

GAURAV RAWAL, BVSc &AH, MS, PhD)

Assistant Professor (Virology)

College of Veterinary Medicine, Arkansas State University

Work Email: grawal@astate.edu

1. Education
2. Description of current role
3. Skills
4. Expertise in teaching DVM curriculum
5. Professional Experience
6. Professional Membership
7. Awards & Scholarships (n=16)
8. Peer-reviewed articles (n=24)
9. Peer-reviewed articles under preparation/under submission (n=6)
10. MS Thesis
11. PhD Thesis
12. Digital Repositories (n=3)
13. Invited talk (n=3)
14. Media coverage (n=7)
15. Proceeding papers (n=39)
16. Magazine articles (n=4)
17. Oral presentations (n=10)
18. Poster presentations (n=13)
19. Leadership
20. License and Certifications
21. Grants
 - 21.1 Grants funded (7)
 - 21.2 Grants submitted, not funded (4)
22. Industry Projects (Selected-19)

1. Education

➤ **2019-2023**

PhD, Population Sciences in Animal Health, Iowa State University, Ames, USA

➤ **2017-2019**

Master of Science, Veterinary Preventive Medicine, Iowa State University, Ames, USA

➤ **2009-2014**

BVSc & AH, Bachelor of Veterinary Science and Animal Husbandry, Tribhuvan University, Nepal

2. Description of current role

Dr. Gaurav Rawal joins the College of Veterinary Medicine as Assistant Professor of Virology. His research focuses on veterinary virology, infectious disease epidemiology, and translational approaches to preventing and controlling viral diseases in livestock and poultry. His work explores viral pathogenesis, host-pathogen interactions, vaccine efficacy, and disease surveillance to develop practical solutions for improving animal health.

Dr. Rawal earned his Bachelor of Veterinary Science and Animal Husbandry (BVSc & AH) degree in Nepal and completed his MS and PhD at Iowa State University. Prior to joining Arkansas State University, he gained extensive industry experience in veterinary clinical research, leading and managing vaccine, pharmaceutical, and biologic studies across multiple livestock species. His expertise includes clinical trials, regulatory research, diagnostics, and collaborative research programs with animal health partners.

At Arkansas State University, Dr. Rawal teaches veterinary virology and epidemiology, mentors DVM and graduate students, and develops research programs focused on advancing animal health, disease prevention, and sustainable livestock production.

3. Skills

➤ **Laboratory skills**

Cell culture, Cell line maintenance, Sample extraction and processing, Virus Isolation, Virus Titration, Virus propagation and production, Virus Neutralization assay, Quantitative Real-time-PCR, Gel-based PCR, Sequencing, Quant Studio 5 RT-PCR, Fluorescence microscopy, FA staining, Hemagglutination test, ELISA, Cytokine measurement, LUMINEX platform, Flow Cytometry, ELISPOT, Bacterial culture, and others.

➤ **Clinical Skills**

Conducting field study, ABSL2+ challenge/animal studies, and feed studies including resource management, sample collection, feeding, caretaking animals, animal examination, necropsy, euthanasia, and post-mortem skills, farm visits, herd evaluation, and others.

➤ **Statistical Skills**

SAS, R

➤ **Software Skills**

DNASTAR, MEGA, BioEdit, Primer Express, GraphPad Prism

➤ **Computer Skills**

➤ MS Word, MS Excel, PowerPoint, Tableau

➤ **Technical Writing**

Writing peer review papers, systematic and scoping reviews, articles, proceedings/conference papers, posters, presentations, proposal writing, report writing, literature search, investigator reports, and scientific reports.

➤ **Teaching/Training**

Preparation of training materials, Client consultation, Clinical presentations

➤ **Language Proficiency**

English, Nepali

4. Expertise in teaching DVM curriculum

- As a DVM and PhD (Virology), I can teach DVM virology courses. Further, I can contribute to the Epidemiology course, including herd disease surveillance and molecular biology courses/rotations
- Guest Lecturer for VET640-Agents of Disease II: Infections of the Hematopoietic System of Porcine & Equine on 16 Sep 24 for South Dakota State University (SDSU) Second-year DVM students. Duration of lecture: 110 minutes.
- Guest Lecturer for VET640-Agents of Disease II: Infections of the Hematopoietic System of Bovine, Feline & Canine on 17 Sep 24 for South Dakota State University (SDSU) Second year DVM students. Duration of lecture: 50 minutes.
- Guest Lecturer for VET640-Agents of Disease II: Viral Infections of the Respiratory System, Pigs & Small Ruminants on 05NOV24 for South Dakota State University (SDSU) Second-year DVM students. Duration of lecture: 50 minutes.
- Guest Lecturer for VET640-Agents of Disease II: Viral Infections of the Respiratory Tract: Feline & Canine on 06NOV24 for South Dakota State University (SDSU) Second-year DVM students. Duration of lecture: 110 minutes.

5. Professional Experience

Timeline	Details
2026 July- Present	Assistant Professor (Virology) CVM A-State
2026 June-Present	Consultant/Remote PI Clinvet SD
2025-Present	American Association of Swine Veterinarians (AASV) Pharmaceutical and Biological Committee Member.
2024-Present	Reviewer at Frontiers in Veterinary Science
2023-2026	Principal Investigator at Clinvet SD
2021-Present	Reviewer at BMC and TBED
2020-2023	Virology lab manager (Dr. Opriessnig's lab)
2019-2023	Graduate Assistant Research (PhD), Iowa State University (Dr. JQ Zhang Lab)
2021	American Association of Veterinary Laboratory Diagnosticians (AAVLD) Virology Committee Member
2020-Present	Reviewer at Journal of Swine Health and Production (JSHAP)
2020-Present	Editorial Board Member, EC Microbiology peer-reviewed journal
2017-2019	Graduate Assistant Research (MS), Iowa State University (Dr. Bailey Arruda & Dr. Daniel Linhares group)
2019-Present	Editorial Board Member, Acta Scientific Microbiology peer-reviewed journal
2015-2016	Technical officer at Dolphin Modern Feed Industry, Kailali, Nepal
2014-2015	Veterinary Medical Officer at Daonne Feeds Pvt. Ltd., Bhairahawa, Nepal

6. Professional Membership

- American Association of Veterinary Laboratory Diagnosticians (AAVLD) (2020-present)
- American Association of Swine Veterinarians (AASV) (2017-present)
- Conference of Research Workers in Animal Diseases (CRWAD) (2020-present)
- Toastmasters International, District 19, Ames, Iowa (2017-2019)

7. Awards & Scholarships

- Recipient of 2023 AAVLD Trainee Award. Received \$1750 as part of the Trainee Award.
- Recipient of 2023 Research Excellence Award. Issued by Iowa State University.
- Recipient of 2023 Professional Advancement Grant (PAG) travel award.

