TEXAS A&M UNIVERSITY

IFRB 2024

Interdisciplinary Faculty of Reproductive Biology

Confronting and solving challenges to reproduction and health by conducting basic, clinical and translational research, and shaping science and health policy

2024, ISSUE 1

POINTS OF INTEREST:

- The IFRB was organized in 1990 and is one of the largest Reproductive Biology Programs in the US
- Membership includes 39 faculty from 11 departments, 5 colleges and 3 research centers of the Texas A&M University System.
- IFRB sponsored activities: 29th Annual R.O. Berry Lecture, 34 year old IFRB Repro Forum Seminar Series, 29th Texas Forum on Reproductive Sciences, and 17th Annual IFRB Retreat

INSIDE THIS

New IFRB Faculty Spotlight

***Dr. Karl J. Clark is an Associate Professor of Precision Gene Editing in the Department of Animal Science at Texas A&M University.**

Dr. Clark was born and raised in Eau Claire, Wisconsin where he enjoyed fishing the local rivers and participated in football and track. He continued his education at the University of Wisconsin- Eau Claire where he did research on antimicrobial peptides found in the skin of Xenopus and earned a B.S. in Biochemistry and Molecular Biology. He then matriculated to the University of Minnesota's Ph.D. program in Molecular, Cellular, Developmental Biology, and Genetics. During his graduate work with Dr. Perry Hackett, Dr. Clark developed gene trapping transposons with the newly developed Sleeping Beauty transposon system- the first DNA transposon system that demonstrated activity in human cells. He worked at Discovery Genomics, Inc., a startup company focused on gene therapy and functional genetics in Minneapolis, MN. During his time at Discovery Genomics, Inc., Dr. Clark worked on many projects including discovering 5' UTR sequences in zebrafish genes, developing assays to determine morpholino knockdown efficiency, and developing minimal Sleeping Beauty transposon vectors for gene therapy applications. Notably, Discovery Genomics was contracted to make the very first GloFish, which was a brightly fluorescent zebrafish sold for home aquariums.

Dr. Clark then returned to the University of Minnesota for postdoctoral training with Dr. Scott Fahrenkrug in the Animal Science Department. While there, he developed methods for the use of various transposon systems and recombinases, like Cre recombinase in large animal models.

Around the end of his time at the University of Minnesota, Dr. Clark joined five colleagues in co-founding Recombinetics, Inc., a livestock genome engineering company based in Edina, Minnesota.

Missing the speed at which new ideas could be put in motion, Dr. Clark moved on to a Research Associate position with Dr. Stephen Ekker at the Mayo Clinic in Rochester, MN. During this time Dr. Clark aided in the production of a library of 1000 gene-break transposon zebrafish lines and trained in zebrafish behavior.

Dr. Clark became a PI of his own lab at Mayo Clinic where he continued to use and develop genome engineering technologies including TALENs and CRISPR/Cas9. Using the gene-break transposon lines, which are random insertional mutagens and targeted gene knockouts, Dr. Clark developed methods to behaviorally test the role of zebrafish genes on rapid stress response. Treating larval zebrafish with rapid salinity or rapid light changes elicits a locomotor response that correlates with cortisol release and is dependent on key hypothalamus, pituitary, adrenal axis signaling receptors, like the ACTH receptor (mc2r) (see ***Figure 1, page 2***).

Dr. Clark and his lab continued to work with colleagues to develop and improve genome engineering methods in zebrafish and human cells. One technique that showed improved programmed editing of small nucleotide changes when compared to the standard practice of using a single-stranded DNA oligonucleotide donor, was to extend the tracrRNA of a CRISPR guide with a DNA donor.

