultural solutions for economic and environmental resilience. National Pork Board. Available: <https://porkcheckoff.org/research/framing-agricultural-solutions-for-economic-and-environmental-resilience/>. Accessed March 2023.
- Shurson, G. C., and P. E. Urriola. (2022). Sustainable swine feeding programs require the convergence of multiple dimensions of circular agriculture and food systems with One Health. *Anim. Front.* 12:30–40.
- Shurson, G. C., R. E. O. Pelton, Z. Yang, P. E. Urriola, and J. Schmitt. (2022). Environmental impacts of eco-nutrition swine feeding programs in spatially explicit geographic regions of the United States. *J. Anim. Sci.* 1–17.

**From:** [Pam Zaabel](#)  
**To:** [Kalley, Mina](#)  
**Subject:** SFEAR  
**Date:** Wednesday, July 5, 2023 5:26:00 PM  
**Attachments:** [SFEAR Overarching AAR Final Cleared 3.5.2020.pdf](#)

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Hi Mina,

Thank you for the conversation today. I have attached the SFEAR exercise summary as we discussed.

Happy reading!

Pam

Pam Zaabel, DVM

Director, Swine Health

National Pork Board

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# Swine Fever Exercise for Agriculture Response

## Functional Exercises and Drills

### APHIS Joint Federal-State-Industry After-Action Report/Improvement Plan

January 31, 2020



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## Exercise Overview

<b>Exercise Name</b>	SFEAR (Swine Fever Exercise for Agriculture Response)
<b>Exercise Dates</b>	September 23 through 26, 2019
<b>Scope</b>	This exercise consisted of a series of functional exercises (FE) and drills, occurring over four days, with varied participation from federal, state, and local agencies, as well as industry. Fourteen states played in the exercise series: Illinois (IL), Indiana (IN), Iowa (IA), Kansas (KS), Michigan (MI), Minnesota (MN), Missouri (MO), Nebraska (NE), North Carolina (NC), Ohio (OH), Oklahoma (OK), Pennsylvania (PA), South Dakota (SD) and Texas (TX). Exercise play was limited to the interactions between participating functional entities; select swine producers in each state; federal, state and county jurisdictions; industry; and the Simulation Cell (SimCell).
<b>Mission Area(s)</b>	Response
<b>VS Critical Activities</b>	The response areas associated with the FE objectives corresponded to 10 of the 23 VS Critical Activities identified in the USDA document <i>FAD Response Ready Reference Guide—Critical Activities and Tools during a FAD Response</i> <sup>1</sup> : Diagnostics, Epidemiological Investigation and Tracing, Information Management, Communication, Health and Safety and Personal Protective Equipment, Biosecurity, Quarantine and Movement Control, Continuity of Business, Mass Depopulation and Euthanasia, and Disposal.
<b>Objectives</b>	<ol style="list-style-type: none"> <li>1. Conduct an initial epidemiological investigation related to an ASF outbreak to support the development of a control area.</li> <li>2. Collect, document, and deliver the appropriate samples necessary to determine the status of a potential infection.</li> <li>3. Given the infected premises in the scenario, determine control area(s).</li> <li>4. Develop, approve, and disseminate public and industry related information to support response actions for each day of play, including a Situation Report.</li> <li>5. Implement the state’s procedures for supporting a national movement standstill.</li> </ol>

<sup>1</sup> FAD Response Ready Reference Guide— Critical Activities and Tools during an FAD Response, [https://www.aphis.usda.gov/animal\\_health/emergency\\_management/downloads/generic\\_critical\\_activities\\_rrg.pdf](https://www.aphis.usda.gov/animal_health/emergency_management/downloads/generic_critical_activities_rrg.pdf)



<b>Objectives (continued)</b>	<ol style="list-style-type: none"><li>6. Develop a depopulation plan specific to the impacted operation(s) in each state’s scenario.</li><li>7. Develop a disposal plan specific to the impacted operation(s) in each state’s scenario.</li><li>8. Develop a complete Incident Action Plan (IAP) for the implementation of the state’s depopulation and disposal plan for the infected operation(s).</li><li>9. Develop a herd plan for the infected premises.</li><li>10. Accept, review, approve, and deliver movement permits for premises requesting movement out of a control area.</li></ol>
<b>Threat or Hazard</b>	Foreign animal disease (FAD) outbreak in swine, specifically ASF.
<b>Scenario</b>	<p>This exercise series was designed to target specific areas of an ASF response. Aside from the farms and animals identified on Day 1, no other aspects of daily play carried over from day to day. Each day of play was designed to stand alone and not be interrelated with the outcomes of previous days. The focus of daily play was as follows:</p> <ul style="list-style-type: none"><li>• Day 1, September 23 – Conducting a foreign animal disease investigation (FADI) and subsequent coordination and engagement of the National Veterinary Services Laboratories’ Foreign Animal Disease Diagnostic Laboratory (NVSL FADDL) and the appropriate laboratories in the National Animal Health Laboratory Network (NAHLN).</li><li>• Day 2, September 24 – Responding to and supporting a state, regional, or national movement standstill depending upon swine populations infected.</li><li>• Day 3, September 25 – Implementing the planning and resource coordination associated with depopulating and disposing of infected and exposed swine.</li><li>• Day 4, September 26 – Implementing a system to allow continuity of business for non-infected operations within a Control Area.</li></ul>
<b>Sponsor</b>	<p>This exercise was sponsored by the USDA VS NTEP and was a cooperative effort of the 14 playing states, the swine industry, and VS. This exercise series builds upon the VS NTEP’s mission to “support a national alliance for protecting U.S. animal agriculture by developing and maintaining competent and highly-trained responders.” This project was supported through a Cooperative Research and Development Agreement (CRADA) number AP17VSSPRS00C077, and USDA APHIS Contract Number 12639519C0047. Points of view or opinions expressed in this document are those of the authors and do not necessarily represent the official position or policies of the USDA.</p>

**Participating  
Organizations**

The following functional groups participated in the FE: 14 states (IA, IL, IN, KS, MI, MN, MO, NE, NC, OH, OK, PA, SD, and TX); VS National Veterinary Stockpile (NVS); Cross Species Working Group (CSWG); National Assembly of State Animal Health Officials (NASAHO); VS Center for Epidemiology and Animal Health (CEAH); APHIS Wildlife Services (WS); NAHLN; FADDL; APHIS Legislative and Public Affairs (LPA); USDA Food Safety and Inspection Service (FSIS); National Pork Board (NPB); National Pork Producers Council (NPPC); North American Meat Institute (NAMI); American Association of Swine Veterinarians (AASV), Swine Health Information Center (SHIC); and 20 private swine producers representing 18 companies (Christensen Farms, Country View Family Farms, Dykhuis Farms, Hord Livestock, Iowa Select Farms, JBS Fresh Pork, JWV Pork, Lehmann Brothers, Livingston Enterprises, Maschoffs, New Fashion Pork, Pipestone, Prestage Farms, Seaboard Foods, Smithfield Foods, Thomas Livestock, Two Mile Pork, and Valley Feeds) playing in the exercise.

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## Executive Summary

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The USDA APHIS VS NTEP sponsored the SFEAR exercise series for the top 14 swine producing states to further their capacity to effectively respond to and mitigate an outbreak of ASF. In addition, 20 private swine producers - representing 18 companies - participated by having real swine production operations play in the drills. This exercise consisted of a series of functional exercises (FE) and drills conducted over a 4-day period (September 23 - 26, 2019). Day 1 focused on a FADI and was conducted as a drill. Day 2 focused on movement standstills and was conducted as a FE. Day 3 focused on depopulation and disposal and was conducted as a combination of FE and drill. Day 4 focused on permitted movement out of a control area and was conducted as a combination FE and drill.

This AAR presents information essential for improving organizational mitigation and response readiness in the event of an ASF incursion, relative to each of the SFEAR exercise series' four focus areas of daily play. The analysis of exercise data will help APHIS VS to: (1) understand policy gaps concerning federal, state, industry, and inter-agency management, (2) gain insight on jurisdictional issues, and (3) support the establishment or improvement of mitigation and response plans that are coordinated and interoperable between federal, state, and industry stakeholders.

Following the design of the SFEAR exercise series, the AAR has been organized into five themes. The first four themes address the topics of each day's play, and the fifth addresses general exercise design.

### Methodology

Five distinct sources of data were analyzed to produce this report:

1. Controller and Evaluator notes from each venue
2. Completed Exercise Evaluation Guides (EEGs)
3. Written feedback from 191 participants
4. Hot wash notes collected from daily hot washes in each exercise venue
5. After-exercise hot washes with the Incident Coordination Group (ICG); Exercise Directors and the Core Planning Team; and Producers, Controllers, and Evaluators.

Data from these sources were reviewed and areas for improvement were identified, either by multiple sources or by multiple playing entities, and recorded. These areas for improvement were further filtered by the entities they impacted. Only areas for improvement that could impact some combination of federal, state, and/or industry entities are included in this report. In addition, corrective actions associated with the areas for improvement, when provided, were recorded and are included in this AAR.

### Highlights from the Analysis

Based on the exercise evaluation analysis, strengths and areas for improvement were identified and organized across five overarching themes.

## Theme 1: Foreign Animal Disease Investigation

Data analysis of the SFEAR documents identified common strengths and areas for improvement regarding the deployment and conduct of a FADI, including sample submission to the appropriate laboratories.

### Strengths and Areas for Improvement

#### Strengths:

- The exercise play showed coordination between foreign animal disease diagnosticians (FADDs), state animal health officials (SAHO), Area Veterinarians In Charge (AVIC), and the state and federal diagnostic laboratories.
- Conducting actual on-farm FADIs, including necropsies and sampling, increased the realism of Day 1 play.
- Participation of the NAHLN laboratories in all 14 states and the FADDL added realism and allowed FADI coordination, as well as sample delivery planning and documentation, to be practiced.
- Having producers engage in play during the FADI and providing site-specific epidemiological data, increased the realism of the exercise.
- Initial coordination between the producer and the state clearly conveyed the expectations and details regarding the pending FADI, and producer follow-up by the FADD was timely.
- The Logistics Center had many requests for personnel, including VS National Incident Management Teams (NIMT), submitted through the Emergency Management Response System (EMRS).
- Most states got their FADI information into EMRS in a timely manner.
- All the states had systems and processes in place to rapidly identify and dispatch FADDs.
- Most states engaged their supporting state agencies in the planning to transport FADI samples from the farms to the state and federal diagnostic laboratories.
- Most states and their associated VS District personnel formed Unified Commands in response to the scenario.
- Almost all the states coordinated with FADDL regarding sample collection and Priority 1 sample delivery.
- FADDs were respectful of the playing farm's biosecurity requirements and other requests made by the playing producers.
- FADDs communicated and coordinated with the producers and their staff during the FADI.

#### Areas for Improvement:

1. After receiving the non-negative result for the index ASF case from the NAHLN laboratory, several states wanted to notify select stakeholders of the non-negative result. APHIS requested that this information not be publicly released until the agency could announce FADDL confirmation of the non-negative result.
2. The FADDs conducting necropsies on sows found that containment of fluids was very difficult.
3. Several of the playing production sites required all materials and supplies brought in by the FADD to undergo disinfection, creating delays.

### Strengths and Areas for Improvement (Continued)

4. Because of the remote location of some premises, FADDs were unable to log onto EMRS2Go and enter their data on site.
5. The draft epidemiological questionnaire provided for the exercise did not include questions regarding other operations a farmworker may work at, or whether any of the farmworker's family work at other operations with susceptible species.
6. The availability of FADDs was reported as potentially a limiting factor in conducting multiple FADIs and the ability to follow up on traces and other dangerous contacts in a timely manner.

### Theme 2: Movement Standstill

Data analysis of the SFEAR documents identified common strengths and areas for improvement regarding the implementation, maintenance, and release of movement standstill restrictions.

### Strengths and Areas for Improvement

#### Strengths

- There was good coordination and communication between the state and industry.
- Having the SAHO from Mississippi and Dr. Jonathan Zack facilitate the National Assembly of State Animal Health Officials (NASAHO) call was realistic, and effective in conveying the potential threats the simulated disease outbreak posed to the swine industry.
- Interacting with neighboring states to coordinate implementation of the movement standstill allowed states and industry to assess the interoperability of their plans and approaches.

#### Areas for Improvement:

1. The initial state and federal press releases regarding the ASF outbreak in Mississippi and the associated movement standstill had little to no information regarding the safety of the food supply and the fact that ASF is not a human health concern.
2. During the exercise, the status and criteria of movement standstills for all states was difficult for the ICG in APHIS to ascertain.
3. Many states were hesitant to initiate an intrastate movement standstill.
4. The scientific/risk-based rationale for the 72-hour duration of the initial national standstill request was not clearly defined.
5. States initiating intrastate standstills had varying movement grace times before total intrastate movement prohibition would take place.
6. Several states had difficulty determining what "critical" intrastate swine-production movements they would allow to continue during the standstill.

### Theme 3: Depopulation and Disposal

Data analysis of the SFEAR documents identified common strengths and areas for improvement regarding the planning and implementation of depopulation and disposal at an infected premises.

#### Strengths and Areas for Improvement

##### Strengths:

- Site management teams worked with the producer and production staff to assess the site and develop an appropriate depopulation and disposal plan.
- The site management team coordinated with the state's Incident Command Post (ICP)/Incident Management Team (IMT).
- The site management teams followed the producers' biosecurity requirements.
- States were thorough in their collection of information and associated development of the herd plan for the infected premises. They addressed the operational requirements of depopulation and disposal, as well as necessary resources, in detail.
- The exercise provided producers and the industry an opportunity to observe and participate in the site management process.
- The exercise's focus, only on depopulation and disposal, allowed these issues to be considered in detail by the players.
- Response-related questions were answered in real time by the ICG.
- Having industry players on-farm and as observers in the ICPs/IMTs allowed real-time feedback regarding state plans for depopulation and disposal.
- The multiple depopulation and disposal webinars sponsored by the VS NTEP, in advance of the exercise, provided valuable training and planning guidance for the states.