- Recipient of 2023 Roy Schultz Travel Award. Issued by the Department of Veterinary Diagnostic and Production Animal Medicine at Iowa State University.
- Recipient of 2022 Roy Schultz Graduate Student Scholarship Award-First Position. Issued by the Department of Veterinary Diagnostic and Production Animal Medicine at Iowa State University in December 2022.
- Recipient of 2022 NAPRRS/NC229 ICSVD Travel Fellowship Award. Issued by Elanco Animal Health in September 2022.
- Recipient of 2022 AAVLD Trainee Award. Received \$1750 as part of the Trainee Award.
- Recipient of 2021 recipient of the Lora and Russ Talbot Graduate Fellowship in Veterinary Medicine. Awarded by ISU on CVM Research Day in August 2021.
- Recipient of 2020 J Lindsay Oaks Best Student Molecular Biology Award (sponsored by BioMérieux) at the American Association of Veterinary Laboratory Diagnosticians (AAVLD) conference.
- Recipient of 2020 People's Choice Winner for the AAVLD/USAHA Photo Contest Animal Agriculture.
- Recipient of 2020 AAVLD Trainee Award. Received \$500 as part of the Trainee Award.
- Recipient of 2019 CVM Graduate Student Travel Award of \$500 for oral and poster presentations in AASV 2019 Annual Meeting (Orlando; March 9-12, 2019).
- Recipient of 2018 Travel Award from the Office of Research and Graduate Studies (\$250) in the CVM Faculty Research Symposium on January 5th, 2018.
- Recipient of the 2017 CVM Graduate Student Travel Award of \$500 for poster presentation at the AASV 2018 Annual Meeting.
- Recipient of 2017 professional development grants (PAG) from Graduate and Professional Student Senate, of \$200 for poster presentation in the AASV 2018 Annual Meeting.
- Merit list Scholarship given to outstanding students of IAAS, Rampur, BVSc& AH study (2009-2013).

8. Peer review articles

1. Armenta-Leyva B, **Rawal G**, Zhang J, Munguía-Ramírez B, Tarasiuk G, Zhang D, Rauh R, Yoon K-J, Giménez-Lirola LG, Zimmerman JJ. Full Factorial Comparison of the Diagnostic Performance of Three Nucleic Acid Extraction Kits and Three PRRSV RT-qPCR Assays

- Using Swine Oral Fluids of Known Status. *Microorganisms*. 2026; 14(2):282. <https://doi.org/10.3390/microorganisms14020282>.
2. Qinming Zhang, **Gaurav Rawal**, Jingjing Qian, Shengpu Zou, Jesse Gillingham, Jianqiang Zhang, Liang Dong, and Meng Lu. Hybrid Metasurface for On-Chip Enrichment and Quantification of Biological Samples. *ACS Applied Materials & Interfaces* 2025 17 (15), 22464-22473. DOI: 10.1021/acsami.5c02409
 3. Opriessnig T, Halbur P, Bayne J, **Rawal G**, Tong H, Mou K, Li G, Zhang D, Zhang J, Muwonge A. Exploratory application of a cannulation model in recently weaned pigs to monitor longitudinal changes in the enteric microbiome across varied porcine reproductive and respiratory syndrome virus (PRRSV) infection statuses. *Front Vet Sci*. 2024 Jul 19;11:1422012.10.3389/fvets.2024.1422012. PMID: 39100768; PMCID: PMC11294941.
 4. Qinming Zhang, **Gaurav Rawal**, Jingjing Qian, Jianqiang Zhang, Liang Dong, and Meng Lu "3D-printed nanoplasmonic device with super-hydrophobic sample concentrator for biosensing", *Proc. SPIE 12861, Frontiers in Biological Detection: From Nanosensors to Systems XVI*, 128610D (13 March 2024); <https://doi.org/10.1117/12.3000427>
 5. Opriessnig T, Gauger PC, Filippesen Favaro P, **Rawal G**, Magstadt DR, Digard P, Lee HM, Halbur PG. An experimental universal swine influenza a virus (IAV) vaccine candidate based on the M2 ectodomain (M2e) peptide does not provide protection against H1N1 IAV challenge in pigs. *Vaccine*. 2024 Jan 12;42(2):220-228. doi: 10.1016/j.vaccine.2023.12.012. Epub 2023 Dec 11. PMID: 38087714.
 6. **Rawal G**, Krueger KM, Yim-Im W, Li G, Gauger PC, Almeida MN, Aljets EK, Zhang J. Development, Evaluation, and Clinical Application of PRRSV-2 Vaccine-like Real-Time RT-PCR Assays. *Viruses*. 2023 Nov 10;15(11):2240. doi: 10.3390/v15112240. PMID: 38005917; PMCID: PMC10675446.
 7. **Rawal G**, Almeida MN, Gauger PC, Zimmerman JJ, Ye F, Rademacher CJ, Armenta Leyva B, Munguia-Ramirez B, Tarasiuk G, Schumacher LL, Aljets EK, Thomas JT, Zhu JH, Trexel JB, Zhang J. In Vivo and In Vitro Characterization of the Recently Emergent PRRSV 1-4-4 L1C Variant (L1C.5) in Comparison with Other PRRSV-2 Lineage 1 Isolates. *Viruses*. 2023 Nov 9;15(11):2233. doi: 10.3390/v15112233. PMID: 38005910; PMCID: PMC10674456.
 8. **Rawal, Gaurav**, Wannarat Yim-im, Ethan Aljets, Patrick G. Halbur, Jianqiang Zhang, and Tanja Opriessnig. 2023. "Porcine Respiratory Coronavirus (PRCV): Isolation and Characterization of a Variant PRCV from USA Pigs" *Pathogens* 12, no. 9: 1097. <https://doi.org/10.3390/pathogens12091097>.
 9. **Rawal, Gaurav**, Jianqiang Zhang, Patrick G. Halbur, Phillip C. Gauger, Chong Wang, and Tanja Opriessnig. 2023. "Experimental Infection of Pigs with a Traditional or a Variant Porcine Respiratory Coronavirus (PRCV) Strain and Impact on Subsequent Influenza A Infection" *Pathogens* 12, no. 8: 1031. <https://doi.org/10.3390/pathogens12081031>

10. Raufur Rahman Khan, Hussam Ibrahim, **Gaurav Rawal**, Jianqiang Zhang, Meng Lu, Liang Dong. Multichannel microfluidic virus sensor for rapid detection of respiratory viruses using virus-imprinted polymer for digital livestock farming. *Sensors and Actuators B: Chemical*, 2023, 133920, ISSN 0925-4005, <https://doi.org/10.1016/j.snb.2023.133920>.
11. Munguía-Ramírez B, Armenta-Leyva B, Henao-Díaz A, Cheng TY, Zhang J, **Rawal G**, Ye F, Giménez-Lirola L, Zimmerman JJ. Effect of extrinsic factors on the detection of PRRSV and a porcine-specific internal sample control in serum, oral fluid, and fecal specimens tested by RT-rtPCR. *J Vet Diagn Invest*. 2023 May 11:10406387231174556. doi: 10.1177/10406387231174556.
12. Zhang, Qinming; **Rawal, Gaurav**; Qian, Jingjing; Ibrahim, Hussam; Zhang, Jianqiang; Dong, Liang; Lu, Meng. Integrated Magneto-Opto-Fluidic Biosensor for Rapid On-chip Assay of Respiratory Viruses of Livestock. *Lab Chip*. 2022 Jul 25. doi:[10.1039/d2lc00406b](https://doi.org/10.1039/d2lc00406b)
13. Deepak Subedi, Parshuram Phuyal, Suman Bhandari, Milan Kandel, **Gaurav Rawal**, Surendra Karki, Santosh Dhakal. Risk Factors Associated with Avian Influenza Subtype H9 Outbreaks in Poultry Farms of Central Lowland Nepal. *Infect. Dis. Rep.* 2022, 14, 525–536. <https://doi.org/10.3390/idr14040056>
14. Wannarat Yim-im, Haiyan Huang, Ying Zheng, Ganwu Li, **Gaurav Rawal**, Phillip Gauger, Karen Krueger, Rodger Main, Jianqiang Zhang. Characterization of PRRSV in clinical samples and the corresponding cell culture isolates. *Transbound. Emerg. Dis.* 15July, 2022. <https://doi.org/10.1111/tbed.14661>
15. Zhu, Jin-Hui, **Gaurav Rawal**, Ethan Aljets, Wannarat Yim-Im, Yong-Le Yang, Yao-Wei Huang, Karen Krueger, Phillip Gauger, Rodger Main, and Jianqiang Zhang. 2022. "Development and Clinical Applications of a 5-Plex Real-Time RT-PCR for Swine Enteric Coronaviruses" *Viruses* 14, no. 7: 1536. <https://doi.org/10.3390/v14071536>
16. **Rawal G**, Angulo J, Linhares DCL, Mah CK, Van Vlaenderen I, Poulsen Nautrup B. The efficacy of a modified live virus vaccine Foster® PRRS against heterologous strains of porcine reproductive and respiratory syndrome virus: A meta-analysis. *Res Vet Sci*. 2022 Dec 5;150:170-178. doi: 10.1016/j.rvsc.2022.06.026. Epub 2022 Jul 2. PMID: 35842948.
17. Opriessnig T, **Rawal G**, McKeen L, Filippsen Favaro P, Halbur PG, Gauger PC. Evaluation of the intranasal route for porcine reproductive and respiratory disease modified-live virus vaccination. *Vaccine*. 2021 Nov 16;39(47):6852-6859. <https://doi.org/10.1016/j.vaccine.2021.10.033>
18. **Rawal G***, Linhares DCL. Scoping review on the epidemiology, diagnostics and clinical significance of porcine astroviruses. *Transbound Emerg Dis*. 2022 May;69(3):974-985. doi: 10.1111/tbed.14123. Epub 2021 May 12. PMID: 33900029.
19. **Rawal G**, Yim-Im W, Chamba F, Smith C, Okones J, Francisco C, Zhang J. Development and validation of a reverse transcription real-time PCR assay for specific detection of

