

# OIE Collaborating Centres Reports Activities

## *Activities in 2018*

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<b>Title of collaborating centre:</b>	Animal Disease Surveillance Systems, Risk Analysis and Epidemiological Modelling
<b>Address of Collaborating Centre:</b>	USDA-APHIS-VS-CEAH 2150 Centre Ave, Building B Fort Collins, CO 80526-8117 UNITED STATES OF AMERICA
<b>Tel.:</b>	+1-970 494.72.00
<b>Fax:</b>	+1-970 472.26.68
<b>E-mail address:</b>	vs.ceah@aphis.usda.gov
<b>Website:</b>	<a href="http://www.aphis.usda.gov/aphis/ourfocus/animalhealth/SA-Epidemiology-AnimalHealth-CEAH">www.aphis.usda.gov/aphis/ourfocus/animalhealth/SA-Epidemiology-AnimalHealth-CEAH</a>
<b>Name of Director of Institute (Responsible Official):</b>	Dr. Bruce Wagner
<b>Name (including Title and Position) of Head of the Collaborating Centre (formally OIE Contact Point):</b>	Dr. Bruce Wagner Director Center for Epidemiology and Animal Health Strategy and Policy USDA-APHIS-VS
<b>Name of writer:</b>	Dr. Theresa Boyle

**ToR: To provide services to the OIE, in particular within the region, in the designated specialty, in support of the implementation of OIE policies and, where required, seek for collaboration with OIE Reference Laboratories**

**ToR: To identify and maintain existing expertise, in particular within its region**

**1. Activities as a centre of research, expertise, standardisation and dissemination of techniques within the remit of the mandate given by the OIE**

Disease control	
Title of activity	Scope
Antimicrobial Resistance workshop	CEAH participated in a workshop titled "Challenges to Changing Antibiotic Use in Food Animal Production: Economics, Data and Policy" including sessions on the impacts of the 2017 FDA GFI 213 antibiotic use policy changes, impacts of the Veterinary Feed Directive policies on veterinarians, data collection by FDA on antibiotic sales and the use of a biomass denominator, developing new animal pharma products, and markets for products labeled as raised with fewer antibiotics.
Agriculture Response Management and Resources (ARMAR) exercise	CEAH staff participated in the Agriculture Response Management and Resources (ARMAR) exercise held the week of May 7 to test the U.S. response to foot-and-mouth disease (FMD) outbreaks in the continental United States. The exercise allowed Federal participants to collaborate with State officials, working through questions regarding surveillance, vaccination strategies, and the use of aggregate testing.
HPAI support	CEAH developed a virus elimination flat rate for floor-raised poultry on a per square foot basis to facilitate the cleaning and disinfection of HPAI-infected premises.
Cattle Fever tick support	In support of the Cattle Fever Tick eradication in Texas, CEAH staff developed a model to better measure cattle treatment efficacy and Nilgai impact on eradication efforts, and held training for the Texas Department of Agriculture
Epidemiology, surveillance, risk assessment, modelling	
Title of activity	Scope
Swine fever surveillance plan	CEAH collaborates on an integrated African Swine Fever/Classical Swine Fever active surveillance plan and surge capacity modeling for ASF.
National Invasive Species Council podcast	CEAH participated in a podcast hosted by the National Invasive Species Council (NISC) on target analysis for invasive species, which describes a generic framework for maximizing early detection of invasive species through space and time.
Biosurveillance Indications and Warning Analytic Community meeting	CEAH hosted the Annual Biosurveillance Indications and Warning Analytic Community (BIWAC) Face-to-Face meeting - a collective effort to provide an interagency forum for collaborative exchange of information among members regarding indications and warning of biological events.

Psittacosis sampling design support	CEAH provided guidance on sampling design for testing the environment and poultry for the Veterinary Services response to cases of psittacosis ( <i>Chlamydia psittacosis</i> ) in workers from two poultry slaughter plants owned by a single cooperation in Virginia and Georgia.
AI surveillance presentation	CEAH presented on the avian influenza surveillance program, specifically data collection, data analysis and areas of improvement; Web GIS tools available; and various data systems with the software that supports data entry and analysis to a VS Surveillance Network Training Course.
Epidemiological models webinar	CEAH gave a webinar presentation to the USAHA Committee on Animal Emergency Management on the use of epidemiological models to support foreign animal disease emergency response activities.
National Invasive Species Council collaboration	CEAH collaborates with the National Invasive Species Council (NISC) to share scientific and technology standards of practice for the identification, detection, mitigation, and/or eradication of invasive species.
Comprehensive and Integrated Animal Disease Surveillance webinar	CEAH presented a webinar on Comprehensive and Integrated Animal Disease Surveillance in the U.S. agriculture to a multidisciplinary group of graduate students and professionals.
vND outbreak support	CEAH provided epidemiological, surveillance, risk analysis and modeling support for the virulent Newcastle disease outbreak in California.
World Equestrian Games risk assessment support	CEAH provided risk assessment support for the World Equestrian Games with an Evaluation of the Risk of Transmission of Equine Piroplasmiasis to Susceptible Horses Following the 2018 World Equestrian Games.
Test validation support	CEAH participates in discussions on the validation of a molecular test for detecting swine foreign diseases in oral fluids.
Animal Disease Spread Model	CEAH developed and tested a production build of the Animal Disease Spread Model.
National disease-spread and control models	CEAH has developed national disease-spread and control models for African swine fever and classical swine fever and a regional disease-spread and control model for virulent Newcastle disease
Statistical models	CEAH developed statistical models to describe probability distribution functions at the serotype level for infection state durations for foot-and-mouth disease.
FMD outbreak modelling	CEAH modelled a FMD outbreak in the US swine population to evaluate the impacts of preclinical infectious duration of foot-and-mouth disease.
Economic consequences of emergency vaccination for FMD	CEAH characterized the economic consequences of two analyses for emergency vaccination for FMD. 1) Surveillance for FMD free status recovery after a simulated outbreak in the US with emergency vaccination; and 2) Sensitivity of economic losses to post-outbreak management of FMD vaccinated animals after a simulated outbreak in the US with emergency vaccination.