(continued on page 2)

IFRB New Faculty Spotlight: Dr. Clark (cont'd from page 1)

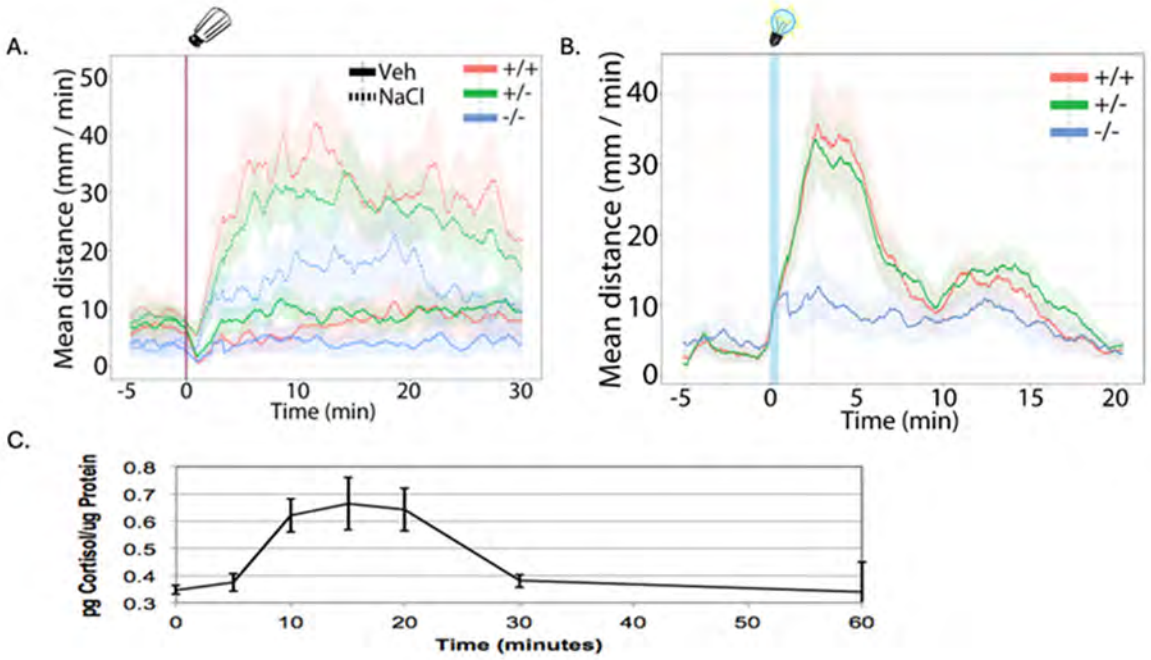

Figure 1. Rapid stress response in larval zebrafish. A, B) Movement from sibling larval zebrafish 5 days post-fertilization (dpf) with three distinct mc2r genotypes (wildtype +/+, heterozygous +/-, and mutant -/-) was recorded. A) Baseline movement was recorded for five minutes before adding fish water (veh) or fish water with high NaCl (NaCl). Larvae exposed to higher NaCl concentrations moved more with a peek between 10-15 minutes and a slow reduction back towards baseline. Mutation of mc2r (-/-) significantly blunts this locomotor response. B) Fish in the dark (recorded using IR light) were exposed to bright white light for 1 minute before switching back to darkness. Unlike wild type (+/+) or heterozygous (+/-) siblings, mc2r (-/-) mutant fish fail to have a significant locomotor response. C) Cortisol measurements of groups of wild-type larval fish (5 dpf) after exposure to increased NaCl in their water (similar to A) demonstrates that the locomotion correlates with cortisol release.

This chimeric RNA:DNA guide, also called a DonorGuide, showed increased efficiency of small DNA edits and recent work suggest that the increased length's available commercially will continue to make substantial increases in targeted nucleotide changes (**Figure 2).**