PRRSgard vaccine-like virus. *Transbound Emerg Dis*. 2022 May;69(3):1212-1226. doi: 10.1111/tbed.14084. Epub 2021 Apr 27. PMID: 33763963.

20. **Rawal G**, Ferreyra FM, Macedo NR, Bradner LK, Harmon KM, Allison G, Linhares DCL, Arruda BL. Ecology of Porcine Astrovirus Type 3 in a Herd with Associated Neurologic Disease. *Viruses*. 2020 Sep 7;12(9):992. doi: 10.3390/v12090992. PMID: 32906600; PMCID: PMC7552043.
21. **Rawal G**, Matias Ferreyra F, R Macedo N, K Bradner L, M Harmon K, Mueller A, Allison G, C L Linhares D, L Arruda B. Detection and Cellular Tropism of Porcine Astrovirus Type 3 on Breeding Farms. *Viruses*. 2019 Nov 12;11(11):1051. doi: 10.3390/v11111051. PMID: 31718108; PMCID: PMC6893673.
22. **Rawal, G., & Shrestha, D.** (2019). Sero-Detection of *Leptospira hardjo* in Cattle of Bhaktapur District of Nepal. *International Journal of Applied Sciences and Biotechnology*, 7(3), 378-381. <https://doi.org/10.3126/ijasbt.v7i3.25713>
23. **Rawal G**, Arruda P, Rademacher C, et al. General overview of the detection of *Mycoplasma hyopneumoniae* DNA by quantitative polymerase chain reaction in diagnostic cases submitted to the Iowa State University Veterinary Diagnostic Laboratory from 2004 to 2016. *J Swine Health Prod*. 2018;26(6):309-315.
24. Shrestha, D., Thapa, B., **Rawal, G.**, Dhakal, S., & Sharma, B. (2015). Prevalence of Demodectic Mange in Canines of Kathmandu Valley having Skin Disorder and Its Associated Risk Factors. *International Journal of Applied Sciences and Biotechnology*, 3(3), 459-463. <https://doi.org/10.3126/ijasbt.v3i3.13218>

9. Peer review paper under preparation or submission:

1. **Gaurav Rawal**, Marcelo Almeida, Phillip Gauger, Fangshu Ye, Chris Rademacher, Ethan Aljets, Loni Schumacher, Benjamin Hollis, Derald Holtkamp, Joseph Thomas, Mallory Wilhelm, Sydney Brosnahan, Julie Fisher, Jinhui Zhu, Alyona Michael, Patrick Halbur, Jianqiang Zhang. Comparative evaluation of six commercial PRRS-2 modified-live virus vaccines against the virulent 1-4-4 L1C variant (L1C.5) strain challenge in weaned pigs. Targeted Journal: Vaccine.
2. **G. Rawal**, N. Craig, P.G. Halbur, G. Li, T. Opriessnig. Comparison of sequencing techniques for finding novel coronaviruses in pig fecal samples. Targeted Journal: Transboundary and Emerging Diseases.
3. **Gaurav Rawal**, Franco Matias Ferreyra, William Hedberg, Lauren McKeen, Nubia R Macedo, Karen M Harmon, Daniel C L Linhares, Bailey L Arruda. Comparison of the infection dynamics of porcine astrovirus type 3 on a breeding farm with or without a history of neurologic disease. Targeted Journal: Viruses MDPI.

4. L. Liu, **G. Rawal**, Q. Chen, P. Gauger, J. Zhang. Validate the effects of a lipid based anti-microbial product on mitigating PEDV and PRRSV in feed samples using both in-vitro and in-vivo studies. Targeted Journal: Transboundary and Emerging Diseases.
5. Tanja Opriessnig, Patrick G. Halbur, **Gaurav Rawal** and others. Genetic characterization of the immunological regions of 600 recent and archived *Erysipelothrix* spp. strains to identify cross-protective targets for improved classification of isolates and more informed vaccination decisions. Targeted Journal: Vaccine.

10. MS Thesis

Rawal, Gaurav, "Epidemiologic characteristics of porcine astrovirus type 3" (2019). *Graduate Theses and Dissertations*. 17548. <https://lib.dr.iastate.edu/etd/17548>

11. PhD Thesis

Rawal, Gaurav. "Characterization of virulence of the emergent PRRSV 1-4-4 L1C variant strain and evaluation of protective efficacy of PRRSV modified live virus vaccines with the aid of the developed vaccine-specific and challenge virus-specific PCR assays." (2023).

12. Digital Repositories

- Rawal, Gaurav; Linhares, Daniel; Arruda, Bailey; and O'Connor, Annette, "A scoping review on the epidemiology, diagnostics, and clinical significance of porcine astroviruses" (2019). *Veterinary Diagnostic and Production Animal Medicine Reports*. 22. https://lib.dr.iastate.edu/vdpam_reports/22
- Rawal, Gaurav; Angulo, Jose; Linhares, Daniel C. L.; and O'Connor, Annette M., "Systematic review and meta-analysis on efficacy of Foster PRRSV Modified Live Virus vaccine studies in growing pigs" (2018). *Veterinary Diagnostic and Production Animal Medicine Reports*. 9. https://lib.dr.iastate.edu/vdpam_reports/9
- Rawal, Gaurav; Rademacher, Christopher; and Linhares, Daniel, "Comparison of productivity losses between swine breeding herds adopting killed or attenuated PRRS virus vaccination protocols following PRRS outbreaks" (2020). *Veterinary Diagnostic and Production Animal Medicine Publications*. 175. https://lib.dr.iastate.edu/vdpam_pubs/175

13. Invited Talk

- Speaker at Animal Sciences Graduate Student Association (ASGSA) Career Webinar, hosted by ASGSA at the University of Maryland, on Monday, July 21, 2025 (1–2 PM EST).
- Development, evaluation, and clinical application of PRRSV-2 vaccine-specific real-time RT-PCR assays. 2023, June 28. ISU James D. McKean swine disease conference, Ames, IA.