##### Areas for Improvement:

1. Ventilation shutdown was selected as the preferred depopulation method by multiple states; however, there was uncertainty whether VS would approve its use and pay federal indemnity for animals depopulated in this manner.
2. The site management teams were not consistent in informing producers of who was ultimately responsible for depopulation and disposal.
3. The epidemiological questionnaire and herd plan used for the exercise did not facilitate collection of critical information for the indemnity calculator.
4. Many states were still uncertain about indemnity, how to value animals, what is reimbursable, and actions that could impact federal indemnity payments.
5. Logistics section personnel in multiple states had difficulty accessing their own state's resource request systems and/or the EMRS for resource ordering.
6. Many states struggled with understanding what resources are available from the NVS.

### Theme 4: Permitted Movement

Data analysis of the SFEAR documents identified common strengths and areas for improvement regarding plans, policies, and procedures for monitoring, reviewing, and approving permitted movements out of Control Areas.

#### Strengths and Areas for Improvement

##### Strengths

- Producers thought the EMRS Permit Gateway (Gateway) was easy to use.
- States planned to use multiple ways to notify producers within control areas of the associated movement permitting requirements (e.g., using local emergency management, using field staff from other state agencies, using telephone alert systems, etc.)
- The exercise provided the pork industry detailed exposure to the movement permitting systems that would be used during a FAD outbreak.
- VS was able to work with some of the largest pork producers in the country to educate them on the Gateway and to get their premises information uploaded into the system.
- Having producers submit movement permit requests for actual movements they would be trying to initiate, added realism to the exercise.
- EMRS associates were on site in most playing states to provide real-time EMRS support.
- Pooled samples and rope tests are now being considered for use in monitoring for ASF infection.

##### Areas for Improvement

1. For interstate movements, the approving destination state did not always inform the receiving location of incoming movements out of a control area.
2. There was variability among states on permitting requirements, such as pre-movement testing.
3. When producers were informed that a permit request was denied, they were not told who rejected it or why.
4. Industry participants were concerned over the amount of time it took for destination states to respond to permit requests.
5. The pre-movement sampling requirements referenced in the exercise guidance documents require large numbers of samples to be collected and analyzed.
6. Many states had difficulty using EMRS during Day 4.
7. Playing producers were not aware of the processes to permit feed and equipment movement out of a control area.



## Theme 5: Exercise Design and Conduct

Data analysis of the SFEAR documents identified common strengths and areas for improvement regarding the development and conduct of the SFEAR functional exercises and drills.

### Strengths and Areas for Improvement

#### Strengths:

- The three ICG conference calls each day allowed states to learn from one another's actions and concerns. These calls also allowed the ICG to maintain situational awareness on the actions of all the playing states.
- Several states were able to leverage Department of Agriculture support beyond the animal health department/division.
- The number of permit-related injects was appropriate to challenge states' plans.
- Industry's engagement and participation in play added realism to the exercise.
- The focus of each day on a unique critical response activity allowed participants to exercise actions, in detail, that they might not have time for in a typical exercise conducted in real-time.

#### Areas for Improvement:

##### General Design and Conduct Issues

1. With 14 states playing and sending the ICG a variety of data, reports, and questions, it was hard for the ICG to review and triage important information in a timely manner.
2. The "siloe" nature of the exercise design created confusion for players regarding daily expectations, what information carried over from one day to another, where play should begin or end, and what is assumed to have already occurred (e.g., if the standstill had been lifted by Day 3 play).
3. The three-per-day ICG calls each day disrupted exercise play in many states.
4. Evaluators and Controllers had difficulty seeing all written products, so tracking critical events was difficult.
5. Several states felt that there were not enough injects from the general public, industry, or the media, directed at public information officers (PIO) or a phone bank.

##### Day 1 Issues

1. Having the FADI, Day 1, before the movement standstill day was confusing to many players. On Day 1, each playing state identified a non-negative herd infected with ASF virus, and on Day 2 they were instructed to play as if they did not have a possible infected premises.
2. Several states indicated that they would have contacted their NAHLN laboratory as soon as the FADD reported that the FADI site had submitted samples earlier in the week. The SimCell was not prepared to interact on this point.

##### Days 2 and 3 Issues

None.

##### Day 4 Issues

1. Many states did not understand that when playing as the origin state, they should consider themselves to have an active outbreak, but when they received permit requests as a receiving state, they should consider the request as if they did not have an active outbreak.
2. The use of training premises identification numbers (PIN) for the exercise caused confusion on Day 4 of play.

## Conclusions

This final AAR/IP was developed through data mining from individual entities, notes, EEGs, other participant feedback/input, and from venue-specific hot washes. The analysis of this information identified 34 areas for improvement, organized under five unique themes. The final AAR/IP presents 73 recommendations for improvement. This final AAR/IP will facilitate the conduct of the VS NTEP 2020 Training and Exercise Planning Workshop (TEPW) in April 2020.

This exercise would not have been possible without the support of the VS NTEP, NPIC, CEAH, and the swine industry. In addition, the enthusiastic and realistic play from the 14 participating states and the 20 private swine production operations representing 18 swine production companies, and numerous supporting agencies and industries, was extremely valuable to the realism and depth of play achieved during the SFEAR exercises.

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## Contents

Handling Instructions.....	i
Exercise Overview .....	iii
Executive Summary .....	vii
Methodology.....	vii
Highlights from the Analysis .....	vii
Theme 1: Foreign Animal Disease Investigation.....	viii
Theme 2: Movement Standstill.....	ix
Theme 3: Depopulation and Disposal.....	x
Theme 4: Permitted Movement .....	xi
Theme 5: Exercise Design and Conduct.....	xii
Conclusions.....	xiii
Section 1: Introduction.....	1
Section 2: After-Action Methodology .....	3
Purpose.....	4
Critical Activities, Goal, and Objectives .....	4
Critical Activities .....	4
Goal.....	5
Objectives .....	5
Data Analysis.....	5
Themes .....	5
Weaknesses of Methodology .....	5
Relationship to Other Documents.....	5
Section 3: Analysis - Themes .....	7
Theme 1: Foreign Animal Disease Investigation.....	7
Strengths .....	7
Areas for Improvement and Recommendations .....	7
Theme 2: Movement Standstill.....	9
Strengths .....	10
Areas for Improvement and Recommendations .....	10
Theme 3: Depopulation and Disposal.....	12
Strengths .....	13
Areas for Improvement and Recommendations .....	13

Theme 4: Permitted Movement ..... 15  
    Strengths ..... 15  
    Areas for Improvement and Recommendations ..... 15  
Theme 5: Exercise Design and Conduct ..... 17  
    Strengths ..... 18  
    General Design..... 18  
    Day 1 ..... 20  
    Day 2..... 20  
    Day 3 ..... 21  
    Day 4..... 21  
Section 4: Improvement Plan..... 23  
Appendix A: Player Profile and Feedback..... 37  
Appendix B: AAM Participants..... 41  
Appendix C: List of Acronyms..... 43

**Tables**

Table 1: SFEAR Participants ..... 3  
Table 2: Exercise Objectives and Associated Critical Activities..... 6  
Table 3: Improvement Plan – FADI ..... 23  
Table 4: Improvement Plan – Movement Standstill ..... 25  
Table 5: Improvement Plan – Depopulation and Disposal ..... 28  
Table 6: Improvement Plan – Permitted Movement..... 30  
Table 7: Improvement Plan – Exercise Design and Conduct ..... 33

**Figure**

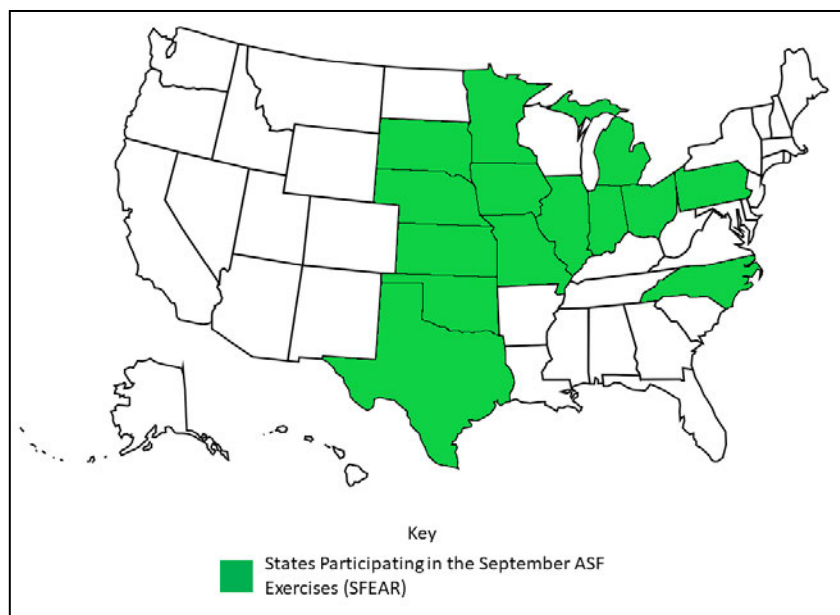
Figure 1 - States Participating in the ARMAR Exercise ..... 1



## Section 1: Introduction

The USDA APHIS VS NTEP sponsored four unique exercises for the top 14 swine producing states (Figure 1) to further their capacity to effectively respond to and mitigate an outbreak of ASF. In addition, 20 private swine producers, representing 18 companies (Christensen Farms, Country View Family Farms, Dykhuis Farms, Hord Livestock, Iowa Select Farms, JBS Fresh Pork, JVV Pork, Lehmann Brothers, Livingston Enterprises, Maschoffs, New Fashion Pork, Pipestone, Prestage Farms, Seaboard Foods, Smithfield Foods, Thomas Livestock, Two Mile Pork, Valley Feeds) participated in the final three exercises.

**Figure 1 - States Participating in the SFEAR Exercise**



The four exercises were: *ASF Response Policy Workshop*, conducted on November 28 and 29, 2018; *ASF Plan Review and Revision Workshop*, conducted on February 27 and 28, 2019; *ASF Response Tabletop Exercise (TTX)*, conducted on April 25 and 26, 2019; and the *SFEAR Exercises and Drills*, conducted on September 23 through 26, 2019. This AAR/IP addresses the outcomes of the fourth exercise.

The September SFEAR exercises and drills were designed to be unique activities targeting key areas of ASF response and mitigation. Each of the 14 states participated from their departmental operations centers, or equivalent; they initiated the appropriate scale of the Incident Command System (ICS), as designated in their response plans; and they deployed field personnel as needed. The 20 producers, each representing one of 18 participating companies, played from their farms on Days 1 and 3. On Days 2 and 4, the companies played from their offices.

The general focus of each day's play was:

September 23, Day 1 - Swine producers in each of the 14 states that volunteered to participate in the entire exercise series, initiated a FADI by contacting the SAHO and reporting an unusual sickness in their swine. The SAHO, in coordination with the AVIC, dispatched a FADD to investigate. The FADD traveled to the operation and conducted a FADI, which included

coordination with NVSL FADDL and the local NAHLN laboratory, the collection of samples, and delivery of the samples to the appropriate NAHLN laboratory. The NAHLN laboratories practiced sample accession and communication of results. This day was a combination drill and FE.

September 24, Day 2 - USDA and the NASAHO conducted a joint conference call for SAHOs and VS District personnel, announcing confirmation of ASF in commercial swine in the United States and initiating, as needed, a temporary state, regional, or national movement standstill. This call started FE play dealing with a state supporting and implementing response activities including movement standstills and notifications.

September 25, Day 3 - States sent site management teams to each of the participating production operations to engage with the producers/companies regarding depopulation and disposal of infected and exposed animals on the farm. This day of play involved on-farm play and “office” play for each state’s IMT. Play involved planning and logistics coordination between personnel in the field and the IMT. On each playing farm, responders and producers determined how to set up for and implement depopulation and disposal. This day of play was a combination drill and FE.

September 26, Day 4 - States implemented their plans to support continuity of business within an ASF outbreak control area. In all cases, this involved implementing a state’s Secure Pork Supply (SPS) plan. This day of play was a combination FE and drill where independent swine producers and integrated swine production companies submitted movement permit requests, either on paper or electronically, based on established control zones. The states initiated the processes for permit application review and approval, and, for interstate movement requests, the origin and destination states coordinated on permit review and approval.

Participating states were engaged at varied levels ranging from functional exercise and drill play throughout the exercise, to participating in a TTX format on Day 2 (noted on Table 1).

Evaluation of this exercise focused on select VS Critical Activities necessary to implement effective policies, plans, and procedures associated with responding to an ASF outbreak in the United States. Exercise evaluation, exercise staff notes, and player feedback were used by each state/federal lead agency to develop AARs and IPs.

For additional details on the SFEAR exercise, please consult the applicable companion publications (i.e., the Exercise Plan, Situation Manual, Controller and Evaluator Manual, and the individual AARs and IPs from each of the participating lead agencies). These documents are available from the Exercise Director.

## Section 2: After-Action Methodology

This AAR/IP is intended to identify strengths and potential areas for improvement that relate to most of the entities participating in the SFEAR exercises and drills. Therefore, this document constitutes an “Overarching AAR/IP,” containing information relative to participating entities as a whole or, at a minimum, some subset of the entire group, such as states and federal partners.

