**Project/Activity Number:** NC229

**Project/Activity Title:** Detection and Control of Porcine Reproductive and Respiratory Syndrome Virus and Emerging Viral Diseases of Swine

**Period Covered:**12/05/2021 to 12/04/2022

**Date of Report:** 1/2/2023

**Annual Meeting Dates:** 12/02/2022 – 12/04/2022

**NC229 Business meeting agenda.**

**Table 1:**

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| --- | --- | --- |
| Time | Presenter | Topic |
| 3:30 | Pogranichniy, Roman, NC229 Chair | NC229-business meeting opening and introduction |
| 3:45 | Michelle Colby | USDA-NIFA update |
| 4:15 | Pineyro-Pineiro, Pablo,  Vice Chair | Summary of previous year report |
| 4:30 | Gourapura, Renukaradhya | Ohio - Ohio State University: AES |
| 4:35 | Lunney, Joan | USDA-ARS Beltsville Agricultural Research Center: USDA |
| 4:40 | Zuckermann, Federico A | Illinois - University of Illinois: AES |
| 4:45 | Pasternak, Jonathan | Indiana - Purdue University: AES |
| 4:50 | Schroeder, Declan | Minnesota - University of Minnesota: AES |
| 4:55 | Diel, Diego | New York -Ithaca : Cornell University: AES |
| 5:00 | Vu, Hiep | Nebraska - University of Nebraska: AES |
| 5:05 | Miller, Laura | USDA-ARS National Animal Disease Center: USDA |
| 5:10 | Pineyro-Pineiro, Pablo | Iowa - Iowa State University: AES |
| 5:15 | Pogranichniy, Roman | Kansas - Kansas State University: AES |
| 5:20 | Nelson, Eric A. | South Dakota - South Dakota State University: AES |