- Invited talk at Veterinary Advisory Council of Phibro Animal Health Corporation on March 2, 2018, on MJPRRS vaccine technology – Comparison against the standard measurements.

14. Media Coverage

- Munguía-Ramírez B, Armenta-Leyva B, Henao-Díaz A, Cheng TY, Zhang J, **Rawal G**, Ye F, Giménez-Lirola L, Zimmerman JJ. Should we be concerned about the effect of sample handling on PRRSV detection by RT-qPCR? Swine Health Monitoring project (SHMP) June 9, 2023, Report.
- W. Yim-im, H. Huang, Y. Zheng, G. Li, G. Rawal, P. Gauger, K. Krueger, R. Main, JQ Zhang*. Is the PRRSV isolate obtained in cell culture the same as the virus present in the original clinical sample? Swine Health Monitoring Project (SHMP) July 29, 2022, Report.
- Gaurav Rawal, Marcelo Almeida, Phillip Gauger, Jeffrey Zimmerman, Jianqiang Zhang. Experimental pig study confirms the high virulence of the recently emerged PRRSV 1-4-4 L1C variant strain.
<https://umnswinenews.com/2022/03/18/experimental-pig-study-confirms-the-high-virulence-of-the-recently-emerged-prrsv-1-4-4-l1c-variant-strain/>
- Gaurav Rawal, Marcelo Almeida, Phillip Gauger, Jeffrey Zimmerman, Jianqiang Zhang. The recently emerged PRRSV 1-4-4 L1C variant strain is highly virulent based on the experimental pig study. Swine Disease Reporting System Report # 49 (March 1, 2022).
<https://www.swinehealth.org/wp-content/uploads/2022/03/SDRS-report-49.pdf>
- Media report about participation in the Iowa Pork Congress Research Poster Contest on March 15, 2022. Pork Producer. Page 14.
<https://mydigimag.rrd.com/publication/?m=53278&i=740922&p=14&ver=html5>
- Received 2020 J Lindsay Oaks Best Student Molecular Biology Award (sponsored by BioMérieux)
<https://www.avma.org/javma-news/2021-04-15/american-association-veterinary-laboratory-diagnosticians>
- Interview on Research of viral infections in swine to answer veterinary questions. Published in Iowa State Daily on Oct-2-2019.
<https://www.iowastatedaily.com/news/iowa-state-university-bailey-arruda-assistant-professor-veterinary-diagnostic-and-production-animal-medicine-department-viral-infections-swine-pigs-college-of-veterinary-medicine-veterinary-pathology-diagnostic-pathologist-diagnosis-disease-surgeon->

gaurav-rawal-franco-matias-ferreyra-paulo-arruda-vet-med-research-team/article_3fa25676-e558-11e9-b1b6-63e038ae6a0e.html

15. Proceeding Papers

1. B Armenta-Leyva, **G Rawal**, J Zhang, B Munguía-Ramírez, D Zhang, G Tarasiuk, R Rauh, KJ Yoon, R Main, LG Giménez-Lirola, J Zimmerman. The diagnostic performance of commercial PRRSV RT-qPCR assays using oral fluid samples of known status. IPVS 2026-Topic 1: Virology and Viral Diseases.
2. Hao Tong, **Gaurav Rawal**, Marcelo Almeida, Phillip Gauger, Ethan Aljets, Jianqiang Zhang. Comparative analysis of PRRSV shedding patterns in weaned pigs vaccinated with six MLV strains: A multi-sample assessment under experimental conditions. AAVLD 2025.
3. B Armenta-Leyva, **G Rawal**, J Zhang, B Munguía-Ramírez, D Zhang, G Tarasiuk, R Rauh, KJ Yoon, R Main, LG Giménez-Lirola, J Zimmerman. Comparison of the diagnostic performance of commercial PRRSV RT-qPCR assays using oral fluid samples of known status. AAVLD 2025.
4. **Gaurav Rawal**, Karen Krueger, Wannarat Yim-im, Ganwu Li, Phillip Gauger, Marcelo Almeida, Ethan Aljets, Jianqiang Zhang. Development, evaluation, and clinical application of PRRSV-2 vaccine-like real-time RT-PCR assays. 2024 IPVS meeting, Leipzig, Germany, Jun 4-7, 2024.
5. **Gaurav Rawal**, Marcelo Almeida, Phillip Gauger, Fangshu Ye, Chris Rademacher, Ethan Aljets, Loni Schumacher, Derald Holtkamp, Alyona Michael, Patrick Halbur, Jianqiang Zhang. Evaluation of protective efficacy of six commercial PRRSV-2 MLV vaccines against the emergent PRRSV 1-4-4 L1C variant strain in weaned pigs. 2023 NAPRRS/NC229 ICSVD Page 95.
6. **Gaurav Rawal**¹, Marcelo Almeida¹, Phillip Gauger¹, Fangshu Ye², Chris Rademacher¹, Ethan Aljets¹, Loni Schumacher¹, Benjamin Hollis¹, Derald Holtkamp¹, Joseph Thomas¹, Mallory Wilhelm¹, Sydney Brosnahan¹, Julie Fisher¹, Jinhui Zhu¹, Alyona Michael¹, Patrick Halbur¹, Jianqiang Zhang. Comparative evaluation of protective efficacy of six commercial PRRSV-2 MLV vaccines against the emergent PRRSV 1-4-4 L1C variant strain in weaned pigs. 2023, June 27-28. ISU James D. McKean swine disease conference.
7. **Gaurav Rawal**¹, Karen Krueger¹, Phillip Gauger¹, Ganwu Li¹, Jianqiang Zhang¹. Development, evaluation, and clinical application of PRRSV-2 vaccine-specific real-time RT-PCR assays. 2023, June 27-28. ISU James D. McKean swine disease conference.
8. Loni. Schumacher¹, Qi Chen¹, Holly Salzbrenner¹, Phillip Gauger¹, Jinhui Zhu¹, Wannarat Yim-im¹, Mallory Wilhelm¹, Ethan Aljets¹, **Gaurav Rawal**¹, Joseph Thomas¹, Michael Welch¹, Drew Magstadt¹, Jianqiang Zhang¹. A cell culture adapted PEDV non-S INDEL

strain is attenuated and protects against wild type PEDV challenge in piglets: Promising vaccine candidate? 2023, June 27-28. ISU James D. McKean swine disease conference.