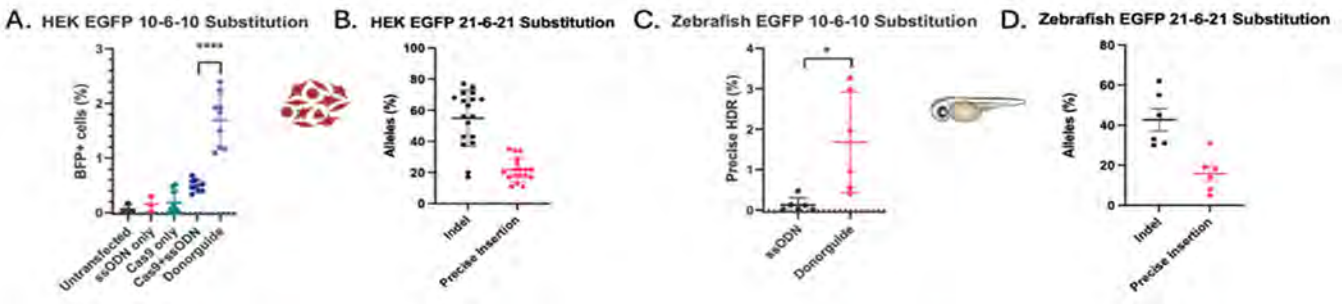

Figure 2. DonorGuide improves precise editing in human cells and zebrafish. A,B) HEK293 cells with an integrated EGFP cassette were edited to convert EGFP to a ~BFP (changes of 2 amino acids). A) The DonorGuide (10-6-10) had 10 nucleotides of homology around the 6 nt that are the edits of targets. In addition to the controls shown, the major measure here is ~4 fold increase in BFP+ expression when comparing using CRISPR/Cas9 ribonucleoprotein with a single-stranded DNA oligonucleotide donor to incorporate the desired change (Cas9+ssODN) to the DonorGuide which has the DNA donor fused to the 3' terminus of the tracr RNA (part of the CRISPR RNA complex). B) When the DonorGuide homology arms are increased to 21 nt instead of 10nt, the precise integration reaches about 20%, a ~10-fold increase. C,D) Zebrafish with an integrated EGFP cassette were treated with the same DonorGuides. In C) the 10 nt homology arms resulted in a similar 4-5- fold increase over ssODN, and in D) the increase of homology to 21 nt, resulted in ~10-fold increase over the 10 nt version.

IFRB New Faculty Spotlight: Dr. Clark (cont'd from page 2)

In addition to these basic research interests, Dr. Clark worked closely with Mayo Clinic's Center for Individualized Medicine to aid in the diagnosis of rare diseases by functionally assessing DNA variants that were potentially implicated in disease. The functional genetic analyses used a wide range of methods ranging from protein assays to cellular assays to whole animal models including gene edited cells and animal models.

Dr. Clark began his current position in the Department of Animal Science at Texas A&M on March 1, 2024. He will continue to use zebrafish as research model to explore the genetics of rapid stress response and endocannabinoid (eCB) signaling. The zebrafish also serves as a great in vivo model for testing new genome engineering technologies. This includes an NIH funded resource grant to continue to produce conditionally mutant fish, further develop DonorGuide technologies in zebrafish, and develop zebrafish lines with chromosomal "landing pads" that will make the production of reporter lines more streamlined and reliable. He is working with his new colleagues to identify areas where gene editing in ruminants will aid in the functional validation of potential gene variants or aid in applying innovative genetic improvements into animals and eventually markets– ranging from health-related issues like liver abscess or bovine congestive heart failure to genetic innovations that will aid in adapting ruminants to changing environments like increased heat or draught.

Dr. Clark hopes to also grow his research interests in zebrafish, including stress biology and endocannabinoid signaling into studies in large animal models. For example, Dr. Clark is interested in the shared and divergent roles of fatty acid amide hydrolase genes (FAAH1 and FAAH2), these genes break down eCB molecules like anandamide. FAAH2 has been lost in most mammalian lineages but remains in humans, non-human primates, some marsupials and pseudo-ruminants as well as non-mammalian models like zebrafish. In addition to the roles of eCB signaling in rapid stress response there are important roles for eCB signaling in preimplantation embryos and implantation– a new scientific research interest in reproductive biology.