## 2.2. Multi-state grants or awards:

1. Fang Y., Diel D., Whittaker G., Miller G., Rowland R., Wang L., Miller A. **Novel diagnostic tools and animal model system for study human/animal interface of COVID-19.** *(NIH 1R01 AI66791-01, 09/17/2021 – 08/31/2025)*
2. Fang Y., Rowland R., Shi J., Zimmerman J., Gimenez-Lirola L. **Develop oral fluid-based blocking ELISA for detection of ASFV infection.** (*USDA Hatch, 10/01/20-09/30/22*)
3. Fang Y. **Preparation of porcine circovirus 3 challenge materials for vaccine efficacy studies.** (*Industry fund, 03/10/2021 – 03/30/2023*)
4. Fang Y. **Isolation and sequencing of PRRSV isolates from US swine farms and preparation of challenge materials** (*Industry fund, 05/03/2021 – 04/30/2024*)
5. Fang Y. **In vitro evaluation of nanoparticle formulated cell culture transfections** (*Industry fund, 5/1/22-4/30/23*)
6. Lu Y., Fang Y., Peinetti A.S. **Development of DNA aptamer-nanopore sensors for direct detection of infectious swine viruses.** (*Swine Health Information Center, 03/01/2022-02/28/2023*)
7. Fang Y. **Evaluation of different nanoparticle delivery technologies in vivo for innate immune response** (*Industry fund, 02/25/2021 – 12/31/2021*)
8. Fang, Y. **A novel arterivirus protein and expression mechanism: implication in vaccine and companion diagnostic assay development** (*USDA-NIFA 2015-67015-32696, 01/01/2015 – 02/14/2022*)
9. Fang, Y., Roady P. **Establish a pregnant sow model for assessment of influenza vaccine efficacy during pregnancy** (*NIH R15AI131148-02, 09/10/2019 – 12/31/2021*).
10. Zuckermann, FA. **Increasing the Breadth of Protection Afforded by Influenza A Virus Vaccines for Swine by Targeting the Matrix Protein 2.** USDA NIFA. FY 2020. 07/15/2020 - 06/14/2023
11. Zuckermann, FA. **A broadly protective vaccine against influenza virus.** Illinois Proof of Concept program. 2022. 6/15/22 – 2/30/23.
12. Diel D., Kenney S., Gourapura R., NPB ($497,000).
13. Torremorell **M.,** Schroeder D., Culhane M., Cheeran M., **Investigations into factors that drive the emergence of novel influenza reassortants in pigs** under field conditions. USDA NIFA 2022-67015-36660 ($500,000)
14. VanderWaal **K.,** Schroeder D., Cheeran M., Rovira A., Makau D., **Translating genetic data to antigenic phenotype for improved management of PRRSV in U.S. swine populations.** USDA NIFA 2022-68008-37146 **(**$300,000.00)
15. Cheeran M. Schroeder D., VanderWaal K., **Decoding the genetic diversity among Porcine Reproductive and Respiratory Syndrome virus variants to elucidate mechanisms of immune recognition in swine**. CVM Multistate ($70,000)
16. Shurson G. Schroeder D., Pedro U., **Evaluation of inactivation of EhV (surrogate for African swine fever virus) in corn- and soybean-based feed ingredients and diets during storage and in vitro digestion processes.** UNITED SOYBEAN BOARD ($137,574)
17. Diel D. and Gourapura, RJ. Novel **Broadly Protective Swine Influenza Vaccine Platforms.** USDA-AFRI 2022-67015-36349 ($650,000)
18. Gourapura RJ,Lunney JK, Kenny SP, Loving C, and LaBresh JM. **Development of new swine reagents to broaden our understanding of immune correlates of protection and microbial pathogenesis.** USDA-AFRI 2019-67015-29815 ($500,000)
19. HogenEsch H., and Gourapura, RJ., **Improving vaccine performance with novel phytoglycogen nanoparticle adjuvants.** USDA-AFRI 2019-67015-29814 ($500,000)
20. Arruda A., **Assessing within-herd PRRS variability and its impact on production parameters.** NPB 18-167 ($106,959)
21. Verma and Pasternak. **Point-of-care detection of African swine fever virus: a paper-based device 2022 for molecular diagnostics.** NAHLN/NADPRP ($1,000,000).
22. Reicks, D., S. Blome, J. Hennings, E. Nelson, J. Zimmerman. **Validating various PCR tests and sample types for African Swine Fever Virus (ASFV) detection in boars; and determining the possibility of transmission via artificial insemination**, National Pork Board. $71,080. (Jan. 2022 to Sept. 2022).
23. Hause, B., E. Nelson, J. Hennings, D. Knudsen, T. Clement, L. Wright. **Surveillance of wildlife for SARS-CoV-2 spillover.** NAHLN/CDC. $83,500. (Jan. 2022 to June 2022).
24. Hause, B., E. Nelson. **Surveillance of livestock and wildlife for SARS-CoV-2 and recombinants with domestic endemic coronaviruses**. NIH, $404,250. (July 2021 to June 2023).
25. Lawson, S., E.A. Nelson. ELISA **Development for Detection of Antibodies to S-Tag in PRRSV Swine Serum**. $10,000. USDA ARS. (April 1, 2021 to March 31, 2022).
26. Ramamoorthy S, Rakibuzzaman AGM, Webb B, Pillatzki A, Nelson E. **Integrating vaccine efficacy and safety by directed suicidal replication**. USDA NIFA AFRI – Animal Health and Disease. $500,000. (July 2021-May 2025).