9. **Gaurav Rawal**, Marcelo Almeida, Phillip Gauger, Jeffrey Zimmerman, Fangshu Ye, Chris Rademacher, Jianqiang Zhang. Virulence comparison of PRRSV 1-4-4 L1C variant strain and other PRRSV strains in experimentally inoculated pigs. 54th AASV Annual Meeting March 4-7, 2023. <https://doi.org/10.54846/am2023/130>
10. Loni Schumacher, Qi Chen, Holly Salzbrenner, Phillip Gauger, Jinhui Zhu, Wannarat Yim-im, Mallory Wilhelm, Ethan Aljets, **Gaurav Rawal**, Joseph Thomas, Michael Welch, Drew Magstadt, Jianqiang Zhang. Attenuation phenotypes and protective efficacy of cell culture adapted PEDV non-S INDEL strain. 54th AASV Annual Meeting March 4-7, 2023.
11. **G. Rawal**^{1*}, J. Zhang¹, P.G. Halbur¹, G. Li¹, P.C. Gauger¹, T. Opriessnig^{1,2}. Experimental pig study comparing contemporary and historical porcine respiratory coronavirus isolates in pigs with and without subsequent influenza A virus infection. 2023 Conference of Research Workers in Animal Diseases (CRWAD). Jan 20-24, 2023.
12. **G. Rawal**^{1*}, M. Almeida¹, P. Gauger¹, J. Zimmerman¹, F. Ye², C. Rademacher¹, B. Armenta-Leyva¹, B. Munguia-Ramirez¹, G. Tarasiuk¹, L. Schumacher¹, E. Aljets¹, J. Thomas¹, J. Zhu¹, W. Yim-im¹, J. Frenier¹, J. Zhang¹. Experimental pig study comparing pathogenicity of PRRSV 1-4-4 L1C variant with other Lineage 1 strains. 2022 NAPRRS/NC229: International Conference of Swine Viral Diseases. Dec 2-4, 2022.
13. **G. Rawal**^{1*}, J. Zhang¹, P.G. Halbur¹, G. Li¹, P.C. Gauger¹, T. Opriessnig^{1,2}. Experimental pig study comparing contemporary and historical porcine respiratory coronavirus isolates in pigs with and without subsequent influenza A virus infection. 2022 NAPRRS/NC229: International Conference of Swine Viral Diseases. Dec 2-4, 2022.
14. **Gaurav Rawal**, Marcelo Almeida, Phillip Gauger, Jeffrey Zimmerman, Chris Rademacher, Jianqiang Zhang. Characterization of the Virulence and Transmissibility of the PRRSV 1-4-4 L1C Variant Strain in Comparison with Other Lineage 1 PRRSV Strains in Weaned Pigs. 2022 ISU James D. McKean swine disease conference. Page 26-29.
15. **Gaurav Rawal**, M. Almeida, P. Gauger, J. Zimmerman, C. Rademacher F. Ye, B. Armenta Leyva, B. Munguía-Ramírez, G. Tarasiuk, L. Schumacher, E. Aljets, J. Thomas, J. Zhu, Y. Wannarat, J. La Frenier, J. Zhang. Characterization of virulence phenotype of a recently emerged PRRSV 1-4-4 L1C variant strain in comparison with other Lineage 1 PRRSV under experimental conditions. AAVLD. October 6 – 12, 2022. Minneapolis, Minnesota.
16. **Gaurav Rawal**, Yim-Im Wannarat, Tanja Opriessnig, Patrick G. Halbur, Jianqiang Zhang. Detection and characterization of contemporary porcine respiratory coronavirus isolate. AAVLD. October 6 – 12, 2022. Minneapolis, Minnesota.
17. **Gaurav Rawal**, Jianqiang Zhang, Patrick G. Halbur, Ganwu Li, Philip C Gauger, Tanja Opriessnig. Comparison of contemporary and historical Porcine respiratory coronavirus

isolates in pigs with and without subsequent influenza virus A infection. AAVLD. October 6 – 12, 2022. Minneapolis, Minnesota.

18. Loni Schumacher, Jinhui Zhu, Wannarat Yim-im, Mallory Wilhelm, Ethan Aljets, Phillip Gauger, Joseph Thomas, **Gaurav Rawal**, Jianqiang Zhang. Attenuation phenotypes and protective efficacy of cell culture adapted PEDV non-S INDEL strain. American College of Veterinary Pathologists (ACVP) and American Society for Veterinary Clinical Pathology (ASVCP) 2022 Annual Meeting. Saturday, November 12 - Tuesday, November 15 Westin Boston Seaport District Boston, Massachusetts.
19. Loni Schumacher, Qi Chen, Holly Salzbrenner, Phillip Gauger, Jinhui Zhu, Wannarat Yim-im, Mallory Wilhelm, Ethan Aljets, **Gaurav Rawal**, Joseph Thomas, Michael Welch, Drew Magstadt, Jianqiang Zhang. Attenuation phenotypes and protective efficacy of cell culture adapted PEDV non-S INDEL strain. AAVLD. October 6 – 12, 2022. Minneapolis, Minnesota.
20. **Gaurav Rawal**, M. Almeida, P. Gauger, J. Zimmerman, F. Ye, B. Armenta Leyva, B. Munguía-Ramírez, G. Tarasiuk, L. Schumacher, E. Aljets, J. Thomas, J. Zhu, V. Flores, J. La Frenier, J. Zhang. Characterization of the clinical impact, pathogenicity, and transmissibility of PRRSV 1-4-4 L1C variant strain in comparison with other PRRSV strains in experimentally inoculated pigs. Congress of the International Pig Veterinary Society (IPVS), Rio de Janeiro, Brazil, June 21-24, 2022.
21. **Gaurav Rawal**, Marcelo Almeida, Phillip Gauger, Jeffrey Zimmerman, Jianqiang Zhang. Experimental comparison of PRRSV 1-4-4 L1C variant strain with other PRRSV strains provides evidence for differences in virulence and transmissibility.” The Eleventh Biennial All Iowa Virology Symposium. March 4-5, 2022.
22. Jinhui Zhu, **Gaurav Rawal**, Ethan Aljets, Wannarat Yim-im, Yong-Le Yang, Yao-Wei Huang, Karen Harmon, Phillip Gauger, Jianqiang Zhang. Development and validation of a swine enteric coronavirus multiplex reverse transcription real-time PCR and investigation of virus detection frequency in US swine. 53rd Annual Meeting of the American Association of Swine Veterinarians. February 26 - March 1, 2022. Indianapolis, Indiana.
23. Jianqiang Zhang, **Gaurav Rawal**, Marcelo Almeida, Phillip Gauger, Jeffrey Zimmerman, and others. Characterization of the pathogenicity and transmissibility of the recently emergent PRRSV 1-4-4 L1C variant strain in comparison with other PRRSV strains. Iowa Veterinary Medical Association (IVMA), Winter Conference, Feb 9-10, 2022. Prairie Meadows, Altoona, Iowa.
24. Jinhui Zhu, **Gaurav Rawal**, Ethan Aljets, Wannarat Yim-im, Yong-Le Yang, Yao-Wei Huang, Karen Harmon, Phillip Gauger, Jianqiang Zhang. Development and validation of a swine enteric coronavirus 4-plex real-time RT-PCR and investigation of virus detection frequency in US swine. AAVLD. October 21 – 26, 2021. Aurora, Colorado.