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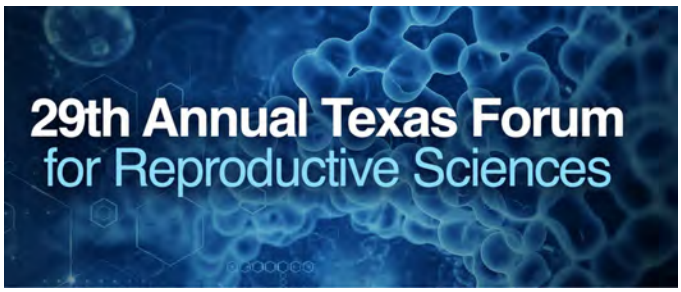
Texas Forum for Reproductive Sciences



*__The 29th Annual Texas Forum for Reproductive Sciences__ regional reproductive biology meeting was hosted by the Cecil H. and Ida Green Center for Reproductive Biology Sciences UT Southwestern April 18-19, 2024 at the T. Boone Pickens Medical Education & Conference Center Dallas, TX 75235.

This years Forum Organizers were Mala Mahendroo, Ph.D., Program Chair and Chandra Yallampalli, Ph.D. 2024 Meeting Organizer. The Four Plenary Speakers for the 2024 meeting included:

Paula Cohen, Ph.D., Director, Center for Reproductive Genomics, Cornell University, Ithaca, NY, Talk title: "The role of Argonaute proteins in regulating the transcriptional activity of sex chromosomes during meiotic prophase I and beyond."

Pablo Ross, DVM, Ph.D., Chief Scientific Officer, STgenetics, Navasota, TX, Talk title: "Epigenetic remodeling of the bovine embryo."

Douglas Strand, Ph.D., Associate Professor, Department of Urology, UT Southwestern Medical Center, Dallas, TX, Talk title: "A Cellular Anatomy of Human Lower Urinary Tract in Health and Disease."

Carmen Williams, M.D., Ph.D., Deputy Chief, Reproductive and Developmental Biology Laboratory, National Institute of Environmental Health Sciences, Durham, NC, Talk title: "Calcium at fertilization and offspring growth – connections and Implications."

The Texas A&M trainees selected for Platform Presentations included::

London Lemke, "Maternal citrulline supplementation to nutrient restricted ewes programs glycine metabolism in postnatal lambs."

Joe Cain, "Pig conceptuses utilize extracellular vesicles for interferon gamma-mediated paracrine communication with the endometrium."

Texas A&M IFRB members presenting posters included:

Alissa Herring, "Maternal citrulline supplementation increases fetal growth rate and programs postnatal pancreatic development in the lambs."

Kyle Herron, "Nutraceutical modulation of placental growth and function by L-citrulline or putrescine supplementation in pregnant sheep."

Kyle Hickman-Brown, "The bacterial communities of reproductive tissues in cyclic and early gestation gilts."

Carli Lefevre, "Evidence for metabolism of creatine by the conceptus, placenta, and uterus for production of ATP during conceptus **development in pigs."**

Olivia Ognibene, "Relationship of toll-like receptor abundance in the boar reproductive tract with dihydrotestosterone prior to attainment of puberty."

Maddison Olivarez, "Effects of dietary supplementation of creatine on fetal muscle and placental development in mid-and-late gestating gilts.

Alexandria Ross, "Concentrations of amino acids and expression of their transporter in the pig uterus throughout pregnancy Matthew Stuehr, Identifying genes associated with retinol pathway expression in corpora lutea in cyclic and pregnant gilts."

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IFRB Seminar Series, 2024

Spring2024

January 19, **Janko Gospocic, Ph.D.,** Assistant Professor, Southwestern Medical Foundation Scholar in Biomedical Research, Department of Psychiatry, UT Southwestern Medical Center *"Climbing the social ladder: Hormonal control of ant caste identity."*

February 2, **Guoyao Wu, Ph.D.,** University Distinguished Professor, Department of Animal Science, Texas A&M University. *"A Texas story of discovery research on nutrition and reproduction to improve animal production."*