27. Xiuqing Wang. **Role of IFITM3 and ZMPSTE24 in PRRSV replication**. USDA NIFA AFRI – Animal Health and Disease. $150,000. (July 2021-June 2023).
28. Hause, B., C-M Lin. 2021. **Etiological Role of Rotavirus Infection in Enteritis and Porcine Respiratory Disease Complex**. American Association of Swine Veterinarians. $27,700. (2021-2022).
29. Ramamoorthy S, Pillatzki A., Webb B., **Integrating vaccine safety and efficacy by directed suicidal replication**. USDA-NIFA, ($500,000).
30. Vu H., Ly H. and Gauger P., **Development of a broadly protective vaccine against swine influenza virus.** USDA-NIFA Gant No 2020-67015-31414 ($500,000)
31. Ciobanu D. and Vu H., **Deconstructing the role of SYNGR2 in viral disease susceptibility in livestock.** USDA-NIFA Grant No. 2020-67015-31415. ($500,000)
32. Vu, H., McVey S., and Lai H., **Systematic screening of African Swine Fever Virus proteome for identification of immunogenic antigens.** USDA-NIFA 2022-67015-37264 ($770,000).
33. Vu H., **Assessing the feasibility of the mRNA vaccine technology for use against ASF.** NPB #21-126 ($72, 508).
34. **The Ecology of Seneca Virus A in U.S. Swine Marketing Chain**. USDA-APHIS 5030-32000-230-066I
35. **Validation of a Live-Virus Vaccine Candidate for Efficient Attenuation and Better Protection.** TENNESSEE STATE UNIVERSITY 5030-32000-230-068R
36. **Pen-Side Detection of Senecavirus A (SVA)**. USDA-APHIS 5030-32000-230-072I
37. **Response to APHIS SARS-CoV-2 Research Priorities Phase 1 (VPR).** USDA-APHIS 5030-32000-230-073I
38. **Characterization of the Evolution of Influenza A Viruses (IAV) in Swine and Pathotyping of IAV in the Natural Host.** NHI NIAID 5030-32000-231-021I.
39. **Characterization of Virus Isolates from the USDA Swine Influenza A Virus Surveillance System.** USDA-APHIS 5030-32000-231-026I.
40. **The Study of Influenza A Viruses in the Swine Host.** DHHS CDC 5030-32000-231-024I
41. **Generation of Zoonotic Influenza Resistant Recombinant Pigs via Site-Directed Technology**. UNIVERSITY OF MARYLAND - COLLEGE PARK, 5030-32000-231-029R.
42. **USDA Influenza A Virus in Swine Surveillance System – Genomic Epidemiology and Evolution**. USDA\_APHIS 5030-32000-231-080I.
43. **Transmission Bottlenecks and Within-host Evolutionary Dynamics of Influenza A Virus.** UNIVERSITY OF GEORGIA, 5030-32000-231-083R
44. **NIAID Centers of Excellence for Influenza Research and Response.** UNIVERSITY OF PENNSYLVANIA, 5030-32000-231-085R.
45. **The Study of Influenza A Viruses in the Swine Host.** DHHS-CDC 5030-32000-231-087I.
46. Zhang J. **Beta testing pooled sampling thresholds against traditional chronic wasting disease testing with ELISA**. Subcontract from Iowa Department of Natural Resources. $68,992. (September 2022- September 2023).
47. Zhang J, Gauger P, Almeida M, Zimmerman J, Rademacher C, Rawal G. **Evaluate the protective efficacy of commercial PRRSV MLV vaccines against the recently emerged PRRSV 1-4-4 L1C variant strain in weaned pigs.** Iowa Pork Producers Association. $69,989. (August 2022- August 2023).
48. Zhang J, Sitthicharoenchai P, Michael A. **Effect of an antiviral compound on mitigating PRRSV infection outcomes in an experimental pig inoculation model**. Genencor International B.V. (Danisco Animal Nutrition & Health). $113,836. (July 2022- June 2023).
49. Gauger P, Pineyro P, Zhang J. **Construction and in-vitro evaluation of two recombinant porcine parainfluenza virus type-1 cDNA clones expressing the hemagglutinin protein or nucleoprotein of the pandemic influenza A virus A/California/07/2009(H1N1)**. ISU College of Veterinary Medicine Seed Grant – USDA Capacity Animal Health and Disease Research program. $20,000*.* (October 2022- October 2023).
50. Zhang J, Gauger P, Almeida M, Zimmerman J, Rawal G. **Evaluate the protective efficacy of commercial PRRSV MLV vaccines against the emerging PRRSV 1-4-4 L1C variant strain in weaned pigs**. Iowa Livestock Health Advisory Council. $20,000. (July 2022- June 2022)
51. Zhang J, Gauger P, Almeida M, Zimmerman J, Rawal G. **Evaluation of the protective efficacy of three PRRSV MLV vaccines against the newly emergent PRRSV 1-4-4 L1C variant strain in weaned pigs.** American Association of Swine Veterinarians Foundation. $30,000. (July 2022- June 2023).
52. Rahe M; Derscheid RJ; Pineyro P; Michael A. **Direct detection of porcine epitheliotropic viruses; astrovirus-4, porcine hemagglutinating encephalomyelitis and porcine parainfluenza, virus in clinical cases of undiagnosed respiratory disease.** Swine Health Information Center. $13,750. (Septemnber 2022- MArch 2023).
53. Pineyro P, Kroeger M. **Development of a Senecavirus A mRNA vaccine prove of concept for the development of FMD vaccine**. Iowa Livestock Health Advisory Council (ILHAC). $24,037.(July 2022- June 2023)