**Table 1: SFEAR Participants**

Venue	Day 1	Day 2	Day 3	Day 4	Total
IA	13	68	23	21	125
IL	6	23	14	16	59
IN	14	19	29	12	74
KS	25	63	79	69	236
MI <sup>2</sup>	5	15	7	12	39
MN	32	61	53	30	176
MO <sup>2</sup>	15	16	19	10	60
NE	17	19	21	17	74
NC	27	25	30	23	105
OH <sup>2</sup>	16	28	20	17	81
OK	6	15	18	12	51
PA	21	21	59	23	124
SD <sup>2</sup>	19	8	15	6	48
TX	22	23	24	22	91
ICG	33	31	31	30	125
IA Producer - Observer Satellites	18	21	32	20	91
<b>Grand Totals</b>	<b>289</b>	<b>456</b>	<b>474</b>	<b>340</b>	<b>1559</b>

Five distinct sources of data were analyzed to produce this report:

1. Controller and Evaluator notes from each venue
2. Exercise EEGs
3. Written feedback from 191 participants (Appendix A shows the number of survey respondents by playing entity and by participating venue)
4. Hot wash notes collected from daily hot washes in each exercise venue
5. After-exercise hot washes with the ICG; Exercise Directors and Core Planning Team; and Producers, Controllers, and Evaluators

These data sources were reviewed and areas for improvement were identified, either by multiple sources or by multiple playing entities, and recorded. The areas for improvement were further filtered by the entities they impacted. Only areas for improvement that could impact some combination of federal, state, and/or industry entities are included in this report. In addition,

<sup>2</sup> Michigan, Missouri, Ohio, and South Dakota participated in a TTX on Day 2.



corrective actions associated with the areas for improvement, when provided, were recorded and are included in this AAR.

## Purpose

The purposes of this AAR are to: (1) identify common strengths and areas for improvement mentioned by a majority of the participating entities in their individual AARs, notes, EEGs, hot washes, and direct input from the exercise core planning team and select VS staff and (2) acquire critical information essential to determining organizational readiness in the event of an ASF incursion.

These commonalities represent issues that should be considered and possibly addressed by all the participating entities, or at least a subset of those entities; e.g., state issues and industry or joint state, industry, and federal issues. In addition, the AAR includes basic exercise information, such as the exercise name, type of exercise, date, location, participating organizations, mission area(s), specific threat or hazard, a brief scenario description, and the name of the exercise sponsor and points of contact (POCs).

The purpose of the accompanying IP is to provide at least one recommendation for each of the identified areas for improvement, assign responsibility for the recommendation, and identify a timeframe for implementation of the recommendation.

## Critical Activities, Goal, and Objectives

### Critical Activities

Evaluation of the SFEAR exercises and drills focused on 10 of the 23 Critical Activities described in the USDA document *FAD Response Ready Reference Guide—Critical Activities and Tools during a FAD Response*<sup>3</sup>. This exercise focused on specific VS Critical Activities that align with the exercise objectives. The VS Critical Activities represent a better descriptor of the key tasks addressed by this exercise, relative to the 32 Core Capabilities<sup>4</sup> identified in the National Preparedness Goal (NPG)<sup>5</sup>. (*This is due to the focus of the Core Capabilities on consequence management, rather than the capabilities VS identifies as critical activities for an effective FAD response.*)

The following Critical Activities are applicable to the exercise objectives and were the focus of the exercise:

1. Diagnostics
2. Epidemiological Investigation and Tracing
3. Information Management
4. Communication
5. Health and Safety and Personal Protective Equipment
6. Biosecurity
7. Quarantine and Movement Control
8. Continuity of Business
9. Mass Depopulation and Euthanasia
10. Disposal

<sup>3</sup> FAD Response Ready Reference Guide— Critical Activities and Tools during an FAD Response, [https://www.aphis.usda.gov/animal\\_health/emergency\\_management/downloads/generic\\_critical\\_activities\\_rrg.pdf](https://www.aphis.usda.gov/animal_health/emergency_management/downloads/generic_critical_activities_rrg.pdf)

<sup>4</sup> Federal Emergency Management Agency (FEMA) Core Capabilities: <https://www.fema.gov/core-capabilities>

<sup>5</sup> National Preparedness Goal <https://www.fema.gov/national-preparedness-goal>

## Goal

The Exercise Planning Team identified the following exercise goal: *Validate existing FAD plans to assure their capacity to address an outbreak of ASF.*

## Objectives

The exercise objectives shown in Table 2 describe the expected outcomes for the exercise. The objectives are linked to specific Critical Activities. The objectives and aligned Critical Activities were selected by the Exercise Planning Team.

## Data Analysis

### Themes

Due to the focused nature of the exercise design, the AAR has been organized into five theme areas representing the topic of each day's play, plus the general exercise design. The five distinct themes are:

1. Foreign Animal Disease Investigation
2. Movement Standstill
3. Depopulation and Disposal
4. Permitted Movement
5. Exercise Design and Conduct

Each theme presents an accounting of associated strengths, a listing of areas for improvement, a root cause analysis or discussion of potential impacts, and corrective actions for the areas for improvement. Like the strengths and areas for improvement, the corrective actions were gleaned from the SFEAR data review.

## Weaknesses of Methodology

The authors of this report were not present when the associated notes were collected, when all the hot washes were conducted, or when the EEGs were completed. This, coupled with the wide geographic distribution of the playing entities, resulted in the overarching SFEAR AAR being created from data mining from the five data sources mentioned above. The authors used an understanding of issues that arose during play and a general understanding of each lead agency's general response plans and policies, as well as professional judgment, to identify common strengths, areas for improvement, and recommendations for corrective action. In many cases, this required the authors to paraphrase or interpret differently worded passages to assemble a common "area for improvement" or "recommendation."

## Relationship to Other Documents

This AAR is directly related to the IP, which drives the improvement process. The IP was developed concurrently with the AAR and is included at the end of this document. The AAR identifies areas for improvement and possible mitigation strategies, while the IP identifies specific recommendations to mitigate the areas for improvement and assigns responsibility and a timeline for each recommendation.

**Table 2: Exercise Objectives and Associated Critical Activities**

Exercise Objective	Critical Activities
Conduct an initial epidemiological investigation related to an ASF outbreak to support the development of a control area.	Epidemiological Investigation and Tracing
Collect, document, and deliver the appropriate samples necessary to determine the status of a potential infection.	Epidemiological Investigation and Tracing, and Diagnostics
Given the infected premises in the scenario, determine control area(s).	Epidemiological Investigation and Tracing
Develop, approve, and disseminate public and industry related information to support response actions for each day of play, including a Situation Report.	Communication
Implement the state’s procedures for supporting a national movement standstill.	Quarantine and Movement Control
Develop a depopulation plan specific to the impacted operation(s) in each state’s scenario.	Mass Depopulation and Euthanasia
Develop a disposal plan specific to the impacted operation(s) in each state’s scenario.	Disposal
Develop a complete IAP for the implementation of the state’s depopulation and disposal plan for the infected operation(s).	Information Management, Biosecurity, and Health and Safety and Personal Protective Equipment
Develop a herd plan for the infected premises.	
Accept, review, approve, and deliver movement permits for premises requesting movement out of a control area.	Continuity of Business

## Section 3: Analysis - Themes

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### *Theme 1: Foreign Animal Disease Investigation*

Data analysis of the SFEAR documents and other feedback identified both strengths and areas for improvement regarding the implementation of a FADI and the associated sampling process. The areas for concern addressed public information issues, the FADI process, and data management.

#### **Strengths**

- Exercise play showed coordination between FADDs, SAHOs, AVICs, and the state and federal diagnostic laboratories.
- Conducting actual on-farm FADIs, including necropsies and sampling, increased the realism of Day 1 play.
- Participation of the NAHLN laboratories in all 14 states and the FADDL added realism and allowed FADI coordination and sample delivery planning and documentation to be practiced.
- Having producers engage in play during the FADI and providing site-specific epidemiological data increased the realism of the exercise.
- Initial coordination between the producer and the state clearly conveyed the expectations and details regarding the pending FADI, and producer follow-up by the FADD was timely.
- The Logistics Center had many requests for personnel, including VS NIMT, submitted through the EMRS.
- Most states got their FADI information into EMRS in a timely manner.
- All the states had systems and processes in place to rapidly identify and dispatch FADDs.
- Most states engaged their supporting state agencies in the planning to transport FADI samples from the farms to the state and federal diagnostic laboratories.
- Most states and their associated VS District personnel formed Unified Commands in response to the scenario.
- Almost all states coordinated with FADDL regarding sample collection and Priority 1 sample delivery.
- FADDs were respectful of the playing farm's biosecurity requirements and other requests made by the playing producers.
- FADDs communicated and coordinated with the producers and their staff during the FADI.

#### **Areas for Improvement and Recommendations**

1. After receiving the non-negative result for the index ASF case from the NAHLN laboratory, several states wanted to notify select stakeholders of the non-negative result. Primarily, these stakeholders consisted of state pork producer associations and other potentially impacted industries. APHIS requested that this information not be publicly released until FADDL confirmed the non-negative result and APHIS made the announcement. Later in the exercise,

APHIS clarified that a very controlled release of the information to key stakeholders was acceptable. This need for tight control on preliminary information is primarily due to potential trade impacts that could result from an early notification based on a false non-negative result.

Possible recommendations include:

- a. APHIS should clearly define what constitutes a “public release” of information.
  - b. If states plan to release this type of preliminary outbreak information to key stakeholders, the need for confidentiality must be emphasized. State communications plans should be amended to address the partial release of “non-public” information.
2. The FADDs conducting necropsies on sows found that containment of fluids was very difficult. Conducting the necropsy on plastic sheeting was reported to be ineffective for containing the bodily fluids released. An uncontrolled release of potentially infected materials could encourage disease spread and make cleaning and disinfection of the area difficult.

Possible recommendations include:

- a. Develop risk-based guidance on effective containment systems that could be used by FADDs in the field.
    - i. One FADD addressed this issue by conducting the necropsy in the bucket of an on-site skid-steer.
    - ii. Another FADD conducted the necropsy inside the building, allowing the fluids to drain into the manure pit.
3. Several of the playing production sites required all materials and supplies brought in by the FADD to undergo disinfection. In several cases, this added 45 to 60 minutes to the farm entry process. These were considered significant delays by the FADDs and producers.

Possible recommendations include:

- a. Send sampling equipment to the farm in advance of an exercise to have it disinfected prior to the start of the FADI.
- b. Developing a self-contained FADI kit for FADDs and hermetically sealing it in a manner that would allow the exterior to be disinfected with a liquid would speed up the process.
- c. Develop guidance for producers to maintain an acceptable FADD sampling kit on-site, pending a FADI.

4. Because of the remote location of some premises, FADDs were unable to log onto EMRS2Go and enter their data; they were unaware that they could enter the data offline.

Possible recommendations include:

- a. EMRS2Go has the capability to be used offline and then have its data uploaded as soon as the FADD has internet connectivity. FADDs should be reminded of this capability and be trained in the offline use of EMRS2Go.
5. The draft epidemiological questionnaire provided for the exercise did not include questions regarding other operations a farmworker may work at, or whether any of the farmworker's family work at other operations with susceptible species.

Possible recommendations include:

- a. The following question should be added to the draft epidemiological questionnaire: *Do any of your staff work at another farm with susceptible species, and do any family members work at other livestock operations with susceptible species?*
6. The availability of FADDs was reported as potentially a limiting factor in conducting multiple FADIs and the ability to follow up on traces and other dangerous contacts in a timely manner. This was due to both the limited number of FADDs available in a state and the recommended downtime (time away from susceptible species) for personnel who have been on an infected premises.

Possible recommendations include:

- a. Alternatives to deploying FADDs to investigations on any premises (contact, suspect, or other) should be developed to conserve these critical resources. An example would be to utilize Type II accredited private practice veterinarians in the state or herd veterinarians in the state who have had training approved by their respective state animal health official.
- b. ASF-specific FADI biosecurity protocols should be reviewed to determine if there are changes that could reduce the required downtime for FADDs.
- c. States and VS Districts should develop procedures for requesting FADD support from non-affected states, VS Districts, or military. The procedures should address any licensure issues, if applicable.
- d. USDA FSIS veterinarians and state meat and poultry inspection veterinarians should be FAD trained and made available if needed for investigations.

## **Theme 2: Movement Standstill**

Data analysis of the SFEAR documents and other feedback identified both strengths and areas for improvement regarding implementation of a movement standstill. The areas for improvement addressed public information issues, implementing a standstill, and setting the criteria and conditions for a movement standstill.

## Strengths

- There was good coordination and communication between the state and industry. Industry and state representatives frankly discussed the implementation and impact of movement standstills, providing both suggestions and concerns. This helped the state design a standstill that was as flexible as possible, while being protective of the industry.
- Having the SAHO from Mississippi and Dr. Jonathan Zack facilitate the NASAHO call was realistic, and effective in conveying the potential threats the simulated disease outbreak posed to the swine industry. The simulated index premises was an operation that, in real-life, has wide-ranging connections with many of the playing states. This also increased the realism of the scenario.
- Interacting with neighboring states to coordinate implementation of the movement standstill allowed states and industry to assess the interoperability of their plans and approaches.

## Areas for Improvement and Recommendations

1. The initial state and federal press releases regarding the ASF outbreak in Mississippi and the associated movement standstill had little to no information regarding the safety of the food supply and the fact that ASF is not a human health concern. Previous exercises in this series have identified the need to emphasize these issues in all public communications regarding an ASF outbreak and response.

### Possible recommendations include:

- a. Working together, state and federal communications staff should develop pre-scripted messaging regarding human health impacts and food safety issues relative to an ASF outbreak. This messaging can be appended to all public communications associated with an ASF outbreak mitigation and response.
  - b. State and federal communications plans should be updated to address the need for emphasizing food safety and human health in all public messaging.
2. During the exercise, the status and criteria of movement standstills for all states was difficult to ascertain. States focused on informing their citizens and affected industries. The ICG, states, and producers all expressed the need to know the status of all states' movement standstills during a FAD outbreak. For industry, this was essential information for any company considering interstate movements, and for the ICG it was critical to maintaining national-level situational awareness.

### Possible recommendations include:

- a. Develop an information clearing house for states to post their status and criteria regarding intrastate and interstate movement standstills during a FAD outbreak. Several possible hosts for this information were suggested: National Pork Board (NPB), the Cross Species Working Group (CSWG), and USDA's response website.
- b. States can post movement standstill information on social media sites and producers/companies can "follow" key states to get notifications when information is posted.