25. Wannarat Yim-im, Haiyan Huang, Ying Zheng, Ganwu Li, **Gaurav Rawal**, Phillip Gauger, Karen Harmon, Jianqiang Zhang. Characterization of PRRSV in clinical samples and the MARC-145 and/or ZMAC cell culture isolates. AAVLD. October 21 – 26, 2021. Aurora, Colorado.
26. Qinming Zhang, **Gaurav Rawal**, Jingjing Qian, Hussam Ibrahim, Jianqiang Zhang, Liang Dong, and Meng Lu. ON-CHIP ANALYSIS OF SWINE RESPIRATORY VIRUSES USING MAGNETIC NANOPARTICLE-ENHANCED PHOTONIC CRYSTAL BIOSENSOR. MicroTAS Conference. October 10 – 14, 2021. Palm Springs, California.
27. Jared McGinley, Alex Bishop, Patrick Halbur, **Gaurav Rawal**, Jianqiang Zhang, Tanja Opriessnig. Assessment of an experimental PCV2d vaccine in the PCV2d challenge model” at 2021 National Veterinary Scholars Symposium. August 4, 2021. Page 237. https://nvss.aavmc.org/wpcontent/uploads/2021/07/2021_national_veterinary_scholarsympo_sium_abstract_booklet.pdf
28. **Rawal G**, Wannarat Y, Chamba F, Francisco C, Smith C, Okones J, Zhang J. Development and validation of a reverse transcription real-time PCR assay for detection of PRRSGard®-like vaccine virus. AASV 2021. Virtual conference. February 27 – March 1, 2021.
29. Schumacher L.L, **Rawal G**, Aljets E, Riordan D, Zhu J, Zhang J, Yim-im W, Gauger P, Magstadt D, Zhang J. Determining infectivity of pork from PEDV positive pigs of different ages. AASV 2021. Virtual conference. February 27 – March 1, 2021.
30. **Rawal G**, Wannarat Y, Chamba F, Francisco C, Smith C, Okones J, Sinha A, Zhang J. Development and validation of a real-time RT-PCR for detection of PRRSGard®-like vaccine virus. Conference of Research Workers in Animal Diseases (CRWAD) 2020.
31. Schumacher L.L, **Rawal G**, Aljets E, Riordan D, Zhu J, Zhang J, Yim-im W, Gauger P, Magstadt D, Zhang J. Determining infectivity of pork from PEDV positive pigs of different ages. AAVLD 2020.
32. **Rawal G**, Chamba F, Francisco C, Smith C, Okones J, Zhang J. Development and validation of a reverse transcription real-time PCR assay to specifically detect PRRSGard®-like vaccine virus. AAVLD 2020.
33. Smith C, Chamba F, Saltzman R, Hintz A, Arruda P, **Rawal G**, Zhang J, Francisco C. PRRSGard® was efficacious against a virulent PRRSV174 challenge. LEMAN 2020.
34. Smith C, Chamba F, Pittman J, **Rawal G**, Zhang J, Francisco C. PRRSGard® had limited performance drag and spread in PRRSV naïve pigs. LEMAN 2020.
35. Smith C, Chamba F, Pittman J, **Rawal G**, Zhang J, Francisco C. Evaluation of the response to PRRSGard administration in weaned pigs. 51st Annual Meeting of the American Association of Swine Veterinarians (Atlanta; March 7-10, 2020). https://www.aasv.org/library/swineinfo/Content/AASV/2020/189_Smith.pdf

36. **Rawal G**, Rademacher C, Linhares D. Comparison of production impact in breeding herds following PRRS clinical outbreaks adopting killed or attenuated PRRS virus vaccination protocols. 50th Annual Meeting of the American Association of Swine Veterinarians (Orlando; March 9-12, 2019).
https://www.aasv.org/library/swineinfo/Content/AASV/2019/043_Rawal.pdf
37. **Rawal G**, Ferreyra MF, Allison G, Mueller A, Macedo N, Bradner L, Harmon K, Linhares D, Arruda B. Porcine astrovirus type 3 is an emerging cause of atypical neurologic disease: Diagnostic cases and infection dynamics on affected sows. 50th Annual Meeting of the American Association of Swine Veterinarians (Orlando; March 9-12, 2019).
https://www.aasv.org/library/swineinfo/Content/AASV/2019/318_Rawal.pdf
38. **Rawal G**, Rademacher C, Linhares D. Description of Herd-Outbreaks Using Killed PRRSV Vaccine with an Attempt to Boost Immune Response. Proceedings Paper 2018 ISU James D. McKean Swine Disease Conference, November 1–2, 2018, Page no. 35-38.
39. **Rawal G**, Shrestha, D. & Koirala, P. 2014 ‘Sero-prevalence of *Leptospira hardjo* in Cattle of Bhaktapur district, Nepal’ published in the Proceedings of Scientific Presentation and Conference Information, 2014.

16. Magazine Articles

- **Rawal G**, Rademacher C, Linhares DCL. Impact of adopting a killed PRRS virus vaccination program. National Hog Farmer. Feb 04, 2020. Available at:
<https://www.nationalhogfarmer.com/animal-health/impact-adopting-killed-prrs-virus-vaccination-program>.
- **Rawal G**, Ferreyra MF, Allison G, Mueller A, Macedo N, Bradner L, Harmon K, Linhares D, Arruda B. Porcine astrovirus type 3 emerging cause of neurologic disease in swine. National Hog Farmer. Nov 06, 2018. Available at:
<https://www.nationalhogfarmer.com/animal-health/porcine-astrovirus-type-3-emerging-cause-neurologic-disease-swine>. Accessed November 06, 2018. **Enlisted as Best of the Month NHF Dec 5, 2018. *Re-published as Porcine astrovirus type 3 emerges as cause of neurologic disease, NHF 2018 Research Review, Vol 63, No.12, Pg. 34, Veterinarians on Call, December 2018.*
- **Rawal G**, Rademacher C, Linhares DCL. Mycoplasma hyopneumoniae detection trends change over time at ISU-VDL. National Hog Farmer. Dec 05, 2017. Available at: <http://www.nationalhogfarmer.com/animal-health/mycoplasma-hyopneumoniae-detection-trends-change-over-time-isu-vdl>. Accessed December 05, 2017.
- **Rawal G**, Shrestha D, & Manandhar S. Nettle as immunomodulator and growth promoter in poultry. www.farm.com.np

17. Oral Presentations

1. Oral presentation “Experimental pig study comparing contemporary and historical porcine respiratory coronavirus isolates in pigs with and without subsequent influenza A virus infection.” 2023 Conference of Research Workers in Animal Diseases (CRWAD). Jan 20-24, 2023.
2. Oral presentation “Experimental comparison of PRRSV 1-4-4 L1C variant strain with other PRRSV strains provides evidence for differences in virulence and transmissibility.” The Eleventh Biennial All-Iowa Virology Symposium. March 4-5, 2022.
3. Oral presentation “Development and validation of real-time RT-PCR for detection of PRRSGard[®] vaccine-like virus” at the 52nd American Association of Swine Veterinarians (AASV) Annual Meeting. Virtual. February 27-March 2, 2021.
4. Oral presentation “Development and validation of a reverse transcription real-time PCR assay to specifically detect PRRSGard[®]-like vaccine virus” at Conference of Research Workers in Animal Diseases (CRWAD) Virtual Annual Meeting, December 5-8, 2020, in Vaccinology-Swine section.
5. Oral presentation “Development and validation of a reverse transcription real-time PCR assay to specifically detect PRRSGard[®]-like vaccine virus” at American Association of Veterinary Laboratory Diagnosticians (AAVLD). Virtual Annual Meeting, October 5-21, 2020, in the Molecular Diagnostics and Bioinformatics Session.
6. Oral presentation “Epidemiology and pathophysiology of porcine astrovirus type 3” at the 6th Annual Graduate & Professional Student Research Conference on April 10th, 2019.
7. Oral presentation “Comparison of production impact in breeding herds following PRRS clinical outbreaks adopting killed or attenuated PRRS virus vaccination protocols” at Research topic session 50th Annual Meeting of the American Association of Swine Veterinarians (Orlando; March 9-12, 2019).
8. 3-MINUTE THESIS presentation at the third annual Graduate College 3MT Competition “Epidemiology and pathophysiology of porcine astrovirus type 3” at Iowa State University, Ames, Iowa, on October 23, 2018.
9. Oral presentation “Comparison of productivity losses between breeding herds adopting killed virus vaccine (MJPRRS[®]) or MLV vaccination protocols following PRRSv infection” at Iowa State University Swine Seminar on February 15th, 2018.
10. Oral presentation “General overview of *Mycoplasma hyopneumoniae* detection by qPCR at the ISU VDL from 2004-2016” at Iowa State University Swine Seminar on August 25th, 2017.