Spatial model of AI environmental persistence risk	CEAH in cooperation with Colorado State University developed a spatial model of AI environmental persistence risk in South Carolina. The pilot study analysed environmental parameters, including wild bird populations, wild bird habitat, and water factors (presence/salinity/temperature) to estimate risk of the AI virus persisting in natural environments. The relative risk to poultry operations was also measured. Methods will be applied to other States and at a national scale.
<b>Training, capacity building</b>	
<b>Title of activity</b>	<b>Scope</b>
Dairy Health course	CEAH presented materials to the Dairy Health course at Colorado State University. The National Animal Health Monitoring System Dairy 2014 calf component study will be covered in the course. The course is a capstone course in the department.
AMR presentation to Korea	CEAH shared, via teleconference, USDA National Animal Health Monitoring System Antimicrobial Resistance (AMR) activities to a delegation visiting Washington DC from the Republic of Korea.
Data Inquiry Reporting Tool	CEAH received a demonstration on the use of the U.S. Department of the Interior, Office of Natural Resources and Revenue's Data Inquiry Reporting Tool. Discussions included shared challenges in ensuring consistent data quality and reporting within their organizations, data stewardship models, and other data governance implementation strategies.
Unmanned Aircraft Systems	CEAH participates in an Unmanned Aircraft Systems (UAS) drone pilot training course. The course provided certification and enables VS to pilot a UAS for VS specific work, for examples, outbreak response and epidemiology investigations.
Data Governance and Information Quality	CEAH staff attended Data Governance and Information Quality 2018 for training in industry standards and best practices in data governance and data management. Topics covered include standardization, stewardship, master data management, documentation, and cultural aspects that will be applied to managing data at CEAH.
Google Earth Engine	CEAH staff attended a workshop on the use of Google Earth Engine - Google's cloud platform for geospatial data analysis and visualization, combines a multi-petabyte catalog of satellite imagery and geospatial datasets with high-powered cloud-based processing and analysis capabilities.
Swine Transboundary Diseases	CEAH staff attended the Swine Transboundary Diseases training course to lecture on surveillance approaches for classical and African swine fever and foot-and-mouth disease in U.S. swine.
<b>Wildlife</b>	
<b>Title of activity</b>	<b>Scope</b>
Scientific updates for bison quarantine requirements	CEAH completed a report titled "Scientific updates for bison quarantine requirements." The purpose of this document was to evaluate any new data and literature available on Brucella abortus in Bison. The assessment estimates time to serconversion and diagnostic test performance.

Mycoplasma bovis in healthy North American bison	CEAH provided analytical support for an interagency collaboration on a serological investigation of the thirty-year history of exposure to Mycoplasma bovis in healthy North American bison.
Migration among subpopulations	CEAH develops a method to estimate rates of migration among subpopulations when those subpopulations are closely related.
APHIS National Feral Swine Program	CEAH participated in meetings reviewing the last 5-years of analysis and research by the National Wildlife Research Center (NWRC) to address feral swine issues in support of the APHIS National Feral Swine Program. The meetings covered the development of disease transmission models between livestock and feral swine that CEAH has participated in developing in addition to the development of toxicants and other mitigation tools developed by NWRC.
Adaptive risk-based surveillance	CEAH develops adaptive risk-based surveillance for use in wildlife. The risk models used are run annually to reallocate surveillance priority based on changes in prevalence and other risk factors. Surveillance is currently conducted for classical swine fever, pseudorabies virus and swine brucellosis using the adaptive risk-based approach.
Wild bird sampling	CEAH assisted in the development of a plan for sampling wild birds to investigate their potential involvement in the virulent Newcastle disease virus outbreak in California.
<b>Avian diseases</b>	
<b>Title of activity</b>	<b>Scope</b>
Pasteurization standards to inactivate vND virus	CEAH provided input on whether current FSIS pasteurization standards would be sufficient to inactivate vND virus in egg products presented for pasteurization.
Backyard poultry population distribution risk model	CEAH developed a new version of a backyard poultry population distribution risk model. The model predicts the number of backyard flocks by neighborhood in southern California using the 2002 and current 2018 vND outbreak data. Risk profiles were generated using the model for recently affected Ventura and Compton areas.
Live bird marketing systems	CEAH staff attended a live bird marketing system working group meeting to discuss diagnostics, surveillance, emergency response, and outreach for avian influenza.
<b>Aquatic animal diseases</b>	
<b>Title of activity</b>	<b>Scope</b>
Aquatic animal diseases	CEAH attends listening sessions to discuss salmonids, catfish, freshwater finfish, and general aquaculture.
Commercial Aquaculture Health Program Standards	CEAH participated in site visits of two Atlantic salmon hatcheries, one of which is participating in a proof-of-concept trial of the Commercial Aquaculture Health Program Standards (CAHPS). Site visits involved evaluation of possible pathways for disease introduction and discussions of recommendations to address periodic findings of infectious salmon anemia virus HPR0 in the region.
<b>Other (Name the category)</b>	
<b>Title of activity</b>	<b>Scope</b>