- c. States can develop text groups for notifications on FAD response, including movement standstill information. Producers/companies can sign up to the text groups for their states of interest.
3. Many states were hesitant to initiate an intrastate movement standstill. They were waiting for VS to request a national movement standstill before moving forward with an intrastate standstill. In a real event, this would have created a movement challenge because some of the major swine import/export states (e.g., IA and NC) immediately decided to implement an intrastate movement standstill. In this circumstance, states that had not initiated an intrastate standstill could be allowing swine to move toward states that have intrastate movement standstills in place.

Possible recommendations include:

- a. USDA should issue its National Movement Standstill recommendation or order quickly with defined minimum criteria. These criteria need to be developed and should be pursued as a collaborative effort between VS and the states.
    - i. Provide guidance on what could be considered a critical intrastate movement that could continue during the standstill.
    - ii. Provide an expected duration of the national standstill, including what conditions could result in lifting, modifying, or extending the national standstill.
    - iii. Identify the start-time for the national standstill, including a discussion of the duration of any grace period.
    - iv. Provide a clear definition of what movement is allowed during the grace period; e.g., *no new movements should be initiated during this time*. In addition, clearly define how movements in progress during a grace period should proceed; i.e., when to return to the place of origin and when to proceed to the next destination.
    - v. If applicable, define the conditions required for VS to provide financial support to an infected or not-infected state in enforcement of a national standstill.
  - b. VS and industry should establish a publicly accessible repository for states to post their status and criteria regarding intrastate movement standstills during a FAD outbreak. Several possible hosts for this information repository were suggested: NPB, the CSWG, and USDA's response website.
4. The scientific/risk-based rationale for the 72-hour duration of the initial national standstill request was not provided and its efficacy was questioned by players.

Possible recommendations include:

- a. VS, states, and industry need to develop a risk-based guidance to determine the optimal duration and scope of a national/regional standstill. This risk-based guidance should consider such issues as the disease, susceptible species, location of the index case, time of year, and any other criteria that could significantly impact or mitigate the risk of disease spread.



5. States initiating intrastate standstills had varying movement grace times before total intrastate movement prohibition would take place. Playing companies that routinely engage in interstate shipment of swine observed that these inconsistencies would lead to what they referred to as “rolling standstills.” These “rolling standstills” could result in hogs being stopped at a destination state’s border where movement standstill has begun sooner than in the hogs’ origin state, or the stoppage could be in a pass-through state. This issue was further exacerbated by interstate shippers being unaware of the start-times for intrastate movement prohibition in pass-through or destination states.

Possible recommendations include:

- a. APHIS should further develop the existing Initial Movement Standstill guidance for standardization and inclusion of the start /stop time, the grace period for pigs in transit to complete transit, and the grace period for pigs in livestock markets to continue transit, and clarify swine held in slaughter plant lairage continue to be slaughtered.
  - b. States should coordinate nationally or regionally to develop uniform grace periods associated with movement standstills when there is no national standstill.
  - c. States that have commuter herd agreements with other states should notify all companies listed in those agreements of movement standstill information as soon as it is determined during an outbreak.
  - d. States should notify all practicing veterinarians of the timing of a movement standstill and the associated restrictions or exceptions. These veterinarians can then spread the word to the producer community.
6. Several states had difficulty in determining what “critical” intrastate swine-production movements they would allow to continue during the standstill. In some instances, this was never accomplished, and a total standstill was the default. Industry felt that low risk and critical intrastate movements should be allowed (e.g., feed); however, there was no consistency among companies on what should be considered low risk and critical. Failure to allow continued intrastate movement of “critical” things could result in animal welfare issues and other impacts to the industry.

Possible recommendations include:

- a. Federal, state, and industry partners should work together to develop risk-based criteria for identifying intrastate movements that are both low risk and critical to the industry. An alternative would be to have this group publish a list of acceptable critical intrastate movements that could be allowed during a standstill.

### ***Theme 3: Depopulation and Disposal***

Data analysis of the SFEAR documents and other feedback identified both strengths and areas for improvement regarding planning for depopulation and disposal of animals at infected premises. Areas for concern included depopulation methods, site management teams, indemnity, logistics, and cleaning and disinfection.

## Strengths

- Site management teams worked with the producer and production staff to assess the site and develop an appropriate depopulation and disposal plan.
- The site management teams coordinated with the state's ICP/IMT.
- The site management teams followed the producers' biosecurity requirements.
- States were thorough in their collection of information and associated development of the herd plan for the infected premises. They addressed the operational requirements of depopulation and disposal, as well as necessary resources, in detail.
- The exercise provided producers and the industry an opportunity to observe and participate in the site management process.
- The exercise's focus only on depopulation and disposal allowed these issues to be considered in detail by the players.
- Response-related questions were answered in real time by the ICG.
- Having industry players on-farm and as observers in the ICPs/IMTs allowed real-time feedback regarding state plans for depopulation and disposal.
- The multiple depopulation and disposal webinars, sponsored by the VS NTEP and offered in advance of the exercise, provided valuable training and planning guidance for the states.

## Areas for Improvement and Recommendations

1. Ventilation shutdown was selected as the preferred depopulation method by multiple states; however, there was uncertainty if VS would approve its use and pay federal indemnity for animals depopulated in this manner.

### Possible recommendations include:

- a. VS should develop a policy guide relative to accepting ventilation shutdown, including conditions for being eligible for indemnity and the documentation needed to support its use.
2. The site management teams were not consistent in informing producers of who was ultimately responsible for depopulation and disposal. The responsible party identified varied among producers, the state, and federal entities.

### Possible recommendations include:

- a. Verify that the herd plan addresses who is responsible for implementing depopulation and disposal, and revise the document if necessary. The herd plan should clarify when these issues will be left to the individual swine owners, in coordination with their state agriculture department, and when federal involvement is necessary.
  - b. Review the existing Case Manager training to see if it addresses how to determine/communicate who is responsible for implementing depopulation and disposal; and revise if necessary.
3. The epidemiological questionnaire (Epi Form) used for the exercise did not facilitate collection of critical information for the indemnity calculator. For example, producers

indicated that the herd plan used in the exercise did not appropriately consider sow farms, and FADDs indicated that there was no place on the forms to record herd inventory information.

Possible recommendations include:

- a. These two tools (Epi Form and Herd Plan) need to be synchronized on the information they provide and/or need, related to herd inventories. The herd plan should clarify when these issues will be left to the individual swine owners, in coordination with their state agriculture department, and when federal involvement is necessary.
4. Many states were still uncertain about indemnity, how to value animals, what is paid, and actions that could impact federal indemnity payments. For example, is a signed herd plan necessary to begin depopulation?

Possible recommendations include:

- a. Clarify the policy regarding the status of a herd plan relative to finalizing indemnity and implementing depopulation.
  - b. VS should provide written guidance on indemnity. This guidance should address such issues as: will 100% indemnity be authorized, how does the calculator work and how often will it be updated in an ASF event, how indemnity is split between company and grower, how indemnity caps are established, what response-related actions can impact the availability of federal indemnity, and what needs to be signed or completed prior to approving an indemnity payment.
5. Logistics section personnel in multiple states had difficulty accessing their own state's resource request systems and/or the EMRS for resource ordering. This was due to a lack of proficiency in using the systems and/or system access issues.

Possible recommendations include:

- a. Provide training and/or refresher training for logistics personnel on how to access and use state and federal resource request systems.
  - b. Develop protocols for logistics personnel to maintain active access to state and federal resource ordering systems, as appropriate.
6. Many states struggled with understanding what resources are available from the NVS. For example, some states requested unusual depopulation equipment, such as whole-house CO<sub>2</sub> depopulation manifolds for swine. This item is not in the NVS catalogue.

Possible recommendations include:

- a. Emergency Coordinators (EC) should work with the states to assure that appropriate logistics personnel have the current NVS catalog.
- b. States and VS District personnel need to conduct NVS resource ordering exercises.
- c. States need to develop procedures to access resources from producers or the local industry.

## Theme 4: Permitted Movement

Data analysis of the SFEAR documents and other feedback identified both strengths and areas for improvement regarding the implementation of permitted movement out of a control area. The areas for improvement included communication, permit requirements, and EMRS.

### Strengths

- Producers thought the Gateway was easy to use.
- States planned to use multiple ways to notify producers within control areas of the associated movement permitting requirements (e.g., using local emergency management, using field staff from other state agencies, using telephone alert systems, etc.).
- The exercise gave the pork industry detailed exposure to the movement permitting systems that would be used during a FAD outbreak.
- VS was able to work with some of the largest pork producers in the country to educate them on the Gateway and to get their premises information uploaded into the system.
- Having producers submit movement permit requests for actual movements they would be trying to initiate, added realism to the exercise.
- EMRS associates were on site in most playing states to provide real-time EMRS support.
- Pooled samples and rope tests are currently being evaluated for use in monitoring for ASF infection.

### Areas for Improvement and Recommendations

1. For interstate movements, the approving destination state did not always inform the receiving location of incoming movements out of a control area. Therefore, these operations did not have the opportunity to refuse the movement.

#### Possible recommendations include:

- a. Modify the permit application to include a verification that the destination is expecting the shipment and will accept it.
2. There was variability among states on permitting requirements, such as pre-movement testing. It wasn't necessarily the requirements themselves that caused concern, but existing variations. In several cases, producers had the origin state approve a permit and the receiving state deny it, applying different criteria. Producers were concerned that *"Failure to have a national approach will lead to states using diagnostics as protectionism of their state and 'hiding' behind requirements that are not based in science."* The producer community requested consistency and common sense in this critical element of disease management which affects business continuity and animal welfare.

Producers were made aware of the permitting requirement for their resident state; however, they had no way to identify the requirements of the destination state. This often resulted in producers requesting interstate movement permits and having their permit requests denied on the grounds that the movement did not meet the permit requirements of the receiving state. In

addition, receiving states were not aware of the origin state's permitting requirements, and therefore were hesitant to approve permit requests.

Possible recommendations include:

- a. Create an information clearing house for states to post SPS permitting criteria. Several possible hosts for this information were suggested: NPB, the CSWG, and USDA's response website.
  - b. States should coordinate nationally or regionally on permitting requirements for SPS movements out of control areas.
  - c. When questions on permitting requirements arise between an origin state and a destination state, the state with the question or concern should contact the other state for clarification. This interaction should be described in a state's SPS plan.
3. When producers were informed that a permit request was denied, they were not told who denied the permit, or why it was rejected. The EMRS Gateway has this functionality and it was disabled for the exercise. This area for improvement addresses permitting outside the Gateway.

Possible recommendations include:

- a. In the case of an intrastate movement request, the state should notify the producer of a rejection and the associated reasons. In the case of an interstate movement permit request, the origin state should be informed by the destination state of a permit rejection and the associated reasons.
4. Industry participants were concerned over the amount of time it took for destination states to respond to permit requests. In some cases, action on a permit request did not occur until a producer called the state to inquire about the delay. Some states reported that they were unaware of interstate movement requests forwarded to them, causing these requests to go unreviewed.

Possible recommendations include:

- a. Origin states should notify destination states of movement permit requests that have been approved, and that are waiting on final approval from the destination state.
  - b. Develop procedures to monitor and refresh the EMRS permitting screens.
  - c. Add the following functionality to the EMRS permitting system: When an interstate movement permit is approved by the origin state, a flag should be sent to the destination state, indicating a pending permit request.
5. The pre-movement sampling requirements referenced in the exercise guidance documents require large numbers of samples to be collected and analyzed. This will require producers to assign many staff members to collect samples (and/or veterinarians if they are the only ones allowed to collect samples), and the resulting analytical costs could be high. If veterinarians are required for this sampling, it will reduce the number of available samplers and greatly increase sampling costs. In addition, this surge in sampling volume could create shortages of sampling supplies. For example, NC needed 5,500 purple top tubes for their initial sampling in the control area, and they could only find 1,500 in the state.

Possible recommendations include:

- a. Develop and validate protocols for pooled sampling or rope testing that could reduce both the number of samples needed and the cost of sampling and analysis.
  - b. Develop training and a “certification” program to allow lay persons to collect surveillance samples. This training and certification could be delivered in advance of an outbreak, or it could be delivered in a “just-in-time” fashion.
  - c. States should identify sampling supply companies that could fill any supply gaps created by a surge in sampling associated with supporting permitted movement out of a control area.
6. Many states had difficulty using EMRS during Day 4. In many cases, the issues revolved around improper or non-existent access permissions or expired accounts. In addition, in many cases, states had insufficient numbers of staff trained, with EMRS access, to quickly review and process permit requests. These challenges resulted in considerable delays in reviewing and approving permits.

Possible recommendations include:

- a. Additional state and VS District personnel need access and training on using EMRS for permitting. Based on the challenges with access and permissions, and to efficiently process permit requests, states need to increase their depth of trained permitting staff, develop processes to maintain user access, and provide periodic practice in using EMRS.
  - b. Conduct periodic exercises for EMRS-trained staff to maintain their proficiency and access to the system.
7. During the exercise, producers inquired about permits to move feed and equipment. They were told this is possible in the Gateway by inputting those movements as “tracked conveyances.” Producers were unaware of how this would be done, or if their states would accept the practice.

Possible recommendations include:

- a. Provide state and producer training on using the “tracked conveyances” feature of the Gateway and EMRS permitting system.
- b. Conduct risk assessments associated with feed production and its impact on virus survival and relative to farm-to-farm feed movements.
- c. Develop guidance on acceptable tracked conveyances.

## ***Theme 5: Exercise Design and Conduct***

Data analysis of the SFEAR documents and other feedback identified both strengths and areas for improvement regarding the design and conduct of the SFEAR exercise. The areas of concern were divided into five categories: General Exercise Design, Day 1, Day 2, Day 3, and Day 4.