# 3. Peer-reviewed publications (total = 94)

## PRRSV

1. Barrera-Zarate, J., Detmer, S.E., Pasternak, J.A., Hamonic, G., MacPhee, D.J., Harding, J.C.S., 2022a. Detection of PRRSV-2 alone and co-localized with CD163 positive macrophages in porcine placental areolae. Vet Immunol Immunopathol 250, 110457.
2. Barrera-Zarate, J.A., Detmer, S.E., Pasternak, J.A., Hamonic, G., MacPhee, D.J., Harding, J.C.S., 2022b. Effect of porcine reproductive and respiratory syndrome virus 2 on angiogenesis and cell proliferation at the maternal-fetal interface. Vet Pathol 59, 940-949.
3. Chaudhari, J., Leme, R.A., Durazo-Martinez, K., Sillman, S., Workman, A.M., Vu, H.L.X., 2022a. A Single Amino Acid Substitution in Porcine Reproductive and Respiratory Syndrome Virus Glycoprotein 2 Significantly Impairs Its Infectivity in Macrophages. Viruses 14.
4. Chaudhari, J., Nguyen, T.N., Vu, H.L.X., 2022b. Identification of Cryptic Promoter Activity in cDNA Sequences Corresponding to PRRSV 5' Untranslated Region and Transcription Regulatory Sequences. Viruses 14.
5. Guidoni, P.B., Pasternak, J.A., Hamonic, G., MacPhee, D.J., Harding, J.C.S., 2022. Effect of porcine reproductive and respiratory syndrome virus 2 on tight junction gene expression at the maternal-fetal interface. Theriogenology 184, 162-170.
6. Yan X, Shang P, Yim-Im W, Sun Y, Zhang J, Firth AE, Lowe JF, **Fang Y\***. 2022. Molecular characterization of emerging variants of PRRSV in the United States: new features of the -2/-1 programmed ribosomal frameshifting signal in the nsp2 region. Virology. 573:39-49.
7. Yuan F, Sharma J, Nanjappa SG, Gaulke CA\*, **Fang Y\***. 2022. Effect of Killed PRRSV Vaccine on Gut Microbiota Diversity in Pigs. Viruses. 14(5):1081.
8. Cook G. M., K. Brown, P. Shang, Y. Li, L. Soday, A. M. Dinan, C. Tumescheit, A. P. Mockett, Y. **Fang\***, A. E. Firth\*, I. Brierley\*. 2022. Ribosome profiling of porcine reproductive and respiratory syndrome virus reveals novel features of viral gene expression. Elife, 11:e75668.
9. **Zuckermann FA**, Husmann R, Chen W, Roady P, Pfeiff J, Leistikow KR, Duersteler M, Son S, King MR, Augspurger NR. *Bacillus*-Based Direct-Fed Microbial Reduces the Pathogenic Synergy of a Coinfection with Salmonella enterica Serovar Choleraesuis and Porcine Reproductive and Respiratory Syndrome Virus. Infect Immun. 2022 Mar 7:e0057421.
10. Campler, M. R., Cheng, T., Schroeder, D. C., Yang, M., Mor, S. K., Ferreira, J. B., & Arruda, A. G. (2022). A longitudinal study on PRRSV detection in swine herds with different demographics and PRRSV management strategies. *Transboundary and Emerging Diseases*.  [doi: 10.1111/tbed.14386](http://dx.doi.org/10.1111/tbed.14386)
11. Schroeder, D. C., Odogwu, N. M., Kevill, J., Yang, M., Krishna, V. D., Kikuti, M., . . . Torremorell, M. (2021). Phylogenetically Distinct Near-Complete Genome Sequences of Porcine Reproductive and Respiratory Syndrome Virus Type 2 Variants from Four Distinct Disease Outbreaks at U.S. Swine Farms over the Past 6 Years. *Microbiology Resource Announcements, 10*(33).  [doi: 10.1128/mra.00260-21](http://dx.doi.org/10.1128/mra.00260-21)
12. Paploski, I. A., Pamornchainavakul, N., Makau, D. N., Rovira, A., Corzo, C. A., Schroeder, D. C., . . . VanderWaal, K. (2021). Phylogenetic Structure and Sequential Dominance of Sub-Lineages of PRRSV Type-2 Lineage 1 in the United States. *Vaccines, 9*(6), 608.  [doi: 10.3390/vaccines9060608](http://dx.doi.org/10.3390/vaccines9060608)
13. Pamornchainavakul N, Kikuti M, Paploski IAD, Makau DN, Rovira A, Corzo CA, et al. Measuring How Recombination Re-shapes the Evolutionary History of PRRSV-2: A Genome-Based Phylodynamic Analysis of the Emergence of a Novel PRRSV-2 Variant. Frontiers in Veterinary Science. 2022;9.
14. Ouyang H, Qiao Y, Yang M, Marabella IA, Hogan CJ, Torremorell M, Olson BA (2022). Single pass wind tunnel testing for recirculating virus aerosol control technologies. J of Aerosol Sciences, 165(2022) 106045. <https://doi.org/10.1016/j.jaerosci.2022.106045>