18. Poster Presentations

1. **Gaurav Rawal**, Marcelo Almeida, Phillip Gauger, Jeffrey Zimmerman, Fangshu Ye, Chris Rademacher, Jianqiang Zhang. Virulence comparison of PRRSV 1-4-4 L1C variant strain and other PRRSV strains in experimentally inoculated pigs. 54th AASV Annual Meeting March 4-7, 2023. <https://doi.org/10.54846/am2023/130>
2. **Gaurav Rawal**¹, Marcelo Almeida¹, Phillip C. Gauger¹, Jeffrey Zimmerman¹, Fangshu Ye², Christopher J. Rademacher¹, Juan-Carlos Mora-Diaz¹, Luis Gimenez-Lirola¹, Jianqiang Zhang¹. Experimental pig study comparing virulence and pathogenesis of PRRS 1-4-4 L1C variant with other Lineage 1 strains. McKean Conference. Nov 3-4, Iowa.
3. **G. Rawal**¹, J. Zhang¹, P.G. Halbur¹, G. Li¹, P.C. Gauger¹, T. Opriessnig^{1,2}. Experimental pig study confirming higher virulence of a contemporary porcine respiratory coronavirus isolate compared to one isolated 30 years ago. McKean Conference. Nov 3-4, Iowa.
4. **Gaurav Rawal**, M. Almeida, P. Gauger, J. Zimmerman, C. Rademacher, F. Ye, B. Armenta Leyva, B. Munguía-Ramírez, G. Tarasiuk, L. Schumacher, E. Aljets, J. Thomas, J. Zhu, J. La Frenier, J. Zhang. Characterization of virulence phenotype of a recently emerged PRRSV 1-4-4 L1C variant strain in comparison with other Lineage 1 PRRSV under experimental conditions. CVM Research Day at Iowa State University on August 16, 2022.
5. **Gaurav Rawal**, M. Almeida, P. Gauger, J. Zimmerman, F. Ye, B. Armenta Leyva, B. Munguía-Ramírez, G. Tarasiuk, L. Schumacher, E. Aljets, J. Thomas, J. Zhu, V. Flores, J. La Frenier, J. Zhang. Characterization of the clinical impact, pathogenicity, and transmissibility of PRRSV 1-4-4 L1C variant strain in comparison with other PRRSV strains in experimentally inoculated pigs. Student Poster Competition at the 2022 Iowa Pork Congress, Des Moines, Iowa.
6. Jared McGinley, Alex Bishop, Patrick Halbur, **Gaurav Rawal**, Jianqiang Zhang, Tanja Opriessnig. Assessment of an experimental PCV2d vaccine in the PCV2d challenge model” at the 2021 CVM Research Day at Iowa State University.
7. Poster presentation “Development and validation of a reverse transcription real-time PCR assay for detection of PRRSGard®-like vaccine virus” at 2020 CVM Research Day at Iowa State University, on Friday, August 7, 2020.
8. Poster presentation “Porcine astrovirus type 3 is an emerging cause of atypical neurologic disease: Diagnostic cases and infection dynamics on affected sows” at 50th Annual Meeting of the American Association of Swine Veterinarians (Orlando; March 9-12, 2019).
9. Poster presentation “Description of the characteristics of PRRSV herd-outbreaks using killed PRRSV vaccine” at Leman Swine Conference, InterContinental Hotel, and at the River Centre in St. Paul, Minnesota, on September 15-18, 2018.
10. Poster presentation “Characteristics of Porcine reproductive & respiratory syndrome herd-outbreaks using killed PRRSV vaccine” at the 2018 CVM Summer Scholar Research Day at Iowa State University, Scheman Building on Friday, August 10, 2018.

11. Poster presentation “GENERAL TRENDS OF *Mycoplasma hyopneumoniae* DETECTION BY PCR IN CASES SUBMITTED TO THE IOWA STATE UNIVERSITY VETERINARY DIAGNOSTIC LABORATORY FROM 2004-2016” at 2018 American Association of Swine Veterinarians (AASV) Annual Meeting Program at Manchester Grand Hyatt in San Diego, California on March 3-6, 2018.
12. Poster presentation “General trends of *Mycoplasma hyopneumoniae* detection by PCR in cases submitted to the ISU-VDL from 2004-2016” at Lemn Swine Conference at the InterContinental Hotel and River Centre in St. Paul, Minnesota on September 16-19, 2017.
13. Poster presentation “General trends of *Mycoplasma hyopneumoniae* detection by PCR in cases submitted to the ISU-VDL from 2004-2016” at 2017 CVM Summer Scholar Research Day at Iowa State University, Scheman Building on August 11, 2017.

19. Leadership

- Vice president (public relation) at Toastmaster International Club, Ames, Iowa (June 2018-May 2019)
- President of Nepal Student Association (NSA), Ames, Iowa (2017-2018)
- Sergeant at Arms at Toastmaster International Club, Ames, Iowa (May 2017-June 2018)
- Elected Research and Communication coordinator of Nepal Veterinary Student Association 16th committee (2012-2013)
- Energy Bus Mentor for Clinvet SD staff, Brookings, SD (2024-2026).

20. License and Certification

- Good Clinical Practice (GCP) Refresher Training. 07 Nov, 2024.
- PQAPLUS program certified by the National Pork Board. Certificate: 5818350004.
- Microsoft Project 2016 Essential Training. Provided by LinkedIn Learning, course completed on Oct 7, 2019, with certificate no. Af5M9wBRUDvB4B791otOLXIwr6eS.

21. Grants

21.1 Grants funded

1. Iowa Pork Producers Association (IPPA) Research Proposal. Evaluate the protective efficacy of commercial PRRSV MLV vaccines against the recently emerged PRRSV 1-4-4 L1C variant strain in weaned pigs. Principal Investigator: Jianqiang Zhang (Iowa State University) and Co-Investigator: Philip Gauger (Iowa State University), Marcelo Almeida (Iowa State University), Jeffrey Zimmerman (Iowa State University), Chris Rademacher (Iowa State University), **Gaurav Rawal** (Iowa State University). Funds Requested for 2022-2023: \$69,989. Duration of the Project: 1 year.
2. Iowa Livestock Health Advisory Council (ILHAC). Title “Evaluate the protective efficacy of commercial PRRSV MLV vaccines against the emerging PRRSV 1-4- L1C variant strain in weaned pigs.” Principal Investigator: Jianqiang Zhang (Iowa State University) and Co-Investigator: Philip Gauger (Iowa State University), Marcelo Almeida (Iowa State

University), Jeffrey Zimmerman (Iowa State University), **Gaurav Rawal** (Iowa State University). Funds Requested for 2022-2023: \$25,000. Duration of the Project: 1 year (6/1/2022 - 5/31/2023).