## Strengths

- The three ICG conference calls each day allowed states to learn from one another's actions and concerns. These calls also allowed the ICG to maintain situational awareness on the actions of all the playing states.
- Several states were able to leverage Department of Agriculture support beyond the animal health department/division.
- The number of permit-related injects was appropriate to challenge states' plans.
- Industry's engagement and participation in play added realism to the exercise.
- The focus of each day on a unique critical response activity allowed participants to exercise actions, in detail, that they might not have time for in a typical exercise conducted in real-time.

## General Design

### *Areas for Improvement and Recommendations*

1. With 14 states playing and sending the ICG a variety of data, reports, and questions, it was hard for the ICG to review and triage important information in a timely manner.

#### Possible recommendations include:

- a. The exercise designers should provide multiple email boxes and assign a few states to each email box. This would also increase the number of personnel necessary to monitor and report on emails.
  - b. Additional ICG staff should be used during the exercise.
2. The "siloes" nature of the exercise design created confusion for players regarding daily expectations, what information carried over from one day to another, where play should begin or end, and what is assumed to have already occurred (e.g., if the standstill had been lifted by Day 3 play).

#### Possible recommendations include:

- a. A daily all-player briefing should be conducted before each day's StartEx. The briefing should address expectations, activities for the day, how to start play, and what assumptions exist regarding prior response. In addition, time must be secured for this briefing, prior to StartEx, each day. On Days 2 and 3, many participants were confused about what they were supposed to do at the onset of play. This briefing was the responsibility of the Controllers for the SFEAR exercise; however, having this briefing delivered by a central entity, like the Master Controller, to all players at the same time, might be more effective.
- b. Revert to a real time sequential exercise format.
- c. During the Concepts and Objectives Meeting, the planning team should examine exercise objectives and determine if a traditional (sequential) daily exercise design or a function-specific (siloes) exercise design is a better match for the exercise goals and objectives.

- d. If using a “siloed” approach for a multiple-state exercise design, be sure the sequence is acceptable to all the playing states. In all cases, the “siloed” activities should occur in the same relative sequence they would in a real event (e.g., in SFEAR, Days 1 and 2 should have been implemented in reverse order). Exercise designers should be open to using a hybrid design where siloed play is mixed with sequential play.
  - e. Provide better Controller training regarding the need for and conduct of pre-play briefings.
  - f. When a siloed exercise design is used, the lead entity playing should develop a partial Incident Action Plan prior to each siloed day. This plan will be used to prepare players for each day of play, presenting the day’s objectives and outlining critical response actions that would have occurred prior to the start of the siloed-day’s play, basically providing a pre-exercise operations briefing. The VS NTEP or SimCell could create a template for these reports to assist states in developing the information, or the task could be assigned to players as “homework” in advance of the exercise conduct.
3. The three-per-day ICG calls disrupted exercise play in many states. These calls were an exercise artificiality; however, they were implemented to allow the identification and capture of key policy issues and potential policy solutions or areas needing further action. The distraction arose in many states when some, if not all, players stopped play to listen to the discussions conducted during these calls. The distracted players often included many of the command and general staff personnel, key decision makers.

Possible recommendations include:

- a. States should consider assigning one person to present state data or concerns, and to take notes. This person could then brief the appropriate IMT staff on important issues.
  - b. These calls should be split into an IMT call and additional policy-level calls. The IMT call should mimic the call format and content of similar daily calls instituted during responses. The policy-level calls should be clearly identified to all players, and open to agency administrators or others who would have authority relative to policy development. For both kinds of calls, the associated objectives need to be clearly presented to players as part of the daily Controller briefing.
  - c. Both the IMT and the policy-level calls should have written agendas, distributed to all attendees. Call moderators should use the agendas to keep the calls on topic and on time.
4. Evaluators and Controllers had difficulty seeing all written products, so tracking critical events was difficult.

Possible recommendations include:

- a. All documents sent to the SimCell should also be printed and placed in an area accessible by the Evaluator and Controller. In addition, when materials are sent to the SimCell, the attending Controller should be added to the “cc” list.
- b. Provide better Controller training on how to monitor for critical events during exercise play.



- c. Have additional Controllers where play occurs in multiple locations. If necessary, Evaluators can act as additional Controllers.
5. Several states felt that there were not enough injects from the general public, industry, or the media, directed at public information officers (PIO) or a phone bank. The general feeling was that in a real event the volume of these interactions would be much greater.

Possible recommendations include:

- a. Simulators and playing states should be assigned at a 1:1 ratio. During SFEAR three states were assigned to each SimCell staff, and the resulting workload did not allow an adequate number of injects to be delivered. The exercise designers feel that there were an appropriate number of injects available relative to the specific focus areas each day and that the low number of injects delivered was due to the excessive number of states assigned to each simulator.
- b. SimCell staff must be dedicated to the SimCell and not participate in other exercise activities.

## Day 1

### *Areas for Improvement and Recommendations*

1. Having the FADI, Day 1, before the movement standstill day was confusing to many players. On Day 1, each playing state identified a non-negative herd infected with ASF virus, and on Day 2 they were instructed to play as if they did not have a possible infected premise.

Possible recommendations include:

- a. Schedule the movement standstill part of the exercise before the FADI part, if the states conducting the FADI are supposed to play the movement standstill as not infected.
2. On Day 1, several states indicated that they would have contacted their NAHLN laboratory as soon as the FADD reported that the FADI site had submitted samples earlier in the week. They would have requested: 1) the sample results for the samples recently submitted (according to the scenario), and if the samples had not been analyzed, have them moved up in the queue; and 2) a search of all past sample submittals by the operation and that they be tested for ASF. This interaction had not been anticipated by the exercise designers and was not coordinated with the playing NAHLNs. The SimCell was not prepared to interact on this point.

Possible recommendations include:

- a. Develop the simulation data to provide states this laboratory-related data if they contact the NAHLN directly or the SimCell.

## Day 2

### *Areas for Improvement and Recommendations*

None.

### Day 3

#### *Areas for Improvement and Recommendations*

None.

### Day 4

#### *Areas for Improvement and Recommendations*

1. Many states did not understand that when playing as the origin state, they should consider themselves to have an active outbreak, but when they received permit requests as a receiving state, they should consider the request as if they did not have an active outbreak.

#### Possible recommendations include:

- a. Provide better Controller training regarding how play would unfold on each day.
  - b. Divide permitting in each state into two distinct sections, one as the initiating state and one as the destination state.
2. The use of training PINs for the exercise caused confusion on Day 4 of play. This confusion arose when producers, using the Gateway, submitted permit requests with their real PINs. This caused confusion for the states who could not find the real PINs in the EMRS training environment.

#### Possible recommendations include:

- a. In advance of the exercise, producers should be provided a master key correlating their real PINs with the ones created when their premises data were migrated from the production side of EMRS to the training side. In addition, some training may be necessary to explain why they must use the training PIN.

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## Section 4: Improvement Plan

This AAR/IP is based on information collected and developed from multiple sources: EEGs, participant feedback forms, hot washes, and Controller and Evaluator notes; and from the review and revisions associated with the After Action Meeting (AAM).

**Table 3: Improvement Plan – Theme 1 FADI**

Issue/Area for Improvement	Recommendation	Capability Element <sup>6</sup>	Responsible Organization	Responsible POC	Start Date	End Date
1. After receiving the non-negative result for the index ASF case from the NAHLN laboratory, several states wanted to notify select stakeholders of the non-negative result.	a. APHIS should clearly define what constitutes a “public release” of information.	Planning				
	b. If states plan to release this type of preliminary outbreak information to key stakeholders, the need for confidentiality must be emphasized. State communications plans should be amended to address the partial release of “non-public” information.	Planning				
2. The FADDs conducting necropsies on sows found that containment of fluids was very difficult.	a. Develop risk-based guidance on effective containment systems that could be used by FADDs in the field. <ul style="list-style-type: none"> <li>i. One FADD addressed this issue by conducting the necropsy in the bucket of an on-site skid-steer.</li> <li>ii. Another FADD conducted the necropsy inside the building, allowing the fluids to drain into the manure pit.</li> </ul>	Planning				
3. Several of the playing production sites required all materials and supplies brought in by the FADD to undergo disinfection, creating delays.	a. Send sampling equipment to the farm in advance of an exercise to have it disinfected prior to the start of the FADI.	Equipment				
	b. Develop a self-contained FADI kit for FADDs and hermetically seal it in a manner that would allow the exterior to be disinfected with a liquid.	Equipment				

<sup>6</sup> *Capability Elements* categorize *Recommendations* by action type and do not infer what entity may be tasked with addressing the recommendation. There are four Capability Elements: Planning, Training, Exercises, and Equipment.

Issue/Area for Improvement	Recommendation	Capability Element <sup>7</sup>	Responsible Organization	Responsible POC	Start Date	End Date
3. (Continued) Several of the playing production sites required all materials and supplies brought in by the FADD to undergo disinfection, creating delays.	c. Develop guidance for producers to maintain an acceptable FADD sampling kit on-site, pending a FADI.	Equipment				
4. Because of the remote location of some premises, FADDs were unable to log onto EMRS2Go and enter their data on site.	a. EMRS2Go has the capability to be used offline and then have its data uploaded as soon as the FADD has internet connectivity. FADDs should be reminded of this capability and be trained in the offline use of EMRS2Go.	Training				
5. The draft epidemiological questionnaire provided for the exercise did not include questions regarding whether a farmworker also worked at another site, or whether any of the farmworker's family work at other operations with susceptible species.	a. The following question should be added to the draft epidemiological questionnaire: <i>Do any of your staff work at another farm with susceptible species, and do any family members work at other livestock operations with susceptible species?</i>	Planning				
6. The availability of FADDs was reported as potentially a limiting factor in conducting multiple FADIs and following up on traces or dangerous contacts in a timely manner.	a. Alternatives to deploying FADDs to investigations on any premises (contact, suspect, or other) should be developed.	Planning				
	b. ASF-specific FADI biosecurity protocols should be reviewed to determine if there are changes that could reduce the required downtime for FADDs.	Planning				
	c. States and VS Districts should develop procedures for requesting FADD support from non-affected states, VS Districts, or military.	Planning				

<sup>7</sup> *Capability Elements* categorize *Recommendations* by action type and do not infer what entity may be tasked with addressing the recommendation. There are four Capability Elements: Planning, Training, Exercises, and Equipment.

Issue/Area for Improvement	Recommendation	Capability Element <sup>7</sup>	Responsible Organization	Responsible POC	Start Date	End Date
	d. USDA FSIS veterinarians and state meat and poultry inspection veterinarians should be FAD trained and made available if needed for investigations.	Training				

**Table 4: Improvement Plan – Theme 2 Movement Standstill**

Issue/Area for Improvement	Recommendation	Capability Element <sup>8</sup>	Responsible Organization	Responsible POC	Start Date	End Date
1. The initial state and federal press releases regarding the ASF outbreak in Mississippi and the associated movement standstill had little to no information regarding the safety of the food supply and the fact that ASF is not a human health concern.	a. Working together, state and federal communications staff should develop pre-scripted messaging regarding human health impacts and food safety issues relative to an ASF outbreak. This messaging can be appended to all public communications associated with an ASF outbreak mitigation and response.	Planning				
	b. State and federal communications plans should be updated to address the need for emphasizing food safety and human health in all public messaging.	Planning				
2. During the exercise, the status and criteria of movement standstills for all states was difficult for the ICG in APHIS to ascertain.	a. Develop an information clearing house for states to post their status and criteria regarding intrastate movement standstills during a FAD outbreak. Several possible hosts for this information were suggested: National Pork Board (NPB), the Cross Species Working Group (CSWG), and USDA’s response website.	Planning				
	b. States should post movement standstill information on social media sites and producers/companies can “follow” key states to get notifications when information is posted.	Planning				

<sup>8</sup> *Capability Elements* categorize *Recommendations* by action type and do not infer what entity may be tasked with addressing the recommendation. There are four Capability Elements: Planning, Training, Exercises, and Equipment.

Issue/Area for Improvement	Recommendation	Capability Element <sup>8</sup>	Responsible Organization	Responsible POC	Start Date	End Date
	c. States should develop text groups for notifications on FAD response, including movement standstill information. Producers/companies can sign up to the text groups for their states of interest.	Planning				

Issue/Area for Improvement	Recommendation	Capability Element <sup>9</sup>	Responsible Organization	Responsible POC	Start Date	End Date
3. Many states were hesitant to initiate an intrastate movement standstill.	<p>a. USDA should issue its National Movement Standstill recommendation or order quickly with defined minimum criteria. These criteria need to be developed and should be pursued as a collaborative effort between VS and the states.</p> <p>i. Provide guidance on what could be considered a critical intrastate movement that could continue during the standstill.</p> <p>ii. Provide an expected duration of the national standstill, including what conditions could result in lifting, modifying, or extending the national standstill.</p> <p>iii. Provide an expected start-time for the national standstill, including a discussion of any allowed grace period.</p> <p>iv. Provide a clear definition of what movement is allowed during the grace period and how movements in process should be handled (advance or return).</p> <p>v. If applicable, define the conditions required for VS to provide financial support to an infected or not-infected state in enforcement of a national standstill.</p>	Planning				

<sup>9</sup> *Capability Elements* categorize *Recommendations* by action type and do not infer what entity may be tasked with addressing the recommendation. There are four Capability Elements: Planning, Training, Exercises, and Equipment.