15. Kikuti M, Vilalta C, Sanhueza J, Melini CM, **Corzo CA**. Porcine reproductive and respiratory syndrome prevalence and processing fluids use for diagnosis in United States breeding herds. *Front Vet Sci*. Accepted for publication. 2022.
16. Kanankege KST, Graham K, **Corzo C**, VanderWaal K, Perez A, Durr P. Adapting an atmospheric dispersion model to assess the risk of windborne transmission of Porcine Reproductive and Respiratory Syndrome virus between swine farms. *Viruses*. Accepted for publication. 2022.
17. Moeller J, Mount J, Geary E, Campler MR, **Corzo CA**, Morrison RB, Arruda A. Investigation of the distance to slaughterhouses and weather parameters in the occurrence of porcine reproductive and respiratory syndrome outbreaks in U.S. swine breeding herds. *Can Vet J*. 2022. 63(5):528-534.
18. Galvis JA, **Corzo CA**, Machado G. Modeling and assessing additional transmission routes for porcine reproductive and respiratory syndrome virus: vehicle movement and feed ingredients. *Transbound. Emerg. Dis.* 2022. Doi: 10.111/tbed.14488.
19. Pamornchainavakul N, Kikuti M, Paploski IAD, Makau DN, Rovira A, **Corzo CA**, VanderWaal K. Measuring how recombination re-shapes the evolutionary history of PRRSV-2: a genome-based phylodynamic analysis of the emergence of a novel PRRSV-2 variant. *Front Vet Sci*. 2022. 9:846904. doi. 10.3389/fvets.2022.846904.
20. Kikuti M, Sanhueza J, Vilalta C, Paploski IAD, VanderWaal K, **Corzo CA**. Porcine reproductive and respiratory syndrome virus 2 (PRRSV-2) genetic diversity and occurrence of wild type and vaccine-like strains in the United States swine industry. *PLoS One*. 2021. 16(11). doi. 10.1371/journal.pone.0259531.
21. Kikuti M, Paploski IAD, Pamornchainavakul N, Picasso-Risso C, Schwartz M, Yeske P, Leuwerke B, Bruner L, Murray D, Roggow BD, Thomas P, Feldmann L, Allerson M, Hensch M, Bauman T, Sexton B, Rovira, VanderWaal K, **Corzo CA**. Emergence of a new lineage 1C variant of porcine reproductive and respiratory syndrome virus 2 in the United States. *Front Vet Sci*. 2021. 8:752938. doi. 10.3389/fvets.2021.752938.
22. Holtkamp D, Torremorell M, **Corzo CA**, Linhares DCL, Almeida MN, Yeske P, Polson DD, Becton L, Snelson H, Donovan T, Pittman J, Johnson C, Vilalta C, Silva GS, Sanhueza J. Proposed modifications to porcine reproductive and respiratory syndrome virus herds classification. *J Swine Health Prod*. 2021. 29(5):261-270.
23. Paploski IAD, Bhojwani RK, Sanhueza JM, **Corzo CA**, VanderWaal K. Forecasting viral disease outbreaks at the farm-level for commercial sow farms in the U.S. *Prev Vet Med*. 2021. 29. doi: 10.1016/j.prevetmed.2021.105449.
24. Almeida M, Zhang M, Lopez WAL, Vilalta C, Sanhueza J, **Corzo CA**, Zimmerman JJ, Linhares DCL. A comparison of three sampling approaches for detecting PRRSV in suckling piglets. *Prev Vet Med*. 2021. 194. doi: 10.1016/j.prevetmed.2021.105427.
25. Almeida M, **Corzo CA**, Zimmerman JJ, Linhares DCL. Longitudinal piglet sampling in commercial sow farms highlights the challenge of PRRSV detection. *Porcine Health Management*. 2021. 7:31. doi: 10.1186/s40813-021-00210-5.
26. Trevisan G, Linhares LCM, Schwartz KJ, Burrough ER, Magalhaes ES, Crim B, Dubey P, Main RG, Gauger P, Thurn M, Lages PTF, **Corzo CA**, Torrison J, Henningson J, Herrman E, McGaughey R, Cino G, Greseth J, Clement T, Christopher-Hennings J, Linhares DCL. Data standardization implementation and applications within and among diagnostic laboratories: integrating and monitoring enteric coronaviruses. *J Vet Diagn Invest*. 2021. Doi: 10.1177/10406387211002163.jvdi.sagepub.com
27. Galvis JA, Prada JM, **Corzo CA**, Machado G. Modeling the transmission and vaccination strategy for porcine reproductive and respiratory syndrome virus. *Transbound. Emerg. Dis.* 2021. Doi: 10.111/tbed.14007.