vND mapping support	CEAH provides vND (Newcastle) outbreak support, including mapping. The team rapidly developed interactive maps and synchronized them with pdf map files.
CWD mapping support	CEAH provides mapping support related to interspecies transmission of chronic wasting disease. The maps show co-locations of Chronic Wasting Disease (CWD) in free-ranging cervids and the distributions of meadow voles ( <i>Microtus pennsylvanicus</i> ) and raccoons ( <i>Procyon lotor</i> ).
LPAI mapping support	CEAH provides low pathogenic avian influenza outbreak support with updates to trade reporting maps. The maps were customized to reflect varying zone requirements for trading partners.
FMD risk assessment mapping support	CEAH produced maps for a Peru FMD risk assessment. The maps show official OIE FMD status by area including areas FMD Free, FMD without vaccination, FMD free with vaccination, FMD containment zones, and areas without an FMD status. These maps were compiled for a variety of countries and areas in South America and Central America.
Longhorned Tick mapping support	CEAH provided mapping support to show counties reporting Longhorned Tick presence and the development of an interactive Tableau dashboard SitRep report for the Longhorned Tick surveillance.
Interactive Tableau dashboard	CEAH developed an interactive Tableau dashboard that tailors views with state-specific BSE surveillance data. The data feeding the dashboard are automatically processed and updated on a weekly schedule, enabling field offices to monitor, drill down into, and download their collection data for any time period from the start of FY 2018 onward. This increased data transparency is a critical step towards improving data quality.
ASF mapping support	CEAH provided mapping support to produce daily visualization maps to communicate the presence and location of African Swine Fever in the world.
Commercial poultry operations mapping support	CEAH in cooperation with Colorado State University, used remote sensing and GIS methods to identify and map commercial poultry operations in several south eastern States. The study used image object extraction and spectral signature techniques to provide superior identification and mapping of poultry barns and premises. The model (maps) of these poultry operations are valuable for both emergency planning and response.

**ToR : To propose or develop methods and procedures that facilitate harmonisation of international standards and guidelines applicable to the designated specialty**

**2. Proposal or development of any procedure that will facilitate harmonisation of international regulations applicable to the surveillance and control of animal diseases, food safety or animal welfare**

Proposal title	Scope/Content	Applicable area
Transatlantic Task Force on Antimicrobial Resistance (TATFAR)	CEAH collaborated with the European Commission (EC), Canadian Food Inspection Agency, U.S. Food and Drug Administration, European Medicines Agency, and U.S. Centre for Disease Control and Prevention on Antimicrobial Stewardship.	<input type="checkbox"/> Surveillance and control of animal diseases <input checked="" type="checkbox"/> Food safety <input type="checkbox"/> Animal welfare

Chapter 1.4 "Animal Health Surveillance" of the OIE Terrestrial Animal Health Code	CEAH prepared and submitted comments on the revised Chapter 1.4 "Animal Health Surveillance" of the OIE Terrestrial Animal Health Code.	<input checked="" type="checkbox"/> Surveillance and control of animal diseases <input type="checkbox"/> Food safety <input type="checkbox"/> Animal welfare
Antimicrobial Resistance metrics	CEAH collaborated with the Canadian Integrated Program for Antimicrobial Resistance Surveillance (CIPARS), U.S. Food and Drug Administration, Public Health Agency of Canada (PHAC) and a member of the European Medicines Agency (EMA) in a bi-annual call to share information and updates on work related to antimicrobial use metrics.	<input type="checkbox"/> Surveillance and control of animal diseases <input checked="" type="checkbox"/> Food safety <input type="checkbox"/> Animal welfare
World Organization of Animal Health (OIE) cooperation project "Capacity development for implementing a GIS applied to surveillance, control and zoning of avian influenza and other emerging avian disease in China".	The workshop developed the first standards for using GIS for zoning and this will be used as the World Animal Health Information System (WAHIS) is updated to WAHIS-plus, the disease reporting tool member countries use to report to the OIE.	<input checked="" type="checkbox"/> Surveillance and control of animal diseases <input type="checkbox"/> Food safety <input type="checkbox"/> Animal welfare
Surveillance requirements to establish containment zones during incursions of transboundary animal diseases.	CEAH participated in Animal Health Quadrilateral (QUADS - United States, Canada, Australia and New Zealand) surveillance network discussions to consider surveillance requirements to establish containment zones during incursions of foot-and-mouth disease (FMD), classical swine fever (CSF), avian influenza (AI), and Newcastle disease (ND). QUADS has advocated for changes to the World Organization for Animal Health Terrestrial Animal Health Code to recognize that containment zones can be implemented during outbreaks of notifiable diseases.	<input checked="" type="checkbox"/> Surveillance and control of animal diseases <input type="checkbox"/> Food safety <input type="checkbox"/> Animal welfare

***ToR: To establish and maintain a network with other OIE Collaborating Centres designated for the same specialty, and should the need arise, with Collaborating Centres in other disciplines***

***ToR: To carry out and/or coordinate scientific and technical studies in collaboration with other centres, laboratories or organisations***

**3. Did your Collaborating Centre maintain a network with other OIE Collaborating Centres (CC), Reference Laboratories (RL), or organisations designated for the same specialty, to coordinate scientific and technical studies?**