February 9, **Sofia Ortega, Ph.D**., Assistant Professor, Department of Animal Science, Reproductive Physiology, University of Wisconsin - Madison. *"Dissecting paternal contributions to early embryonic development and pregnancy in the bovine.*

February 16, **Heidi Vanden Brink, Ph.D.** Assistant Professor, Department of Nutrition, Texas A&M University, *"Towards early detection, prevention, and management of adolescent PCOS."*

March 1, **Benjamin Beaton, Ph.D.,** Reproductive Biology Scientific Lead and Manager, Genus PLC. *"Commercial-scale generation of porcine reproductive and respiratory syndrome (PRRS) virus resistant pigs."*

March 8, **Andrei Golovko, Ph.D., M.B.A.**, Associate Director, Business Development. GenoBioTX/Shanghai Model Organisms Center (USA), LLC. *"Decoding the mystery of life by gene editing."*

March 22, **Nancy H. Ing, Ph.D.,** Professor, Department of Animal Science, Physiology of Reproduction, Texas A&M University. *"20+ years of research on stallion testes and sperm: lessons and opportunities."*

April 5, **Carey Satterfield, Ph.D.,** Professor, Department of Animal Science, Physiology of Reproduction. Texas A&M University, *"Overcoming maternal malnutrition during pregnancy-Insights from the sheep."*

April 12, **Martha Susiarjo, Ph.D.,** Associate Professor, Department of Environmental Medicine, University of Rochester Medical Center. *"Environmental modulator of genomic imprinting and impacts on maternal fetal health."*

April 26, **Pedro Fontes, Ph.D.,** Assistant Professor, Department of Animal Science, University of Georgia. *"Impact of management and nutrition on beef bull fertility."*

Fall 2024

August 23. **Agnieszka Wacławik, Ph.D.,** Associate Professor, Department of Hormone Action Mechanisms , Institute of Animal Reproduction and Food Research, Polish Academy of Sciences. *"Deciphering embryo-maternal cross-talk during early pregnancy in the pig."*

September 6, **Tad Sonstegard, Ph.D.,** Chief Executive and Scientific Officer, Acceligen. *"Adaptive breeding of performance breeds of cattle."*

September 20, **Giri Athrey Ph.D.,** *Associate Professor, Associate Department Head, Department of Poultry Science, Quantitative & Functional Genomics Lab, Texas A&M University. "Broiler breeder fertility declines: from consequences to causes."*

September 27, **Barbara Murphy, Ph.D.,** Founder, Equilume Ltd., Associate Professor, University College Dublin, Head of Equine Science. *"How to advance the vernal transition and improve breeding efficiency using blue light."*

October 4, **Thainá Minela, Ph.D.,** Postdoctoral Associate, Departments of Animal Science and Veterinary Integrative Biosciences, Texas A&M University. *"Pregnancy: Life against all odds."*

October 11, **Zachary Seekford, Ph.D.,** Postdoctoral Associate, Department of Animal Science, Texas A&M University. *"Unlocking the secrets: How the immune system influences fertility in cattle."*

November 8, **Dan Mathew, Ph.D.,** Assistant Professor, Department of Animal Science, University of Tennessee, *"The in vitro produced conceptus: what the endometrium can tell us."*

November 15, **Bryan McLendon, Ph.D.,** Developmental Biology, Colossal Bioscience, "Laying the foundation for ex vivo gestation."

November 22, **Günter Wagner, Ph.D.,** Alison Richard Professor Emeritus of Ecology and Evolutionary Biology, Yale University, Hagler Fellow, Hagler Institute, Texas A&M University, "Placental biology and the biology of cancer malignancy."

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29th Annual Dr. Raymond O. Berry Memorial Lecture

The Twenty-Ninth Annual Dr. Raymond O. Berry Memorial Lecture, sponsored and organized by the Interdisciplinary Faculty of Reproductive Biology, was held at the Texas A&M Institute for Preclinical Studies (TIPS) Auditorium on November 1, 2024.

