

BIOMEDICAL & VETERINARY SCIENCES

GRADUATE PROGRAM



ANNOUNCES

The Doctor of Philosophy Seminar and Examination of

Amanda Kravitz

**"Host Genetic Markers of Resistance and
Susceptibility to Ovine Johne's Disease "**

Tuesday, August 8th, 2023

1:00PM

VMIA 220



Bio

I was born in La Mesa California and lived there until moving to Brush Prairie Washington at age 11. In 2015 I graduated with a Bachelor of Science in Microbiology from Colorado State University, where I participated in bacteriology, virology, and pre-clinical surgical research in large animal models that verified my two passions for veterinary medicine and infectious disease research. Since starting the DVM/PhD dual degree program in 2016 in Dr. Nathan's lab, I've had the opportunity to combine my passions and investigate a complex disease in one of my favorite species (sheep) with implications in public health and translational medicine. Outside of veterinary medicine and research, I enjoy spending time outside, doing yoga, and being with my 3 dogs.

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VMCVM Office of Research and Graduate Studies

Lay Language Abstract

Johne's disease, also known as paratuberculosis is caused by the bacterium *Mycobacterium avium subsp. paratuberculosis* (MAP). This bacterium causes a chronic, untreatable, and fatal disease of cattle, sheep, and goats and results in millions of dollars in economic losses worldwide. This organism (MAP) is also suspected to play a role in Crohn's disease in humans, and thus is a potential public health concern. In young animals, infection occurs shortly after birth through ingestion of food or water contaminated with MAP. Interestingly, the majority (90%) of infected sheep do not develop disease and remain healthy, while 10% are unable to contain infection and become sick with ovine Johne's disease (OJD). The exact reason why this variation occurs is unknown, however studies over the past two decades have focused on investigating if differences in host genetics can account for the observed variation. Studies have identified markers within the genome called single nucleotide polymorphisms (SNPs), that are used to track genes and regions in association with different outcomes observed. Here, we conducted a genome-wide association study (GWAS) to identify SNPs as markers for resistance (animals that remain healthy) or susceptibility (animals unable to fight infection) in two groups of sheep. We aimed to identify SNPs associated with resistant or susceptible sheep, to inform future selective breeding programs. These programs inform about individual breeding decisions, where breeding only resistant animals can generate a more resistant population over time. Our studies supported evidence for a gene found previously; inhibitor of nuclear factor kappa B kinase subunit beta (*IKBKB*), and genes not yet identified including janus kinase 2 (*JAK2*), early endosome antigen 1 (*EEA1*), solute carrier family 7 member 11 (*SLC7A11*), and adenylate kinase 3 (*AK3*). Interestingly, these genes have been identified as important in susceptibility to tuberculosis and Crohn's disease in humans, which could indicate a common disease pathway between these diseases. This research provides a foundation for future studies to build upon to further identify SNPs, genes, and pathways related to resistance/susceptibility to OJD.

Publications

Kravitz, A., Tyler, R., Manohar, B.M. et al. Successful restoration of archived ovine formalin fixed paraffin-embedded tissue DNA and single nucleotide polymorphism analysis. *Vet Res Commun* (2022).
<https://doi.org/10.1007/s11259-022-09937-0>

Kravitz A, Pelzer K and Sriranganathan N (2021) The Paratuberculosis Paradigm Examined: A Review of Host Genetic Resistance and Innate Immune Fitness in *Mycobacterium avium* subsp. *Paratuberculosis* Infection. *Front. Vet. Sci.* 8:721706.doi: 10.3389/fvets.2021.721706