Yes

Name of OIE CC/RL/other organisation(s)	Location	Region of networking Centre	Purpose
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Canadian Food Inspection Agency (CFIA)	Canada	<input type="checkbox"/> Africa <input checked="" type="checkbox"/> Americas <input type="checkbox"/> Asia and Pacific <input type="checkbox"/> Europe <input type="checkbox"/> Middle East	CEAH (SDA) collaborated with CFIA to revise a CFIA document describing the need for "temporary protection zones".
Instituto Zooprofilattico Sperimentale Venezia (IZSVE) and the Chinese Academy of Inspection and Quarantine (CAIQ)	China	<input type="checkbox"/> Africa <input checked="" type="checkbox"/> Americas <input checked="" type="checkbox"/> Asia and Pacific <input checked="" type="checkbox"/> Europe <input type="checkbox"/> Middle East	World Organization of Animal Health (OIE) cooperation project "Capacity development for implementing a GIS applied to surveillance, control and zoning of avian influenza and other emerging avian diseases in China" - to discuss standards for using GIS in their countries and reviewed a data product specification document for zoning using GIS.
European Food Safety Agency (EFSA)	Europe	<input type="checkbox"/> Africa <input type="checkbox"/> Americas <input type="checkbox"/> Asia and Pacific <input checked="" type="checkbox"/> Europe <input type="checkbox"/> Middle East	CEAH staff served as Hearing Experts at the request of the EFSA, in a review of a rapid risk assessment for the presence of LPAI virus in poultry meat. Hearing experts were asked to help identify recent studies that indicated the presence of LPAI virus in meat, and review various sections of the draft assessment.
Canadian Veterinary Surveillance Epidemiology Network	Canada	<input type="checkbox"/> Africa <input checked="" type="checkbox"/> Americas <input type="checkbox"/> Asia and Pacific <input type="checkbox"/> Europe <input type="checkbox"/> Middle East	CEAH staff collaborated with CFIA on animal health syndromic surveillance.
Canadian Food Inspection Agency (CFIA)	Canada	<input type="checkbox"/> Africa <input checked="" type="checkbox"/> Americas <input type="checkbox"/> Asia and Pacific <input type="checkbox"/> Europe <input type="checkbox"/> Middle East	CEAH staff collaborated with CFIA on the challenges and applications for modeling foot and mouth disease spread within the InterSpread Plus epidemiologic model as well as enhancing cross agency collaboration.

**4. Did your Collaborating Centre maintain a network with other OIE Collaborating Centres, Reference laboratories, or organisations in other disciplines, to coordinate scientific and technical studies?**

Yes

Name of OIE CC/RL/other organisation(s)	Location	Region of networking Centre	Purpose
Transatlantic Task Force on Antimicrobial Resistance (TATFAR)	United States	<input type="checkbox"/> Africa <input checked="" type="checkbox"/> Americas <input type="checkbox"/> Asia and Pacific <input checked="" type="checkbox"/> Europe <input type="checkbox"/> Middle East	Two Working groups met to: 1) produce a reflection paper on "Harmonization for reporting the consumption of antimicrobials in veterinary medicine: with the goal of developing a common lexicon for communicating regarding AM use" and 2) discuss regulations regarding alternatives to antimicrobials (ATAs), potential definitions of ATAs and antibiotics, and harmonization of the definitions.



**ToR: To place expert consultants at the disposal of the OIE.**

**5. Did your Collaborating Centre place expert consultants at the disposal of the OIE?**

Yes

Name of expert	Kind of consultancy	Subject
Lori Gustafson	Aquaculture subject matter expert to the OIE Aquatic Animal Health Code ad hoc group	Lori Gustafson participated in the ad hoc group meeting on 'Susceptibility of Fish Species to Infection with OIE List Diseases.' The purpose of this group is to review literature and recommend updates to species listed as susceptible in pathogen-specific chapters in the OIE Aquatic Animal Health Code. Resulting recommendations go to the Aquatic Animal Standards Commission for consideration and then to member countries for review, prior to adoption.
Jennifer Siembieda	Animal epidemiology and surveillance expert	Jennifer Siembieda participated in the OIE cooperation project "Capacity development for implementing a GIS applied to surveillance, control and zoning of avian influenza and other emerging avian disease in China".
Dana Cole	Risk assessment expert.	Dana Cole participated in the development of the Joint Risk Assessment (JRA) Chapter of the Tripartite Guidance for Addressing Zoonotic Diseases. She served as workgroup lead during workshop of experts February 26-28th, 2018 to develop the chapter describing the conduct of JRA and served as expert on the development of the Joint Risk Assessment Toolkit, participating in the training of 25 JRA facilitators in the use of the toolkit in September 2018.

**ToR: To provide, within the designated specialty, scientific and technical training to personnel from OIE Member Countries**

**6. Did your Collaborating Centre provide scientific and technical training, within the remit of the mandate given by the OIE, to personnel from OIE Member Countries?**

Yes

- a) Technical visits: 2
- b) Seminars: 0
- c) Hands-on training courses: 2
- d) Internships (>1 month): 2

Type of technical training provided (a, b, c or d)	Content	Country of origin of the expert(s) provided with training	No. participants from the corresponding country

a	CEAH hosted Jean Claude Rukundo, a Borlaug Fellow from Rwanda, and his mentor Dr. Andrew Mohammed. The one-day visit was designed to provide an overview of analytical support provided by CEAH for animal health policy; animal disease traceability programs; work at the wildlife-domestic livestock interface; and data management and geospatial topics, including demonstrations of web map applications for emergency response and Tableau dashboards for surveillance.	Rwanda	2
a	A delegation was hosted by the Chinese Ministry for Agriculture and Rural and traveled to the cities of Beijing, Qingdao, Chengdu and Guangzhou. The delegation discussed emerging and zoonotic diseases in agriculture including the current African swine fever outbreak in China and identified areas for potential future collaborations. The delegation also met with the Food and Agriculture Organization of the United Nations Emergency Centre for Transboundary Animal Diseases and the China Centers for Disease Control and Prevention.	China	70
c	CEAH provided a brucellosis subject matter expert for the Pakistan One Health Workshop. The workshop, co-sponsored by the Centers for Disease Control and Prevention and USDA, supported the government of Pakistan with a workshop to develop a National One Health Framework and Strategic Plan. The workshop focused on zoonotic diseases of national and international significance with an emphasis on rabies and brucellosis.	Pakistan	30
c	CEAH attended and presented at the USGS/USDA/Republic of Korea International Workshop on Wildlife Diseases and One Health.	China, Korea, Japan	30
d	An internship with Risk Assessment to evaluate pathways for classical swine fever.	U.S.	1
d	Training was provided to interns to develop maps for reporting on emerging diseases using newer web-based tools in Excel and the APHIS GIS Portal. Students learned how to quickly develop maps using Excel data, publish the map to the APHIS GIS Portal, and develop high quality map products for reporting.	U.S.	3