Dr. Irina Burd, MD, PhD, Sylvan Frieman, MD Endowed Professor of Obstetrics, Gynecology & Reproductive Sciences, and Chair, Obstetrics, Gynecology, and Reproductive Sciences, University of Maryland, School of Medicine was selected by IRFB faculty to give the presentation, "Immunoperinatology: Controlling maternal immune responses in pregnancy may be the key to optimizing neonatal long-term health."

Dr. Burd is a graduate of Rutgers University and earned her Ph.D. and M.D. from the Robert Wood Johnson Medical School. Dr. Burd earned her undergraduate degree from Rutgers University followed by a combined M.D./Ph.D. program at the Rutgers University-Robert Wood Johnson Medical School. She completed her residency in obstetrics and gynecology at the Thomas Jefferson University Hospital where she served as an Administrative Chief resident and performed a fellowship in maternal-fetal medicine at the University of Pennsylvania. Dr. Burd was recruited to the University of Maryland from Johns Hopkins University where Dr. Burd rose through the ranks from Assistant Professor to Full Professor. She is now the Sylvan Frieman, M.D. Professor and Chair of the Department of Obstetrics, Gynecology and Reproductive Sciences at the University of Maryland. Her areas of clinical expertise include high-risk pregnancy conditions and fetal brain development.

Dr. Burd has published over 160 peer-reviewed research articles and is the recipient of numerous honors, including the Ikaria Research Award from the Perinatal Research Society, a research award from the American Board of Obstetrics and Gynecology/ American Association of Obstetricians and Gynecologists Foundation, the Thomas R. Boggs Jr. Research Award from the Philadelphia Perinatal Society, Passano Foundation Clinician Scientist Award, Society for Reproductive Investigations President's Achievement Award, and American Society for Reproductive Immunology Distinguished Service Award. Dr. Burd is a member of the American Society for Clinical Investigations (Honor Society). She is a recipient of National Institutes of Health funding since 2009 and served as a Chair of NICHD Study Section on Obstetrics and Maternal Fetal Biology from 2016 to 2021. She is past President of Perinatal Research Society, Immediate Past President of the American Society for Reproductive Immunology and President Elect of the Society for Reproductive Investigation.

For her outstanding contributions, Texas A&M University recognizes the work of Dr. Burd through the Raymond O. Berry Memorial Lecture which was established in 1994 by **Dr. Fuller W. Bazer**. This Lecture Series ensures that his contributions will continue to inspire students and faculty whose application of biotechnology to the field of reproductive biology contributes to animal agriculture and impacts the biomedical community. Dr. Berry's pioneering studies of genetic factors affecting reproduction contributed basic knowledge about maternal immune recognition of the fetal-placental unit. These principles are now fundamental to the discipline of reproductive immunology.

Dr. Bill Foxworth, a doctoral trainee of Dr. Duane Kraemer who was a student of Dr. Berry presented slides and comments on Dr. Berry's seminal contributions that launched the reproductive immunology field.

Annual meeting organizers and contributors include: **Dr. Fuller W. Bazer**, Distinguished Professor, Department of Animal Science, with joint appointments in the Departments of Veterinary Integrative Biosciences and Veterinary Physiology and Pharmacology is co-organizer of the 2024 IFRB Retreat and Dr. Raymond O. Berry Memorial Lecture. He is a reproductive biologist whose research focuses on pregnancy recognition signals for establishment of pregnancy, uterine biology, linkages between nutrition and reproduction, and interferon tau as a potential therapeutic for treatment of inflammatory diseases.

Dr. Greg A. Johnson, Professor and Chancellor's Enhancing Development and Generating Excellence in Scholarship Fellow, Veterinary Integrative Biosciences, was co-organizer of the 2024 IFRB Retreat and a past R.O. Berry Lecturer. His research focuses on molecular, cellular, and physiological interactions between the conceptus and uterus during pregnancy recognition signaling, implantation and placental development with the goal of applying new knowledge towards clinical strategies to prevent pregnancy loss in women, livestock and companion animals.