Kuenstner JT, Naser S, Chamberlin W, Borody T, Graham DY, McNees A, Hermon-Taylor J, Hermon-Taylor A, Dow CT, Thayer W, Biesecker J, Collins MT, Sechi LA, Singh SV, Zhang P, Shafran I, Weg S, Telega G, Rothstein R, Oken H, Schimpff S, Bach H, Bull T, Grant I, Ellingson J, Dahmen H, Lipton J, Gupta S, Chaubey K, Singh M, Agarwal P, Kumar A, Misri J, Sohal J, Dhama K, Hemati Z, Davis W, Hier M, Aitken J, Pierce E, Parrish N, Goldberg N, Kali M, Bendre S, Agrawal G, Baldassano R, Linn P, Sweeney RW, Fecteau M, Hofstaedter C, Potula R, Timofeeva O, Geier S, John K, Zayanni N, Malaty HM, Kahlenborn C, **Kravitz A**, Bulfon A, Daskalopoulos G, Mitchell H, Neilan B, Timms V, Cossu D, Mameli G, Angermeier P, Jelic T, Goethe R, Juste RA and Kuenstner L (2017) The Consensus from the *Mycobacterium avium* ssp. *paratuberculosis* (MAP) Conference 2017. *Front. Public Health* 5:208. doi: 10.3389/fpubh.2017.00208

Presentations

Kravitz, A., Tyler R, Sriranganathan N, (2019, July) Can host genetics determine infection outcome with *Mycobacterium avium* subsp. paratuberculosis? Insights into the future of Johne's Disease Research. 3rd National Colloquium for Combined DVM/PhD Biomedical Scientists, Worcester, MA (poster)

Kravitz, A., Pelzer, K, Michalak P, Lahmers K, Witonsky S, Sriranganathan N, (2019, November) Genetic Resistance and Johne's Disease in Sheep: Hunting for (SNPs) Needle in a Genomic Hay Stack. Virginia-Maryland College of Veterinary Medicine Biomedical and Veterinary Science Research Symposium, Blacksburg, VA (poster)

Kravitz, A., Michalak P, Tyler R, Sriranganathan N, (2018, July) Johne's disease-investigation beyond the organism. 2nd National Colloquium for Combined DVM/PhD Biomedical Scientists, College Station, TX (poster)

Kravitz, A., Lahmers K, Witonsky S, Dickerman A, Sriranganathan N, (2018, March). A potential new approach to Johne's Disease-a graduate student's adventure through unanswered scientific questions. Virginia-Maryland College of Veterinary Medicine Biomedical and Veterinary Science Research Symposium Blacksburg, VA (poster)

Kravitz, A. (2018, February). Uncovering One Hundred Years of Controversy- Is *Mycobacterium avium* subsp. paratuberculosis zoonotic? Virginia-Maryland College of Veterinary Medicine Biomedical and Veterinary Sciences Seminar, Blacksburg, VA (oral)

Kravitz, A. (2017, May) Evaluation of an Automatic Liquid Culture System for Detection and Recovery of *Mycobacterium avium* subsp. paratuberculosis Virginia-Maryland College of Veterinary Medicine Biomedical and Veterinary Sciences Seminar, Blacksburg, VA (oral)

Awards and Academic Achievements

- Virginia-Maryland College of Veterinary Medicine Dual Degree Scholarship (2016-current)
- Biomedical and Veterinary Sciences Graduate Student Assembly Executive Board Member (2018-2020)
- One Health Working Group Representative, One Health Day Case Competition Lead (2018-2020)
- National Association of Veterinary Scientists (NAVS) Founding Member (2019)
- NAVS Executive Board Member and Colloquium Planning Committee Member (2019)
- DVM/PhD Program Representative and Board Member-NAVS (2019-2020)
- Veterinary Leadership Institute Student Leadership Summit attendee (2021)
- Mitchell Essey Memorial Scholarship Recipient (2023)

Examination Graduate Committee

Major Advisor/Chair:

Nammalwar Sriranganathan, PhD, DACVM, B.V.Sc., M.V.Sc. Veterinary
Medicine
Professor Emeritus
Department of Biomedical Sciences and Pathobiology

Graduate Advising Committee Members:

Kevin Pelzer, DVM, MPVM, DACVPM
Professor
Department of Large Animal Clinical Sciences

Sharon Witonsky, DVM, PhD, DACVIM
Associate Professor
Department of Large Animal Clinical Sciences

Pawel Michalak PhD
Professor and Associate Dean for Biomedical Affairs and Research
Virginia College of Osteopathic Medicine-LC (VCOM-LC)

Gota Morota
Assistant Professor
Department of Animal and Poultry Sciences



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