***ToR: To organise and participate in scientific meetings and other activities on behalf of the OIE***

**7. Did your Collaborating Centre organise or participate in the organisation of scientific meetings on behalf of the OIE?**

No

***ToR: To collect, process, analyse, publish and disseminate data and information relevant to the designated specialty***

**8. Publication and dissemination of any information within the remit of the mandate given by the OIE**

a) Articles published in peer-reviewed journals: 29

- 1) Beck-Johnson, L.M.; Hallman, C.; Miller, R.S.; Portacci, K.; Gorsich, E.E.; Grear, D.A.; Hartmann, K.; Webb, C.T. (2018), Estimating and exploring the proportions of inter- and intrastate cattle shipments in the United States.
- 2) Bertram, Miranda R, Amy Delgado, Steven J Pauszek, George R Smoliga, Barbara Brito, Carolina Stenfeldt, Ethan J Hartwig, et al. "Effect of Vaccination on Cattle Subclinically Infected with Foot-and-Mouth Disease Virus in Cameroon." *Preventive veterinary medicine* 155 (2018): 1-10.
- 3) Bjork, Kathe E, Victoria Fields, Lindsey P Garber, and Christine A Koprak. "Factors Associated with Salmonella Prevalence in Us Swine Grower-Finisher Operations, 2012." *Foodborne pathogens and disease* 15, no. 8 (2018): 489-97.
- 4) Garza SJ, Michael A Tabak, Ryan S Miller, Matthew L Farnsworth, Christopher L Burdett. Abiotic and biotic influences on home-range size of wild pigs (*Sus scrofa*). *Journal of Mammalogy*, Volume 99, Issue 1, 1 February 2018, Pages 97-107
- 5) Gorsich, Erin E, Clifton D McKee, Daniel A Grear, Ryan S Miller, Katie Portacci, Tom Lindström, and Colleen T Webb. "Model-Guided Suggestions for Targeted Surveillance Based on Cattle Shipments in the US." *Preventive veterinary medicine* 150 (2018): 52-59.
- 6) Gustafson L, Jones R, Dufour-Zavala L, Jensen E, Malinak C, McCarter S, Opengart K, Quinn J, Slater T, Delgado A, Talbert M, Garber L, Remmenga M, Smeltzer M. "Expert Elicitation Provides a Rapid Alternative to Formal Case-Control Study of an H7N9 Avian Influenza Outbreak in the United States." *Avian Diseases* 62 (2018): 201-209.
- 7) Hagerman, Amy D, David D South, Travis C Sondgerath, Kelly A Patyk, Robert L Sanson, Russ S Schumacher, Amy H Delgado, and Sheryl Magzamen. "Temporal and Geographic Distribution of Weather Conditions Favorable to Airborne Spread of Foot-and-Mouth Disease in the Coterminous United States." *Preventive veterinary medicine* 161 (2018): 41-49.
- 8) Hayer, SS, K VanderWaal, R Ranjan, JK Biswal, S Subramaniam, JK Mohapatra, GK Sharma, et al. "Foot-and-Mouth Disease Virus Transmission Dynamics and Persistence in a Herd of Vaccinated Dairy Cattle in India." *Transboundary and emerging diseases* 65, no. 2 (2018): e404-e15.
- 9) McClure, Meredith L., Christopher L. Burdett, Matthew L. Farnsworth, Steven J. Sweeney, and Ryan S. Miller. "A Globally-Distributed Alien Invasive Species Poses Risks to United States Imperiled Species." *Scientific Reports* 8, no. 1 (2018): 5331.
- 10) McConnel, Craig S, Ashleigh A McNeil, Joleen C Hadrich, Jason E Lombard, Jane Heller, and Franklyn B Garry. "A Comparison of a Novel Time-Based Summary Measure of Dairy Cow Health against Cumulative Disease Frequency." *Irish veterinary journal* 71, no. 1 (2018): 7.
- 11) Miller, Ryan S, Susan M Opp, and Colleen T Webb. "Determinants of Invasive Species Policy: Print Media and Agriculture Determine Us Invasive Wild Pig Policy." *Ecosphere* 9, no. 8 (2018).
- 12) Moreno-Torres K, Brito B, Branam M, Rodriguez L, Delgado A, Stenfeldt C, Arzt J. "Foot-and-Mouth Disease Infection Dynamics in Contact-Exposed Pigs Are Determined by the Estimated Exposure Dose." *Frontiers in Veterinary Science* 5:167 (2018).
- 13) Nielsen, MK, MA Branam, AM Wiedenheft, R Digianantonio, JA Scare, JL Bellaw, LP Garber, et al. "Anthelmintic Efficacy against Equine Strongyles in the United States." *Veterinary parasitology* 259 (2018): 53-60.
- 14) Orloski K, Robbe-Austerman S, Stuber T, Hench B and Schoenbaum M (2018) Whole Genome Sequencing of *Mycobacterium bovis* Isolated From Livestock in the United States, 1989-2018. *Front. Vet. Sci.* 5:253.
- 15) Pedersen, Kerri, Ryan S Miller, Anthony R Mustante, Timonhthy S White, Il Freye, D James, and Thomas Gidlewski. "Antibody Evidence of Porcine Reproductive and Respiratory Syndrome Virus Detected in Sera Collected from Feral Swine (*Sus Scrofa*) across the United States." *Journal of Swine Health and Production* 26, no. 1 (2018): 41-44.
- 16) Rawdon, TG, MG Garner, RL Sanson, MA Stevenson, C Cook, C Birch, SE Roche, et al. "Evaluating Vaccination Strategies to Control Foot-and-Mouth Disease: A Country Comparison Study." *Epidemiology & Infection* 146, no. 9 (2018): 1138-50.
- 17) Shivley, CB, JE Lombard, NJ Urie, DM Haines, R Sargent, CA Koprak, TJ Earleywine, JD Olson, and FB Garry. "Preweaned Heifer Management on Us Dairy Operations: Part Ii. Factors Associated with Colostrum Quality and Passive Transfer Status of Dairy Heifer Calves." *Journal of dairy science* 101, no. 10 (2018): 9185-98.
- 18) Shivley, C. B., J. E. Lombard, N. J. Urie, C. A. Koprak, M. Santin, T. J. Earleywine, J. D. Olson, and F. B. Garry. "Preweaned Heifer Management on Us Dairy Operations: Part Vi. Factors Associated with Average Daily Gain in Preweaned Dairy Heifer Calves." *Journal of Dairy Science* 101, no. 10 (2018): 9245-58.
- 19) Sonnier, Jakeitha L, Jeffrey S Karns, Jason E Lombard, Christine A Koprak, Bradd J Haley, Seon-Woo Kim, and Jo Ann S Van Kessel. "Prevalence of Salmonella Enterica, Listeria Monocytogenes, and Pathogenic Escherichia Coli in Bulk Tank Milk and Milk Filters from Us Dairy Operations in the National Animal Health Monitoring System Dairy 2014 Study." *Journal of dairy science* 101, no. 3 (2018): 1943-56.
- 20) Stenkamp-Strahm, C., J. E. Lombard, R. J. Magnuson, L. M. Linke, S. Magzamen, N. J. Urie, C. B. Shivley, and C. S. McConnel. "Preweaned Heifer Management on Us Dairy Operations: Part Iv. Factors Associated with the Presence of Escherichia Coli O157 in Preweaned Dairy Heifers." *Journal of Dairy Science* 101, no. 10 (2018):