Issue/Area for Improvement	Recommendation	Capability Element <sup>9</sup>	Responsible Organization	Responsible POC	Start Date	End Date
	b. VS and industry should establish a publicly accessible repository for states to post their status and criteria regarding intrastate movement standstills during a FAD outbreak. Several possible hosts for this information repository were suggested: NPB, the CSWG, and USDA's response website.	Planning				
4. The scientific/risk-based rationale for the 72-hour duration of the initial national standstill request was not provided and its efficacy was questioned by players.	a. VS, states, and industry should develop a risk-based guidance to determine the optimal duration and scope of a national/regional standstill. This guidance should consider such issues as the disease, susceptible species, location of the index case, time of year, and any other criteria that could significantly mitigate the risk of disease spread.	Planning				
5. States initiating intrastate standstills had varying movement grace times before total intrastate movement prohibition would take place.	a. APHIS should further develop the existing Initial Movement Standstill guidance for standardization and inclusion of the start /stop time, the grace period for pigs in transit to complete transit, and the grace period for pigs in livestock markets to continue transit, and clarify that swine held in slaughter plant lairage continue to be slaughtered.	Planning				
	b. States should coordinate nationally or regionally on grace periods for movement standstills.	Planning				
	c. States that have commuter herd agreements with other states should notify all companies listed in those agreements of movement standstill information as soon as it is determined during an outbreak.	Planning				
	d. States should notify all practicing veterinarians of the timing of a movement standstill and the associated restrictions or exceptions. These veterinarians can then spread the word to the producer community.	Planning				



Issue/Area for Improvement	Recommendation	Capability Element <sup>9</sup>	Responsible Organization	Responsible POC	Start Date	End Date
6. Several states had difficulty determining what “critical” intrastate swine-production movements they would allow to continue during the standstill.	a. Federal, state, and industry partners should work together to develop risk-based criteria for identifying intrastate movements that are both low risk and critical to the industry. An alternative would be to have this group publish a list of acceptable critical intrastate movements that could be allowed during a standstill.	Planning				

**Table 5: Improvement Plan – Theme 3 Depopulation and Disposal**

Issue/Area for Improvement	Recommendation	Capability Element <sup>10</sup>	Responsible Organization	Responsible POC	Start Date	End Date
1. Ventilation shutdown was selected as the preferred depopulation method by multiple states; however, there was uncertainty if VS would approve its use and pay federal indemnity for animals depopulated in this manner.	a. VS should develop a policy guide relative to accepting ventilation shutdown, including conditions for being eligible for indemnity and the documentation needed to support its use.	Planning				
2. The site management teams were not consistent in informing producers of who was ultimately responsible for depopulation and disposal.	a. Verify that the herd plan addresses who is responsible for implementing depopulation and disposal, and revise the document if necessary.	Planning				
	b. Review the existing Case Manager training to see if it addresses how to determine/communicate who is responsible for implementing depopulation and disposal, and revise if necessary.	Training				

<sup>10</sup> *Capability Elements* categorize *Recommendations* by action type and do not infer what entity may be tasked with addressing the recommendation. There are four Capability Elements: Planning, Training, Exercises, and Equipment.

Issue/Area for Improvement	Recommendation	Capability Element <sup>10</sup>	Responsible Organization	Responsible POC	Start Date	End Date
3. The epidemiological questionnaire and herd plan used for the exercise did not facilitate collection of critical information for the indemnity calculator.	a. These two tools (Epi Form and Herd Plan) need to be synchronized on the information they provide and/or need, related to herd inventories. The herd plan should clarify when these issues will be left to the individual swine owners, in coordination with their state agriculture department, and when federal involvement is necessary.	Planning				
4. Many states were still uncertain about indemnity, how to value animals, what is reimbursable, and actions that could impact federal indemnity payments.	a. Clarify the policy regarding the status of a herd plan relative to finalizing indemnity and implementing depopulation.	Planning				
	b. VS should provide written guidance on indemnity. This guidance should address such issues as: will 100% indemnity be authorized, how the calculator works and how often will it be updated in an ASF event, how indemnity is split between company and grower, how indemnity caps are established, what response-related actions can impact the availability of federal indemnity, and what needs to be signed or completed prior to approving an indemnity payment.	Planning				
5. Logistics section personnel in multiple states had difficulty accessing their own state's resource request systems and/or the EMRS for resource ordering.	a. Provide training and/or refresher training for logistics personnel regarding accessing and using state and federal resource request systems.	Training				
	b. Develop protocols for logistics personnel to maintain active access to state and federal resource ordering systems, as appropriate.	Planning				
6. Many states struggled with understanding what resources are available from the NVS.	a. Emergency Coordinators (EC) should work with the states to assure that the appropriate logistics personnel have the current NVS catalog.	Planning				
	b. States and VS District personnel should conduct NVS resource ordering exercises.	Exercises				
	c. States need to develop procedures to access resources from producers or the local industry.	Planning				

**Table 6: Improvement Plan – Theme 4 Permitted Movement**

Issue/Area for Improvement	Recommendation	Capability Element <sup>11</sup>	Responsible Organization	Responsible POC	Start Date	End Date
1. For interstate movements, the approving destination state did not always inform the receiving location of incoming movements out of a control area.	a. Modify the permit application to include a verification that the destination is expecting the shipment and will accept it.	Planning				
2. There was variability among states on permitting requirements, such as pre-movement testing.	a. An information clearing house should be created for states to post SPS permitting criteria. Several possible hosts for this information were suggested: NPB, the CSWG, and USDA’s response website.	Planning				
	b. States should coordinate nationally or regionally on permitting requirements for movements out of control areas.	Planning				
	c. When questions on permitting requirements arise between an origin state and a destination state, the state with the question or concern should contact the other state for clarification. This interaction should be described in a state’s SPS plan.	Planning				
3. When producers were informed that a permit request was denied, they were not told who rejected it or why.	a. In the case of an intrastate movement request, the state should notify the producer of a rejection and the associated reasons. In the case of an interstate movement permit request, the origin state should be informed by the destination state of a permit rejection and the associated reasons.	Planning/ Training				

<sup>11</sup> *Capability Elements* categorize *Recommendations* by action type and do not infer what entity may be tasked with addressing the recommendation. There are four Capability Elements: Planning, Training, Exercises, and Equipment.

Issue/Area for Improvement	Recommendation	Capability Element <sup>12</sup>	Responsible Organization	Responsible POC	Start Date	End Date
4. Industry was concerned over the amount of time it took for destination states to respond to permit requests.	a. Origin states should notify destination states of movement permit requests that have been approved, and that are waiting on final approval from the destination state.	Planning				
	b. Develop procedures to monitor and refresh the EMRS permitting screens.					
	c. Add the following functionality to the EMRS permitting system: When an interstate movement permit is approved by the origin state, a flag should be sent to the destination state, indicating a pending permit request.	Equipment				
5. The pre-movement sampling requirements referenced in the exercise guidance documents require large numbers of samples to be collected and analyzed.	a. Develop and validate protocols for pooled sampling or rope testing that could reduce both the number of samples needed and the cost of sampling and analysis.	Planning				
	b. Develop training and a “certification” program to allow lay persons to collect surveillance samples. This training and certification could be delivered in advance of an outbreak, or it could be delivered in a “just-in-time” fashion.	Training				
	c. States should identify sampling supply companies that could fill any supply gaps created by a surge in sampling associated with supporting permitted movement out of a control area.	Equipment				

<sup>12</sup> *Capability Elements* categorize *Recommendations* by action type and do not infer what entity may be tasked with addressing the recommendation. There are four Capability Elements: Planning, Training, Exercises, and Equipment.

Issue/Area for Improvement	Recommendation	Capability Element <sup>13</sup>	Responsible Organization	Responsible POC	Start Date	End Date
6. Many states had difficulty using EMRS during Day 4.	a. Additional state and VS District personnel need access and training on using EMRS for permitting. Based on the challenges with access and permissions, and to efficiently process permit requests, states should increase their depth of trained permitting staff and develop processes to maintain user access and provide periodic practice in using EMRS.	Training				
	b. Conduct periodic exercises for EMRS-trained staff to maintain their proficiency and access to the system.	Exercises				
7. Playing producers were not aware of the processes to permit feed and equipment movement out of a control area.	a. Provide state and producer training on using the “tracked conveyances” feature of the Gateway and EMRS permitting system.	Training				
	b. Conduct risk assessments associated with feed production and its impact on virus survivability and relative to farm-to-farm feed movements.	Planning				
	c. Develop guidance on acceptable tracked conveyances.	Planning				

<sup>13</sup> *Capability Elements* categorize *Recommendations* by action type and do not infer what entity may be tasked with addressing the recommendation. There are four Capability Elements: Planning, Training, Exercises, and Equipment.

**Table 7: Improvement Plan – Theme 5 Exercise Design and Conduct**

Issue/Area for Improvement		Recommendation	Capability Element <sup>14</sup>	Responsible Organization	Responsible POC	Start Date	End Date
<b>General Design</b>	1. With 14 states playing and sending the ICG a variety of data, reports, and questions, it was hard for the ICG to review and triage important information in a timely manner.	a. Have multiple email boxes and assigning a few states to each email box. This would also increase the number of personnel necessary to monitor and report on emails.	Equipment				
		b. Use additional ICG staff during the exercise.	Planning				
	2. The “siloe” nature of the exercise design created confusion for players regarding daily expectations, what information carried over from one day to another, where play should begin or end, and what is assumed to have already occurred (e.g., if the standstill had been lifted by Day 3 play).	a. A daily all-player briefing should be conducted before each day’s StartEx. In addition, time must be secured for this briefing, prior to StartEx, each day.	Planning				
		b. Revert to a real time sequential exercise format.	Planning				
		c. During the Concepts and Objectives Meeting, the planning team should examine exercise objectives and determine if a traditional (sequential) daily exercise design or a function-specific (siloe) exercise design is a better match for the exercise goals and objectives.	Planning				
		d. If using a “siloe” approach for a multiple-state exercise design, be sure the sequence is acceptable to all the playing states. In all cases, the “siloe” activities should occur in the same relative sequence they would in a real event.	Training				
		e. Provide better Controller training regarding the need for and conduct of pre-play briefings.	Training				
		f. When a siloe exercise design is used, the lead entity playing should develop a partial Incident Action Plan, prior to each siloe day.	Planning				

<sup>14</sup> *Capability Elements* categorize *Recommendations* by action type and do not infer what entity may be tasked with addressing the recommendation. There are four Capability Elements: Planning, Training, Exercises, and Equipment.

Issue/Area for Improvement	Recommendation	Capability Element <sup>15</sup>	Responsible Organization	Responsible POC	Start Date	End Date	
<b>General Design</b>	3. The three-per-day ICG calls disrupted exercise play in many states.	a. States should consider assigning one person to present state data or concerns, and to take notes. This person could then brief the appropriate IMT staff on important issues.	Planning				
		b. These calls should have been split into an IMT call and additional policy-level calls. The IMT call should mimic the call format and content of similar daily calls instituted during responses. The policy-level calls should be clearly identified to all players, and open to agency administrators or others who would have authority relative to policy development.	Planning				
		c. Both the IMT and the policy-level calls should have written agendas, distributed to all attendees.	Planning				
	4. Evaluators and Controllers had difficulty seeing all written products, so tracking critical events was difficult.	a. All documents sent to the SimCell should also be printed and placed in an area accessible by the Evaluator and Controller.	Planning				
		b. Provide better Controller training regarding how to monitor for critical events during exercise play.	Training				
		c. Have additional Controllers where play occurs in multiple locations.	Equipment				
	5. Several states felt that there were not enough injects from the general public, industry, or the media, directed at public information officers (PIO) or a phone bank.	a. Having three states assigned to each SimCell staff was excessive and did not allow an adequate number of injects to be delivered. Simulators and playing states should be assigned at a 1:1 ratio.	Planning				
		b. SimCell staff must be dedicated to the SimCell and not participate in other exercise activities.	Planning				

<sup>15</sup> *Capability Elements* categorize *Recommendations* by action type and do not infer what entity may be tasked with addressing the recommendation. There are four Capability Elements: Planning, Training, Exercises, and Equipment.

Issue/Area for Improvement		Recommendation	Capability Element <sup>16</sup>	Responsible Organization	Responsible POC	Start Date	End Date
Day 1	1. Having the FADI, Day 1, before the movement standstill day was confusing to many players.	a. Schedule the movement standstill part of the exercise before the FADI part, if the states conducting the FADI are supposed to play the movement standstill as not infected.	Planning				
	2. Several states indicated that they would have contacted their NAHLN laboratory as soon as the FADD reported that the FADI site had submitted samples earlier in the week. The SimCell was not prepared to interact on this point.	a. Develop the simulation data to provide states this laboratory-related data if they contact the NAHLN directly or the SimCell.	Planning				
Day 2	None		Not Applicable				
Day 3	None		Not Applicable				
Day 4	1. Many states did not understand that when playing as the origin state, they should consider themselves to have an active outbreak, but when they received permit requests as a receiving state, they should consider the request as if they did not have an active outbreak.	a. Provide better Controller training regarding how play would unfold on each day.	Training				
		b. Divide permitting in each state into two distinct sections, one as the initiating state and one as the destination state.	Planning				

<sup>16</sup> *Capability Elements* categorize *Recommendations* by action type and do not infer what entity may be tasked with addressing the recommendation. There are four Capability Elements: Planning, Training, Exercises, and Equipment.