28. Fleming, D.S., Miller, L.C., Li, J., Lager, K.M., Van Geelen, A., Sang, Y. 2022. Transcriptomic analysis of liver indicates novel vaccine to porcine reproductive and respiratory virus promotes homeostasis in T-Cell and inflammatory immune responses compared to commercial vaccine in pigs. Frontiers in Veterinary Science. 9. Article 791034. <https://doi.org/10.3389/fvets.2022.791034>.
29. Cheng, T.Y., Campler, M.R., Schroeder, D.C., Yang, M., Mor, S.K., Ferreira, J.B., Arruda, A.G., 2022. Detection of Multiple Lineages of PRRSV in Breeding and Growing Swine Farms. Front Vet Sci 9, 884733.
30. Moeller, J., Mount, J., Geary, E., Campler, M.R., Corzo, C.A., Morrison, R.B., Arruda, A.G., 2022. Investigation of the distance to slaughterhouses and weather parameters in the occurrence of porcine reproductive and respiratory syndrome outbreaks in U.S. swine breeding herds. Can Vet J 63, 528-534.
31. Guidoni, P.B., Pasternak, J.A., Hamonic, G., MacPhee, D.J., Harding, J.C.S., 2022. Effect of porcine reproductive and respiratory syndrome virus 2 on tight junction gene expression at the maternal-fetal interface. Theriogenology 184, 162-170.
32. Ison, E.K., Hopf-Jannasch, A.S., Harding, J.C.S., Alex Pasternak, J., 2022. Effects of porcine reproductive and respiratory syndrome virus (PRRSV) on thyroid hormone metabolism in the late gestation fetus. Veterinary research 53, 74.
33. Katwal, P., Aftab, S., Nelson, E., Hildreth, M., Li, S., Wang, X., 2022. Role of zinc metalloprotease (ZMPSTE24) in porcine reproductive and respiratory syndrome virus (PRRSV) replication in vitro. Archives of virology 167, 2281-2286.
34. Cui X, Xia D, Huang X, Sun Y, Shi M, Zhang J, Li G, Yang Y, Wang H, Cai X, An T. 2022. Recombinant characteristics based on 949 PRRSV-2 genomic sequences in 1991-2021 revealed viral multiplication ability contribute to the dominant recombination. *Microbiology Spectrum*. Sep 8: e02934-22.
35. Yim-im W, Huang H, Zheng Y, Li G, Rawal G, Gauger P, Krueger K, Main R, Zhang J. 2022. Characterization of PRRSV in clinical samples and the corresponding cell culture isolates. *Transboundary and Emerging Diseases*. 69: e3045-e3059.
36. Trevisan G, Zeller M, Li G, Zhang J, Gauger P, Linhares D. 2022. Implementing a user-friendly format to analyze PRRSV next-generation sequencing results and associating breeding herd production performance with a number of PRRSV strains and recombination events. *Transboundary and Emerging Diseases*. 69: e2214-e2229.
37. López W, Zimmerman J, Gauger P, Harmon K, Magtoto R, Bradner L, Holtkamp D, Zhang M, Zhang J, Ramirez A, Linhares D, Giménez-Lirola L. 2022. Considerations in the use of processing fluids for the detection of PRRSV RNA and antibody. *Journal of Veterinary Diagnostic Investigation*. 34(5): 859-863.
38. Yuan X, Shang P, Yim-im W, Sun Y, Zhang J, Firth A, Lowe J, Fang Y. 2022. Molecular characterization of emerging variants of PRRSV in the United States: new features of the -2/-1 programmed ribosomal frameshifting signal in the nsp2 region. *Virology*. 573: 39-49.
39. Li P, Koziel JA, Zimmerman JJ, Zhang J, Cheng TY, Yim-im W, Jenks WS, Lee M, Chen B, Hoff SJ. 2022. Correction: Li, et al., Mitigation of airborne PRRSV transmission with UV light treatment: proof-of-concept. Agriculture 2021, 11, 259. *Agriculture*. 12(5): 680.
40. Rawal G, Yim-im W, Chamba F, Smith C, Okones J, Francisco C, Zhang J. 2022. Development and validation of a reverse transcription real-time PCR assay for specific detection of PRRSGardvaccine-like virus. *Transboundary and Emerging Diseases*. 69: 1212-1226.
41. Rupasinghe R, Lee K, Liu X, Gauger PC, Zhang J, Martínez-López B. (2022). Molecular evolution of porcine reproductive and 1 respiratory syndrome virus field strains from 2 two swine production systems in the midwestern United States from 2001 to 2020. *Microbiology* *Spectrum*. 10(3): e0263421.