9214-28.

- 21) Tabak, Michael A., Mohammad S. Norouzzadeh, David W. Wolfson, Steven J. Sweeney, Kurt C. Vercauteren, Nathan P. Snow, Joseph M. Halseth, et al. "Machine Learning to Classify Animal Species in Camera Trap Images: Applications in Ecology." *Methods in Ecology and Evolution* (2018): 1-6.
- 22) Tabak, Michael A, Colleen T Webb, and Ryan S Miller. "Propagule Size and Structure, Life History, and Environmental Conditions Affect Establishment Success of an Invasive Species." *Scientific reports* 8, no. 1 (2018): 10313.
- 23) Tack, Danielle M, Mary Jane McCool-Eye, Christopher R Kizer, David A Dargatz, and Adele M Turzillo. "Exploration of Veterinary Shortages in the Wake of the Veterinary Feed Directive." *Journal of the American Veterinary Medical Association* 253, no. 10 (2018): 1334-41.
- 24) Thompson, Jada M, and Ann Hillberg Seitzinger. "Economic Evaluation of Low Pathogenic Avian Influenza in Northeastern US Live Bird Markets." *The Journal of Applied Poultry Research* (2018): pfy020.
- 25) Urie, NJ, JE Lombard, CB Shivley, CA Koprak, AE Adams, TJ Earleywine, JD Olson, and FB Garry. "Prewaned Heifer Management on Us Dairy Operations: Part I. Descriptive Characteristics of Prewaned Heifer Raising Practices." *Journal of dairy science* 101, no. 10 (2018): 9168-84.
- 26) ———. "Prewaned Heifer Management on Us Dairy Operations: Part V. Factors Associated with Morbidity and Mortality in Prewaned Dairy Heifer Calves." *Journal of Dairy Science* 101, no. 10 (2018): 9229-44.
- 27) Urie, N. J., J. E. Lombard, C. B. Shivley, A. E. Adams, C. A. Koprak, and M. Santin. "Prewaned Heifer Management on Us Dairy Operations: Part Iii. Factors Associated with Cryptosporidium and Giardia in Prewaned Dairy Heifer Calves." *Journal of Dairy Science* 101, no. 10 (2018): 9199-213.
- 28) van Senten, Jonathan, Carole R. Engle, Kathleen Hartman, Kamina K. Johnson, and Lori L. Gustafson. "Is There an Economic Incentive for Farmer Participation in a Uniform Health Standard for Aquaculture Farms? An Empirical Case Study." *Preventive Veterinary Medicine* 156 (2018): 58-67.
- 29) White, M, K Kauffman, J Lewis, and R Miller. "Wild Pigs Breach Farm Fence through Harvest Time in Southern San Joaquin Valley." *California Agriculture* 72, no. 2 (2018): 120-26.