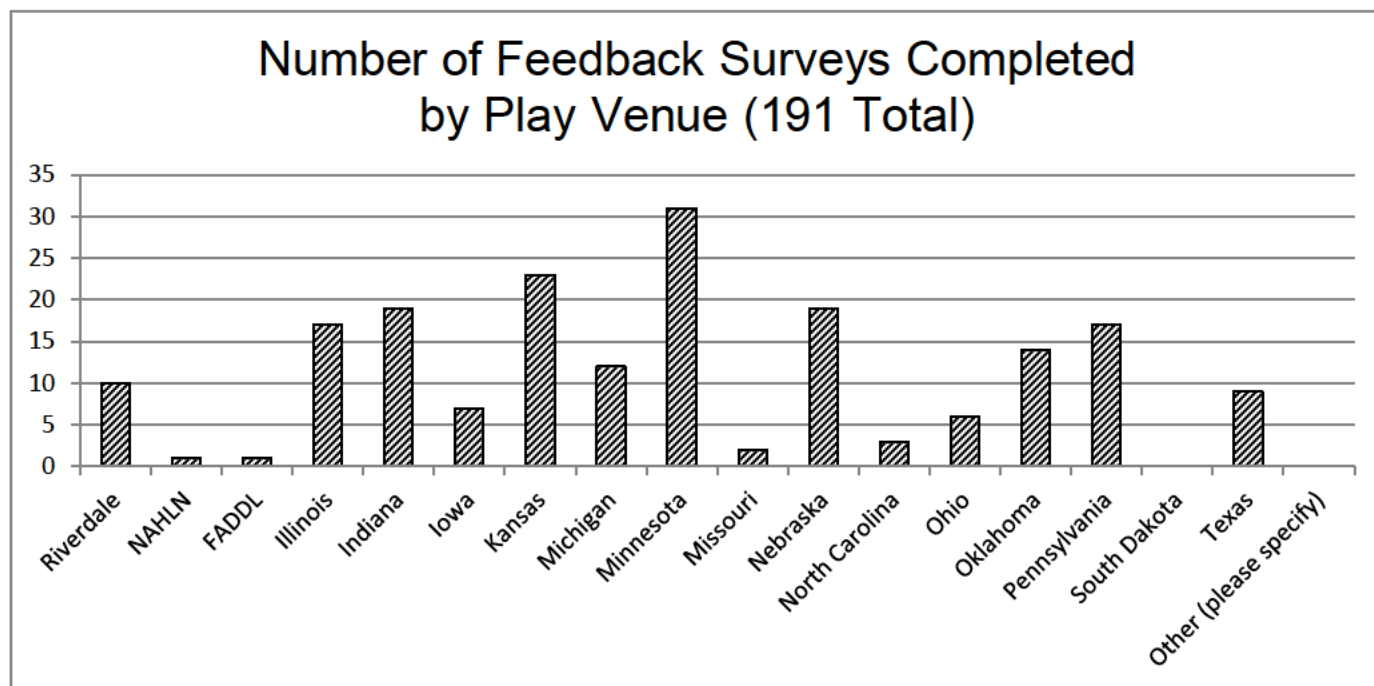
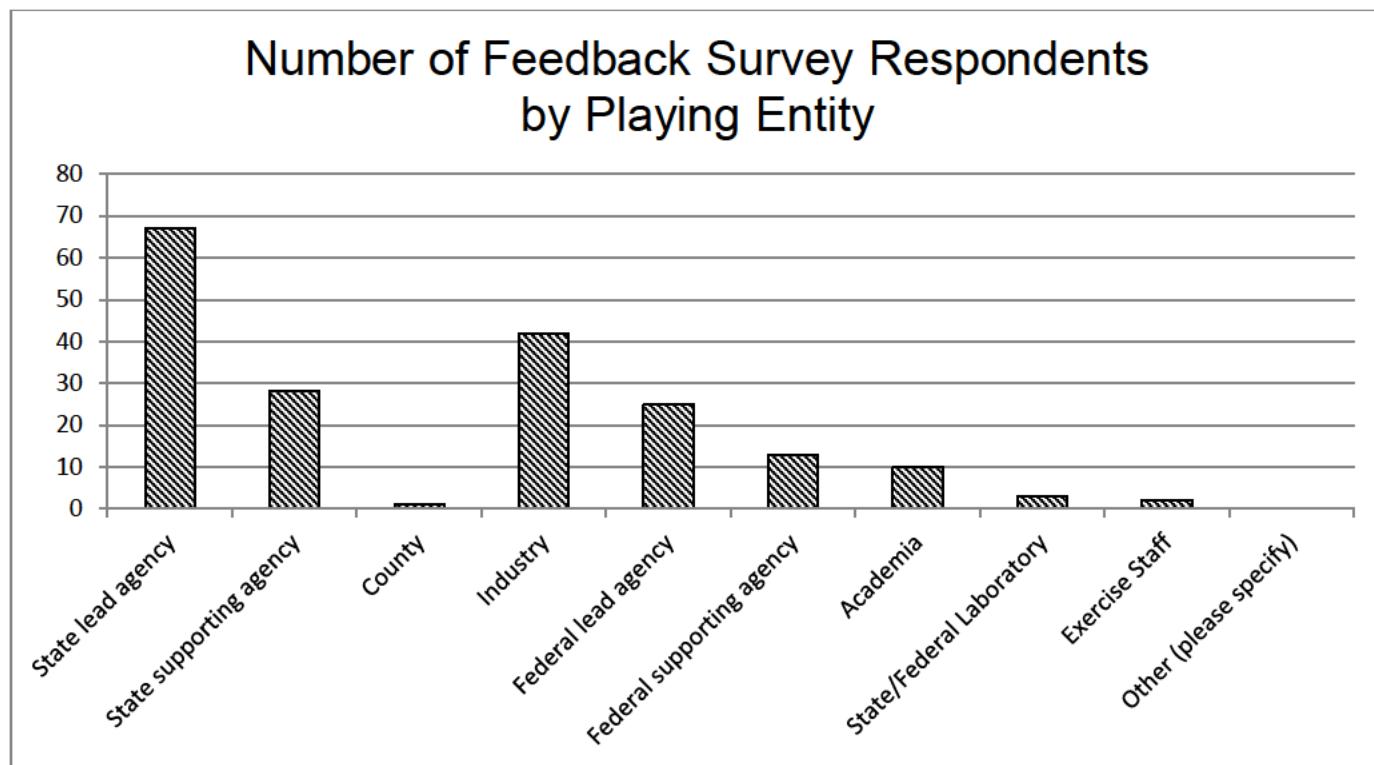


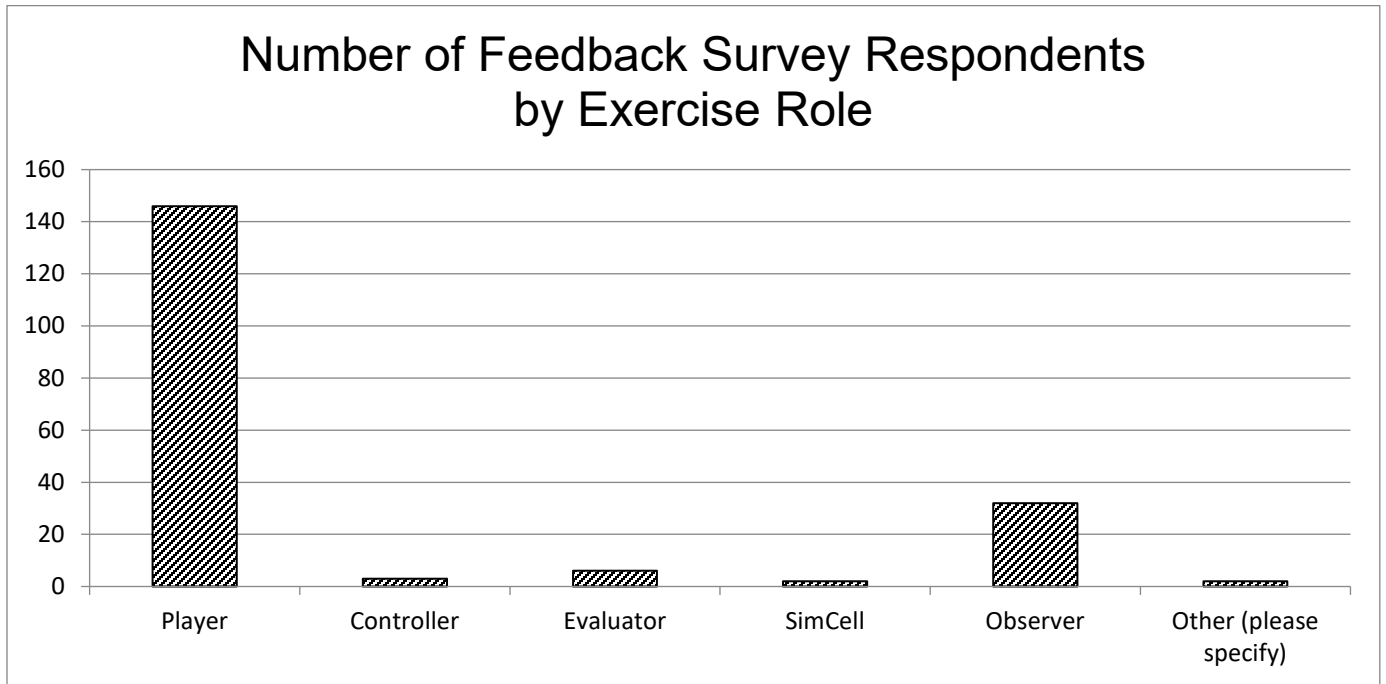
Issue/Area for Improvement	Recommendation	Capability Element <sup>17</sup>	Responsible Organization	Responsible POC	Start Date	End Date
	2. The use of training PINs for the exercise caused confusion on Day 4 of play. a. In advance of the exercise, producers should be given a master key correlating their real PINs with the ones created when their premises data were migrated from the production side of EMRS to the training side. In addition, some training may be necessary to explain why they must use the training PIN.	Planning				

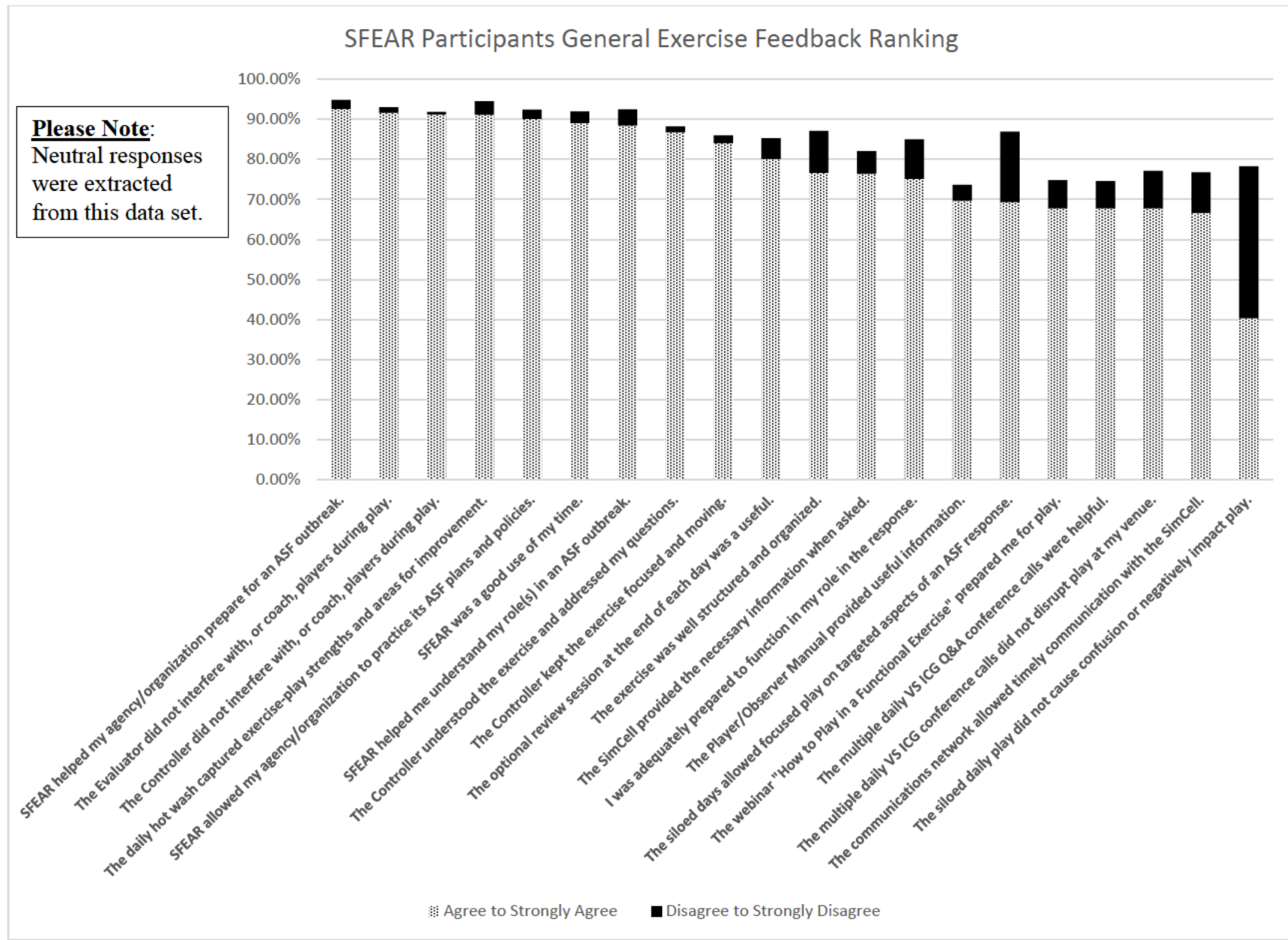
<sup>17</sup> *Capability Elements* categorize *Recommendations* by action type and do not infer what entity may be tasked with addressing the recommendation. There are four Capability Elements: Planning, Training, Exercises, and Equipment.



## Appendix A: Player Profile and Feedback







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## Appendix B: AAM Participants

This table lists the individuals who participated in one or more of the three AAMs. The AAMs for all Themes were held via videoconference. The AAM for Themes 1 and 2 was held on January 16, 2020. The AAM for Themes 3 and 4 was held on January 23, 2020. The AAM for Theme 5 was held on January 30, 2020. The word “Attended” indicates participation and a blank indicates that individual did not participate in that AAM.