## African Swine Fever Virus

1. Shurson, G. C., Palowski, A., Ligt, J. L., Schroeder, D. C., Balestreri, C., Urriola, P. E., & Sampedro, F. (2022). New perspectives for evaluating relative risks of African swine fever virus contamination in global feed ingredient supply chains. *Transboundary and Emerging Diseases, 69*(1), 31-56.  [doi: 10.1111/tbed.14174](http://dx.doi.org/10.1111/tbed.14174)
2. Shurson, G.C., Urriola, P.E., & van de Ligt, J.L.G. 2021. Can we effectively manage parasites, prions, and pathogens in the global feed industry to achieve One Health? *Transboundary and Emerging Diseases 69*(1), 4-30. DOI: [10.1111/tbed.14205](https://doi.org/10.1111/tbed.14205)
3. Schambow, R., Sampedro, F., Urriola, P.E., van de Ligt, J.L.G., Perez, A., & Shurson, G.C. 2021. Rethinking the uncertainty of African swine fever virus contamination in feed ingredients and risk of introduction into the United States. *Transboundary and Emerging Diseases* *69*(1),157-175. <https://doi.org/10.1111/tbed.14358>
4. Dee, N., Havas, K., Shah, A., Singrey, A., Spronk, G., Niederwerder, M., Nelson, E., Dee, S., 2022a. Evaluating the effect of temperature on viral survival in plant-based feed during storage. Transbound Emerg Dis 69, e2105-e2110.
5. Dee, S., Shah, A., Jones, C., Singrey, A., Hanson, D., Edler, R., Spronk, G., Niederwerder, M., Nelson, E., 2022b. Evidence of viral survival in representative volumes of feed and feed ingredients during long-distance commercial transport across the continental United States. Transbound Emerg Dis 69, 149-156.
6. Luong, H.Q., Lai, H.T., Do, L.D., Ha, B.X., Nguyen, G.V., Vu, H.L., 2022. Differential antibody responses in sows and finishing pigs naturally infected with African swine fever virus under field conditions. Virus research 307, 198621.
7. Havas K, Gogin AE, Basalaeva JV, Sindryakova IP, Kolbasova OL, Titov IA, Lyska VM, Morgunov SY, Vlasov ME, Sevskikh TA, Pivova EY, Kudrjashov DA, Zimmerman S, Witbeck W, Giménez-Lirola LG, Nerem J, Spronk GD, Zimmerman JJ, Sereda AD. (2022). An Assessment of Diagnostic Assays and Sample Types in the Detection of an Attenuated Genotype 5 African Swine Fever Virus in European Pigs over a 3-Month Period. Pathogens. 2022 Mar 26;11(4):404. doi: 10.3390/pathogens11040404.

## Influenza

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