b) International conferences: 13

- 1) Jason Lombard from CEAH supported a booth at the World Dairy Expo held in Wisconsin - a trade show bringing together leading researchers, technical experts and national sales representatives from around the world and see the latest technology for the dairy industry.
- 2) Oriana Beemer from CEAH presented at the 15th International Symposium of Veterinary Epidemiology and Economics (ISVEE) in Chiang Mai, Thailand. Her poster was entitled "Assessment of the value of PCR assays in oral fluid samples for detection of African Swine Fever, Classical Swine Fever, and Foot-and-Mouth Disease in U.S. Swine". Other CEAH posters included: 1. Simulating the spread and control of classical swine fever in the United States: analysis of emergency vaccination strategies; 2. Decision support tools and multi-criteria decision analysis to support state and national-level decisions during an emergency response: application to foot-and-mouth disease control in the United States; 3. Overview of the animal disease spread model: A tool for simulating highly contagious disease outbreaks; 4. An evaluation of management practices associated with the presence of Salmonella heidelberg infections in U.S. dairy calves; 5. Infection dynamics of foot-and-mouth disease in contact-exposed pigs are determined by the estimated exposure dose; 6. Inferring the spatial spread of highly pathogenic avian influenza H5N2 clade 2.3.4.4 during the 2015 epidemics in Iowa; 7. What can we say from the death of layer chickens? Estimating within-flock HPAI (H5N2) dynamics using an approximate Bayesian computation framework; 8. Management practices associated with higher average daily gain in preweaned dairy heifers; 9. Temporal and geographic distribution of weather conditions favorable to airborne spread of foot-and-mouth disease in the coterminous United States; 10. Using secondary data to model livestock truck-borne fomite disease transfer potential; 11. Management practices associated with morbidity and mortality in preweaned dairy heifer calves.
- 3) Lori Gustafson from CEAH attended the 8th International Symposium on Aquatic Animal Health in Canada. She presented on progress towards collaborative management of (1) transboundary disease and (2) regional shellfish health.
- 4) Kamina Johnson from CEAH attended the Agricultural & Applied Economics Association (AAEA) Annual Meeting and Post-Conference Workshop on Economics and Animal Health and Biosecurity. Ms. Johnson co-authored the presentation: "Saving our Bacon Without Hamstringing the Industry: Sensitivity of Economic Losses to Post-Outbreak Management of Foot-and-Mouth Disease Vaccinated Animals in a Simulated US Outbreak."
- 5) Mikey Tabak from CEAH attended the Annual Meeting of the Ecological Society of America. He gave two presentations: "A population genomic approach for estimating migration when sample size is small and populations are closely related" and "Disease prevalence in an invasive species demonstrates tradeoffs between species diversity and environmental conditions."
- 6) Julianna Lenocho from CEAH attended the 5th International One Health Congress in Canada. The Congress was attended by over 800 participants from 60 countries. Additionally, Dr. Lenocho was an invited speaker at the roundtable discussion on "Innovative Transboundary and Emerging Disease Control Strategies at the Human-Animal Interface".

7) Andrew Fox from CEAH attended the 2018 Esri International Users Conference. The conference brings together over 10,000 GIS professionals from around the world to highlight geospatial applications and successes across a variety of industries. He provided updates on the FY19 Enterprise License Agreement (ELA) and information on USDA level GIS initiatives.

8) Kamina Johnson from CEAH attended the Second Meeting of the International Society for Economics and Social Sciences of Animal Health (ISESSAH), a workshop titled "From Economic Assessment to Policy Making." She gave an oral presentation titled, "Selecting an Optimal Surveillance Option During an Outbreak: A comparison of Cost-Effectiveness for Highly Pathogenic Avian Influenza."

9) Melissa Schoenbaum from CEAH presented at the ModSim World 2018 Conference. Her presentation demonstrated how the R language can be used with the Animal Disease Spread Model to compare outputs from many scenarios.

10) Ryan Miller from CEAH attended the International Wild Pig Conference to present 12 talks and posters. 1. Predicting watershed level seroprevalence of Pseudorabies virus and swine brucellosis for the United States, 2. Estimating feral swine abundance at the national, state, and county scales for the United States using agency removal data, 3. A national approach for risk-based targeted surveillance for feral swine diseases of concern to domestic animal and human health, 4. Morphometric Measurements and Body Weights of Wild Pigs in North America, 5. The influence of environmental conditions on the litter size and survival of native and non-native wild pigs, 6. Solutions for Big Data: Harnessing the power of machine learning to automate the identification of camera trap images, 7. A method for evaluating progress of the APHIS National Feral Swine Damage Management program using management data to estimate prevention of spatial spread, 8. Historical, current, and potential population size estimates of invasive wild pigs in the United States, 9. Assessment of Invasive Wild Pig Disease Risks and Management Priorities, 10. New Mexico Feral Swine Fecundity: 2010-2016, 11. The influence of environmental conditions on the litter size and survival of native and non-native wild pigs, and 12. Predicting invasive wild pig population establishment following introduction into a new location.

11) Amy Delgado from CEAH presented a webinar to the EUFMD Modelling Network. The webinar will highlight several recent analyses that aim to improve our understanding and ability to model FMD virus transmission in swine.

12) Judy Akkina and Julianna Lenocho from CEAH attended the International Society for Disease Surveillance (ISDS) One Health Symposium and Annual Conference. Dr. Akkina is a member of the organizing committee of the One Health Symposium and moderated a panel session on "Overcoming Barriers to One Health" and gave a presentation titled "Epidemiology of Suspected Pesticide Poisoning in Livestock" at the annual conference. Dr. Lenocho gave a presentation on One Health activities in APHIS VS at the One Health Symposium.

13) Kelly Patyk from CEAH attended the International Workshop on Wildlife Diseases and One Health. She gave a presentation titled "Modeling the Potential Spread and Control of Highly Pathogenic Avian Influenza (HPAI) in the United States".

c) National conferences: 13

1) Julianna Lenocho from CEAH will be giving an update titled "Veterinary Services Global Monitoring of Foreign and Emerging Animal Diseases" to the Critical Infrastructure Partnership Advisory Council (CIPAC).

2) Judy Akkina gave a webinar presentation on the surveillance of toxic hazards to livestock and poultry and the epidemiology of suspected pesticide poisoning to the Poison Centre and Public Health Collaboration Community of Practice. This Community of Practice has members from the Council of State and Territorial Epidemiologists, the American Association of Poison Control Centres and the Centres for Disease Control and Prevention's Health Studies Branch.