Name	Agency	AAR/IP Themes		
		1 & 2	3 & 4	5
Dr. George Amsden	USDA APHIS VS		Attended	
Dr. Maria Antognoli	USDA APHIS VS			Attended
Dr. John Bare	USDA APHIS VS	Attended	Attended	Attended
Dr. Fred Bourgeois	USDA APHIS VS		Attended	
Dr. Tim Boyer	USDA APHIS VS	Attended		
Mr. Matt Bragg	USDA APHIS VS	Attended		
Ms. Lisa Brown	USDA APHIS VS	Attended		
Dr. Fredric Cantor	USDA APHIS VS	Attended	Attended	Attended
Dr. Maria Cooper	IN BOAH		Attended	
Dr. Evelyn Crish	USDA APHIS VS		Attended	
Dr. Joanna Davis	USDA APHIS VS		Attended	Attended
Mr. Bryan Deimeke	SES	Attended	Attended	Attended
Dr. Lewis Dodds	USDA APHIS VS		Attended	Attended
Ms. Sharon Fisher	USDA APHIS VS	Attended	Attended	Attended
Dr. Ross Free	USDA APHIS VS			Attended
Dr. Sandy Gilmore	IL DA	Attended	Attended	
Dr. Rod Hall	ODAFF	Attended		
Dr. Tom Hans	USDA APHIS VS	Attended	Attended	Attended
Dr. Andrew Hennenfent	IDALS	Attended		Attended
Dr. Dane Henry	USDA APHIS VS	Attended		
Mr. Eric Hess	SES	Attended	Attended	Attended
Dr. Kellie Hough	USDA APHIS VS	Attended		Attended
Dr. Nicki Humphrey	USDA APHIS VS	Attended		Attended
Ms. Caitlin Jandegian	USDA APHIS VS		Attended	
Ms. Sandy Johnson	SES	Attended	Attended	Attended
Dr. Todd Johnson	USDA APHIS VS	Attended		Attended
Mr. Dennis Kohler	USDA WS	Attended	Attended	Attended
Dr. John Korslund	USDA APHIS VS	Attended		Attended
Ms. Chelsea Kramer	NDA	Attended		Attended
Dr. Molly Lee	CFSPH	Attended	Attended	Attended
Dr. Tiffany Lee	NAMI		Attended	
Dr. Christina Loiacono	USDA APHIS VS	Attended		Attended

Name	Agency	AAR/IP Themes		
		1 & 2	3 & 4	5
Mr. Mark Lyons	APHIS	Attended		
Dr. Sara McReynolds	KDA	Attended	Attended	
Ms. Lori Miller	USDA APHIS VS	Attended	Attended	
Dr. Noelia Moyeno	USDA APHIS VS		Attended	
Dr. Michael Neault	NCDACS	Attended		
Ms. Kelly Oliver	KDA		Attended	Attended
Dr. Barbara Porter-Spalding	USDA APHIS VS	Attended	Attended	Attended
Dr. Sarah Reinkemeyer	MDA	Attended	Attended	
Dr. Dan Righter	USDA APHIS VS	Attended	Attended	
Dr. Jim Roth	CFSPH	Attended	Attended	
Mr. Mike Serach	APHIS	Attended	Attended	
Dr. Susan Skorupski	USDA APHIS VS		Attended	Attended
Ms. Rebecca Slater	WDATCP		Attended	Attended
Mr. Mike Starkey	MN DA	Attended	Attended	
Dr. Greg Suskovic	MN BOAH	Attended	Attended	Attended
Mr. Rick Tanner	USDA APHIS VS	Attended	Attended	Attended
Dr. Todd Tedrow	SDAIB		Attended	Attended
Mr. Andy Titsworth	USDA APHIS VS	Attended	Attended	Attended
Ms. Elizabeth Weier	MDARD	Attended		
Ms. Kelli Werling	IN BOAH	Attended	Attended	
Mr. Rodney White	USDA APHIS VS		Attended	Attended
Dr. Delwin Wilmot	USDA APHIS VS	Attended	Attended	Attended
Ms. Amber Wilson	SES	Attended	Attended	Attended
Dr. Johnathan Zack	USDA APHIS VS	Attended		
<b>Total Participants</b>		<b>40</b>	<b>38</b>	<b>31</b>

## Appendix C: List of Acronyms

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AAM	After-Action Meeting
AAR	After-Action Report
AASV	American Association of Swine Veterinarians
APHIS	Animal and Plant Health Inspection Service
ASF	African Swine Fever
AVIC	Area Veterinarian In Charge
BOAH	Board of Animal Health
CEAH	Center for Epidemiology and Animal Health
CRADA	Cooperative Research and Development Agreement
CSWG	Cross Species Working Group
EC	Emergency Coordinator
EEG	Exercise Evaluation Guide
EMRS	Emergency Management Response System
FAD	Foreign Animal Disease
FADD	Foreign Animal Disease Diagnostician
FADDL	Foreign Animal Disease Diagnostic Laboratory
FADI	Foreign Animal Disease Investigation
FE	Functional Exercise
FOUO	For Official Use Only
FSIS	Food Safety and Inspection Service
Gateway	EMRS Permitting Gateway
IA	Iowa
IAP	Incident Action Plan
ICG	Incident Coordination Group
ICP	Incident Command Post
ICS	Incident Command System
IL	Illinois
IMT	Incident Management Team
IN	Indiana
IP	Improvement Plan
KS	Kansas
LPA	Legislative and Public Affairs
MDARD	Michigan Department of Agriculture and Rural Development
MI	Michigan
MN	Minnesota
MO	Missouri
NAHLN	National Animal Health Laboratory Network
NAMI	North American Meat Institute
NASAHO	National Assembly of State Animal Health Officials
NC	North Carolina
NE	Nebraska
NIMT	National Incident Management Team



NPB	National Pork Board
NPG	National Preparedness Goal
NPIC	National Preparedness and Incident Coordination
NPPC	National Pork Producers Council
NTEP	National Training and Exercise Program
NVS	National Veterinary Stockpile
NVSL	National Veterinary Services Laboratories
ODAFF	Oklahoma Department of Agriculture, Food and Forestry
OH	Ohio
OK	Oklahoma
PA	Pennsylvania
PIN	Premises Identification Number
PIO	Public Information Officer
POC	Point of Contact
SAHO	State Animal Health Official
SD	South Dakota
SDAIB	South Dakota Animal Industries Board
SES	SES, Incorporated
SFEAR	Swine Fever Exercise for Agriculture Response
SHIC	Swine Health Information Center
SPS	Secure Pork Supply
SimCell	Simulation Cell
TEPW	Training and Exercise Planning Workshop
TTX	Tabletop Exercise
TX	Texas
USDA	United States Department of Agriculture
VS	Veterinary Services
WS	Wildlife Services

**From:** [Melissa Johnson](#)  
**To:** [amiller@cdmlaw.com](mailto:amiller@cdmlaw.com)  
**Cc:** [Jerry Flint](#); [Rachel Holdren](#)  
**Subject:** FW: NEW FOIA 2023-AMS-00119-F  
**Date:** Friday, May 5, 2023 10:08:00 AM  
**Attachments:** [FOIA 2023-AMS-00119-F Request.pdf](#)  
[Transmittal 2023-AMS-00119-F.docx](#)  
[FOIA Search Form.pdf](#)

Attachment 3 omitted as not responsive

---

Amber,

Good morning. Please create a hold order for FOIA 2023-AMS-00119-F. Search terms are highlighted in yellow below.

Thanks,

**Melissa Johnson**

Director of Administration  
National Pork Board  
[mjohnson@pork.org](mailto:mjohnson@pork.org)  
(515) 223-3448

---

**From:** Reyna, Maribel - MRP-AMS <Maribel.Reyna@usda.gov>  
**Sent:** Tuesday, May 2, 2023 12:06 PM  
**To:** Melissa Johnson <MJohnson@pork.org>  
**Cc:** Jerry Flint <jflint@pork.org>  
**Subject:** NEW FOIA 2023-AMS-00119-F

Melissa,

The new attached FOIA 2023-AMS-00119-F was received. NPB should search for **any records referencing “ventilation shutdown”, “VSD”, “VSD+” from date range November 11, 2021 through April 21, 2023**. Please submit all records by May 22, 2023 to allow the FOIA office to submit all records within the final due date.

If you have any questions or concerns don't hesitate to contact me.

**Maribel Reyna**

USDA, Agricultural Marketing Service  
Livestock & Poultry Program  
Deputy Director - Research & Promotion Division  
Office: (202) 302-1139  
[Maribel.Reyna@usda.gov](mailto:Maribel.Reyna@usda.gov)

For R&P information and resources, please visit the website [here](#).  
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**From:** [C. Heath](#)  
**To:** [AMS FOIA \(AMS\)](#)  
**Subject:** [External Email]FOIA Request  
**Date:** Friday, April 21, 2023 5:11:45 PM

---

**[External Email]**

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I seek the following information:

All communications from Nov 11, 2021 to the present referencing “ventilation shutdown,” "VSD," or "VSD+" made by any individual associated with, employed by, related to or working for in any capacity of the following checkoff programs: a. American Egg Board; b. American Lamb Board; c. Cattleman’s Beef Promotion and Research Board; d. National Dairy Promotion and Research Board; and e. National Pork Board. (Date Range for Record Search: From 11/11/2021 To 04/21/2023).

Thank you!



C. Heath, DVM (she/her)  
Co-founder of [OurHonor.org](#)  
[Donate Today and Support Our Work!](#)  
Founding Committee Member of [Veterinarians Against Ventilation Shutdown](#)  
Twitter [@drcrystalheath](#) [@OurHonorVets](#)  
Instagram [@dr.crystalheath](#) [@OurHonorVets](#)  
Facebook [Crystal Heath](#) [Our Honor](#)



1400 Independence Avenue, SW  
Room 2055-S, STOP 0201  
Washington, D.C. 20250-0201

**DATE:** April 25, 2023

**TO:** Jennifer Porter, Deputy Administrator  
Livestock and Poultry Program

**AND:** Dana Coale, Deputy Administrator  
Dairy Program

**FROM:** Mark Brook, FOIA Officer  
Office of the Administrator

**SUBJECT:** FOIA Request: 2023-AMS-00119-F

The attached Freedom of Information Act (FOIA) request was received by the AMS FOIA Office on April 24, 2023. The requester seeks the following:

All communications from Nov 11, 2021 to the present referencing “ventilation shutdown,” "VSD," or "VSD+" made by any individual associated with, employed by, related to or working for in any capacity of the following checkoff programs: a. American Egg Board; b. American Lamb Board; c. Cattleman’s Beef Promotion and Research Board; d. National Dairy Promotion and Research Board; and e. National Pork Board.

**Livestock & Poultry:**

- American Egg Board
- American Lamb Board
- Cattleman’s Beef Promotion and Research Board
- National Pork Board

**Dairy Program:**

- National Dairy Promotion and Research Board

(Date Range for Record Search: From 11/11/2021 To 4/24/2023)

The requester is classified as “all other” for the purposes of assessing fees. If the fee estimate should exceed \$200.00, please provide a fee estimate by **May 1, 2023**.

In accordance with 5 U.S.C. §552, we must respond to this request within 20 working days of initial receipt of the request in AMS. Please provide a copy of responsive documents, either interim or final, to our office by **May 15, 2023**.

Please include the FOIA request tracking number 2023-AMS-00119-F in all communications regarding this request.

If you have any questions or concerns, please contact me at 202-302-0650 or [Mark.Brook@usda.gov](mailto:Mark.Brook@usda.gov). Thank you for your assistance.

**From:** [Melissa Johnson](#)  
**To:** [Reyna, Maribel - MRP-AMS](#)  
**Cc:** [Jerry Flint](#); [Melissa Johnson](#)  
**Subject:** RE: NEW FOIA 2023-AMS-00119-F  
**Date:** Thursday, May 18, 2023 9:59:00 AM  
**Attachments:** [2023-AMS-00119-F Search and Review Form.pdf](#)

---

Maribel,

Attached is the FOIA form for 2023-AMS-00119-F. Nate should be in the process of uploading the files for you.

Regards,  
Melissa

---

**From:** Reyna, Maribel - MRP-AMS <Maribel.Reyna@usda.gov>  
**Sent:** Tuesday, May 2, 2023 12:06 PM  
**To:** Melissa Johnson <MJohnson@pork.org>  
**Cc:** Jerry Flint <jflint@pork.org>  
**Subject:** NEW FOIA 2023-AMS-00119-F

Melissa,

The new attached FOIA 2023-AMS-00119-F was received. NPB should search for any records referencing “ventilation shutdown”, “VSD”, “VSD+” from date range November 11, 2021 through April 21, 2023. Please submit all records by May 22, 2023 to allow the FOIA office to submit all records within the final due date.

If you have any questions or concerns don’t hesitate to contact me.

**Maribel Reyna**

USDA, Agricultural Marketing Service  
Livestock & Poultry Program  
Deputy Director - Research & Promotion Division  
Office: (202) 302-1139  
[Maribel.Reyna@usda.gov](mailto:Maribel.Reyna@usda.gov)

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# FOIA SEARCH & REVIEW FORM

Request NUMBER  Type of Search  Initial  Additional

AMS Program Office

Sub Program Office (S)

Date Search Began  Date Search Ended

This section pertains to the individual conducting the search

Name  Title

Length of Time in Current Position  Fed Employee?  Yes  No

## ELECTRONIC SEARCH (leave blank if no electronic search was performed)

System(s) Searched  Email  Workstation  Shared Network  Database (Please Name)

Please list email accounts searched

Please select which portions of the email account(s) were searched.

Incoming Email  Outgoing Email  Calendar  Group Inbox(es)

Keyword(s) Used

Please list workstation(s) searched

Responsive Date Range Start  End



Briefly Summarize why this search was appropriate

Search was performed based on the FOIA request provided.

---

**MANUAL SEARCH** (leave blank if no manual search was performed)

Please list all file systems searched (In your response please include where the files are located and how they are organized)

Responsive Date Range

Start

End

Briefly Summarize why this search was appropriate

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**SUBJECT MATTER EXPERT INTERVIEW** (leave blank if no interview was performed)

Please list the names people interviewed and the date of the interview

Briefly Summarize why these people were interviewed

***Please attach a written statement that memorialized the interview.***

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**SEARCH RESULTS**

Please list the overall total amount of pages, data, files, and/or boxes searched

Search results came back with 578 emails  
Overall review time is reflected in minutes

If all the records reviewed were not responsive to the request, please explain why some of these records were not responsive

(b)(5) Deliberative Process Privilege . We  
recommend (b)(5) Deliberative Process Privilege .

Overall Total Search Time

Name of employee who conducted initial review

Overall Total Review Time