3. American Association of Swine Veterinarians (AASV) Foundation. Evaluation of the protective efficacy of three PRRSV MLV vaccines against the newly emergent PRRSV 1-4-4 L1C variant strain in weaned pigs. Principal Investigator: Jianqiang Zhang (Iowa State University) and Co-Investigator: Philip Gauger (Iowa State University), Marcelo Almeida (Iowa State University), Jeffrey Zimmerman (Iowa State University), **Gaurav Rawal** (Iowa State University). Funds Requested: \$30,000. Duration of the Project: 1 year (2022 - 2023).
4. Iowa Livestock Health Advisory Council (ILHAC). Title “Development and validation of singleplex and multiplex real-time RT-PCRs for specific detection of vaccine-like PRRSV strains.” Principal Investigator: Jianqiang Zhang (Iowa State University) and Co-Investigator: **Gaurav Rawal** (Iowa State University), Karen Harmon (Iowa State University), Philip Gauger (Iowa State University). Funds Requested for 2021-2022: \$25,000. Duration of the Project: 1 year (7/1/2021 - 6/30/2022).
5. American Association of Swine Veterinarians (AASV) Foundation. Generation of antisera against six commercial PRRSV modified live virus vaccines and evaluate their *in vitro* cross neutralization against genetically diverse PRRSV laboratory and field isolates. Principal Investigator: Jianqiang Zhang (Iowa State University) and Co-Investigator: **Gaurav Rawal** (Iowa State University), Derald Holtkamp (Iowa State University), Loni Schumacher (Iowa State University). Funds Requested: \$30,000. Duration of the Project: 1 year (2021 - 2022).
6. Title: “Sero-Detection of *Leptospira hardjo* in Cattle of Bhaktapur District of Nepal.” Principal Investigator: **Gaurav Rawal** (IAAS) and Co-Investigator: Pragya Koirala (Government of Nepal, Central Veterinary Laboratory), Denusha Shrestha (IAAS). This research project was funded by Internship Advisory Committee, Institute of Agriculture and Animal Science (IAAS), Rampur, Chitwan, Nepal. Duration of Project: 6 months. Funds obtained: \$600.
7. Title: “Prevalence of Demodectic Mange in Canines of Kathmandu Valley having Skin Disorder and Its Associated Risk Factors.” Principal Investigator: Denusha Shrestha (IAAS) and Co-Investigator: Balram Thapa (Government of Nepal, Veterinary Teaching Hospital), **Gaurav Rawal** (IAAS) This research project was funded by Internship Advisory Committee, Institute of Agriculture and Animal Science (IAAS), Rampur, Chitwan, Nepal. Duration of Project: 6 months. Funds obtained: \$600.

22. 2 Grants submitted, not funded

1. Iowa Pork Producers Association 2020 Spring Research Proposal. Title “Comparison of six commercial PRRSV-2 live attenuated vaccines for virus shedding, immune responses and protection against a field isolate in weaned pigs as well as evaluation of vaccine antisera to *in vitro* cross neutralize genetically diverse PRRSV laboratory and field isolates.” Principal Investigator: Jianqiang Zhang (Iowa State University) and Co- Investigator: Mark Wagner

(Fairmont Veterinary Clinic), Crystal Loving (USDA National Animal Disease Center), **Gaurav Rawal** (Iowa State University), Loni Schumacher (Iowa State University). Funds Requested: \$85,149. Duration of the Project: 1 year (2020 - 2021).

2. Iowa Pork Producers Association 2020 Spring Research Proposal. Title “Which antibody assay better correlates with PEDV mucosal immunity?” Principal Investigator: Jianqiang Zhang (Iowa State University) and Co-Investigator: Crystal Loving (USDA National Animal Disease Center), **Gaurav Rawal** (Iowa State University), Loni Schumacher (Iowa State University). Funds Requested: \$55,989. Duration of the Project: 1 year (2020 - 2021).
3. Iowa Livestock Health Advisory Council (ILHAC). Title: “Generation of antisera against commercial PRRSV modified live virus vaccines and evaluate their *in vitro* cross neutralization against genetically diverse PRRSV laboratory and field isolates.” Principal Investigator: Jianqiang Zhang (Iowa State University) and Co-Investigator: **Gaurav Rawal** (Iowa State University). Funds Requested for 2020-2021: \$25,000. Duration of the Project: 1 year (7/1/2020 - 6/30/2021).
4. Phibro Animal Health. Title: “Every other farrowing room.” Principal Investigator: Christopher Rademacher (Iowa State University) and Co-Investigator: **Gaurav Rawal** (Iowa State University) and Daniel Linhares (Iowa State University) Funds Requested for July 1, 2018, through June 30, 2019: \$75,366. Duration of the Project: 1 year.

23. Industry Projects (Selected ones)

1. Evaluation of RBX0006 oral and respiratory tissue distribution following intranasal or oral administration in nursery pigs. Resilient Biotics. Investigator: Gaurav Rawal, 28Nov23
2. Non-Target Animal Safety Study in Mice receiving a live, attenuated cps1 *Coccidioides* vaccine master seed (MS+1). Hennessy Research Associates, LLC. Investigator: Gaurav Rawal, 27Nov23
3. Non-Target Animal Safety Study and tissue tropism in Rabbits receiving a live, attenuated cps1 *Coccidioides* vaccine master seed (MS+1). Hennessy Research Associates, LLC. Investigator: Gaurav Rawal, 17Oct23
4. BVDV Type 2 Strain 890 virulence confirmations in 6-week-old calves, Clinvet SD. Investigator: Gaurav Rawal, 13Dec23
5. Efficacy of a dose of $10^{5.5}$ CCU *Mycoplasma synoviae* vaccine strain K5885A in protecting against air sacculitis and synovitis when administered to 4-week-old SPF chickens. ECO Animal Health. Investigator: Gaurav Rawal, 21Nov23
6. BRSV new challenge material virulence confirmation in young colostrum deprived calves. Clinvet SD. Investigator: Gaurav Rawal, 25Jan24
7. 9 CFR 113.33 Mouse safety test. Invetx. Investigator: Gaurav Rawal, 25 Jan 24.

8. Duration of Immunity study for the Mycoplasma hyopneumoniae fraction of porcine circovirus killed baculovirus vector, Lawsonia intracellularis-Mycoplasma hyopneumoniae bacterin, administered once as a two ml dose. Merck Animal Health. Investigator: Gaurav Rawal, 11 Mar 24.
9. Dose determination of Gleptoferron contained in C629 product in the prevention of anemia in newborn piglets. Ceva Sante Animal S.A. Investigator: Gaurav Rawal, 18 Dec 23.
10. Dose confirmation of A97602 contained in C629 product in the prevention of anemia in newborn piglets. Ceva Sante Animal S.A. Investigator: Gaurav Rawal, 18 Dec 23.
11. Export testing of Bovine Rotavirus-Coronavirus Vaccine-KV Clostridium Perfringens Type C&D Escherichia Coli Bacterin Toxoid in Bovine for safety and detection of extraneous agents. Merck Animal Health. Investigator: Gaurav Rawal, 06 Sep 24.
12. Evaluating the safety and efficacy of genetically engineered microbial medicines (GEMM™) VIZ. Biopersist™ in a porcine acute colitis model. Melius MicroBiomics Inc. Investigator: Gaurav Rawal, 19 Jun 24.
13. BRSV challenge material (Lung lavage fluids and BAL) confirmation in colostrum-deprived young calves. Clinvet SD. Investigator: Gaurav Rawal, 12 Feb 24.
14. Pulmonary Alveolar Macrophage (PAM) collection. Clinvet SD. Investigator: Gaurav Rawal, 02 Feb 24.
15. Qualification of a BRSV reference vaccine in approximately 3 to 4-week old calves (product codes: 1185.23, 4465.24, and 44A5.20). Boehringer Ingelheim Animal Health USA Inc. Investigator: Gaurav Rawal, 06 Sep 24.
16. Qualification of new Escherichia coli F41 Master Reference. Merck Animal Health. Investigator: Gaurav Rawal, 06 Aug 24.
17. Onset of protection against infectious bovine rhinotracheitis disease following vaccination with a modified live virus vaccine. BIAH. Investigator: Gaurav Rawal, 10 Jan 25.
18. Evaluation of safety and fetal protection from BVDV persistent infection after vaccination with a BVDV Type 1 and Type 2 vaccine and a BVDV Type 2 challenge in > 12-month-old pregnant seronegative heifers. BIAH. Investigator: Gaurav Rawal, 30 Feb 25.
19. Qualification of a new Bovine Viral Diarrhea Type II Reference Vaccine (VS Codes 1185.23 and 4465.24). BIAH. Investigator: Gaurav Rawal, 20 Mar 25.