3) Natalie Urie and Katherine Marshall attended the Texas Sheep and Goat Exposition on August 17th and 18th to promote the upcoming NAHMS 2019 Goat Study. This two day event hosted over 250 producers and extension involved in the sheep and goat industry.

4) Chelsey Shivley gave a presentation at the American Veterinary Medical Association (AVMA) Convention in on the relationship between animal welfare and antimicrobial use in livestock.

5) Julianna Lenocho attended the joint American Veterinary Medical Association (AVMA)/American College of Veterinary Preventive Medicine (ACVPM) as the current chair of the Membership and Outreach committee and gave an update presentation on activities.

6) Oriana Beemer and Marisa Rotolo presented on "Use of Oral Fluids as a Testing Specimen for Detecting Swine Transboundary Animal Diseases" to the United States Animal Health Association Committee on Animal Emergency Management.

7) Kamina Johnson represented APHIS at the 2018 Livestock Marketing Information Center Technical Advisory Committee Annual Meeting and presented an overview of research projects related to the economic impact of reducing swine dysentery in US swine and distributing limited vaccine during an FMD outbreak.

8) Sherrilyn Wainwright from CEAH attended the 2018 Dr. James Steele Diseases in Nature Conference and presented a poster titled: "Global monitoring of drivers of animal disease outbreaks to inform local risks of disease introduction."

9) Jason Lombard from CEAH attended the Dairy Calf and Heifer Association meeting and presented on the

'Implications of Salmonella Heidelberg on the US dairy industry'.

10) MaryJane McCool-Eye from CEAH attended the Esri Federal User Conference to present on the successful implementation and integration of WebGIS technologies to fulfil the APHIS mission, including the use of web mapping for the 2017 avian influenza (AI) outbreak response in the southeast United States; how Excel mapping tools are being used to manage AI biosecurity outreach in Washington State; and how the Esri Predictive Analysis Tools are being used to identify areas at greater risk of AI virus introductions to poultry farms.

11) CEAH poster "Identifying Commercial Poultry Operations from High-Resolution Imagery to Support Animal Health Emergencies", was accepted and displayed at the 2018 Esri Federal GIS Conference Map Gallery.

12) Gericke Cook from CEAH delivered a presentation on pathways methodologies to the National Biosurveillance Integration Center (NBIC), Homeland Security as part of the Biosurveillance Expert Analyst (BETA) webinar series.

13) Katherine Marshall attended the National Goat Federation meeting and presented a poster titled: "Designing the National Animal Health Monitoring System (NAHMS) Goat 2019 Study".

d) Other

(Provide website address or link to appropriate information): 9

1) CEAH published an Outbreak Surveillance Toolbox. It is designed to provide veterinary epidemiologists with resources to quickly develop a consistent and complete surveillance plan to identify infected herds and animals due to an outbreak of an infectious animal disease.

<https://www.aphis.usda.gov/aphis/ourfocus/animalhealth/ceah-toolbox/home>

2) CEAH released an info sheet on trends in vaccination practices for equids. The data are from three National Animal Health Monitoring System (NAHMS) Equine studies: 1998, 2005, and 2015. The info sheet is available on the NAHMS website. <https://www.aphis.usda.gov/aphis/ourfocus/animalhealth/monitoring-and-surveillance/nahms>

3) CEAH releases an info sheet on U.S. Milk Quality. The 2017 summary is available at [https://www.aphis.usda.gov/animal\\_health/nahms/dairy/downloads/dairy\\_monitoring/BTSCC\\_2017infosheet.pdf](https://www.aphis.usda.gov/animal_health/nahms/dairy/downloads/dairy_monitoring/BTSCC_2017infosheet.pdf)

4) CEAH released R package for analyzing camera trap images. The R package (Machine Learning for Wildlife Image Classification; MLWIC) is in a "beta" version and available from Github (<https://github.com/mikeyEcology/MLWIC>).

5) CEAH released info sheets on the seroprevalence of antibodies to *Toxoplasma gondii* and *Trichinae spiralis*. The info sheets are available on the NAHMS website.

<https://www.aphis.usda.gov/aphis/ourfocus/animalhealth/monitoring-and-surveillance/nahms>

6) CEAH released the FY 2017 fourth quarter report on influenza A virus surveillance in swine. The report is available for stakeholders to view at:

[https://www.aphis.usda.gov/aphis/ourfocus/animalhealth/animal-disease-information/swine-disease-information/ct\\_swine\\_health\\_monitoring\\_surveillance](https://www.aphis.usda.gov/aphis/ourfocus/animalhealth/animal-disease-information/swine-disease-information/ct_swine_health_monitoring_surveillance)

7) SDA submitted the major 2017 infectious disease outbreaks, based on disease reports provided to the OIE, for inclusion in the annual International Security and Nonproliferation Biological Weapons Convention Annual Confidence Building Measures (BWC CBM) Return. The return is available via the official BWC website:

[https://www.unog.ch/80256EE600585943/\(httpPages\)/04FBBDD6315AC720C1257180004B1B2F?OpenDocument](https://www.unog.ch/80256EE600585943/(httpPages)/04FBBDD6315AC720C1257180004B1B2F?OpenDocument)

8) CEAH completed a National Animal Health Monitoring System (NAHMS) study on the U.S. Beef cow-calf industry. This was the fourth NAHMS cow-calf study of the beef industry and involved producers in 24 States representing more than 70 percent of beef cows and beef cow operation in the United States. Results will be available on the NAHMS website in early summer 2019. [www.aphis.usda.gov/nahms](http://www.aphis.usda.gov/nahms)

9) CEAH released the fourth NAHMS Dairy 2014 report: Nutrient Management Practices on U.S. Dairy Operations 2014. This report is available on the NAHMS website:

<https://www.aphis.usda.gov/aphis/ourfocus/animalhealth/monitoring-and-surveillance/nahms>