Dr. Rodolfo Cardoso, Associate Professor, Department of Animal Science, provided introductory comments. He is Chair of the Executive Committee of Texas A&M University's Interdisciplinary Faculty of Reproductive Biology. Dr. Cardoso's research focuses on understanding the impact of the prenatal and early postnatal environments on reproductive neuroendocrine function in females using sheep and cattle as animal models to benefit both the livestock industry, as well as human reproductive health. His research integrates animal physiology with cellular and molecular biology to elucidate mechanisms by which the perinatal environment can modulate several reproductive processes in offspring. Dr. Cardoso's teaching interests range from practical reproductive management of livestock to advanced reproductive neuroendocrinology.

Dr. William "Bill" Foxworth, the former Director and Lead Scientist, International Goat Research Center, Cooperative Agricultural Research Center, Prairie View A&M University. Before retirement, his research was focused on small and large ruminant reproductive physiology, gamete physiology, in vitro fertilization, transgenic animal production, gene targeting, mammalian semen, embryo transfer and cryopreservation, cell modification, bioweapons and agroterrorism and development and management of biosecurity facilities for animals used in research and commercial applications.

The Twenty-Ninth Annual Dr. Raymond O. Berry Memorial Lecture and Seventeenth Annual Interdisciplinary Faculty of Reproductive Biology Retreat was supported by the Department of Animal Science, College of Agriculture and Life Sciences; Departments of Veterinary Integrative Biosciences, Veterinary Large Animal Clinical Sciences, and Veterinary Physiology and Pharmacology, College of Veterinary Medicine and Biomedical Sciences; College of Agriculture and Human Sciences, Prairie View A&M University; and Departments of Neuroscience and Experimental Therapeutics, and Molecular and Cellular Medicine, College of Medicine, Texas A&M University

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IFRB Postdoctoral Trainee Spotlight

***Dr. Zachary (Zack) Seekford** is a postdoctoral research associate in the laboratories **of Drs. Ky Pohler and Dr. Cliff Lamb.** Zack grew up on his family's dairy farm in the Shenandoah Valley of Virginia and was actively involved with 4-H and FFA. Zack completed a BS degree in Dairy Science in 2018 and a MS degree in Animal Science in 2020 at Virginia Tech. Under the mentorship of Dr. Alan Ealy and Dr. Vitor Mercadante, Zack investigated the effects of supplementing in vitro produced bovine embryos with interleukin-6 and followed post-transfer embryonic and placental development of these pregnancies throughout the first 70 days of gestation. In August 2020, Dr. Seekford moved to the University of Florida to complete his PhD training under the mentorship of Dr. John Bromfield. During his PhD, he studied how uterine diseases such as metritis and endometritis together with inflammation on a cellular level perturb reproductive function in dairy cows. His research specifically focused on investigating the molecular and cellular impacts of inflammation on ovarian and uterine function, as well as embryonic development. Using both clinical and cell culture models he investigated whether inflammatory insults to ovarian granulosa cells could be carried over to luteal cells following ovulation and subsequent luteinization. Results from the clinical study revealed that occurrence of uterine diseases during periods of follicle and corpora lutea development negatively impacted the prospective size and steroidogenesis of these structures. His in vitro research also demonstrated that acute inflammation to granulosa cells reduced progesterone secretion during early luteinization by modifying extracellular cholesterol uptake, lipid droplet accumulation, and mitochondrial number. Lastly, using an induced uterine infection model coupled with ovum pickup, in vitro fertilization and RNA sequencing, Dr. Seekford identified novel genes changed following bacterial contamination in the uterus and demonstrated that blastocysts developing from oocytes collected from cows with bacterial infection have reduced developmental competence for pregnancy. Findings from his doctoral studies have been published in *Theriogenology* and *Reproduction,* with several papers still in review. In June of 2024, Dr. Seekford moved to College Station to continue his training as a postdoctoral research associate. Currently, his research explores the relationships between pregnancy associated glycoproteins (PAGs), prostaglandins and their potential roles in modulating the maternal immune system during pregnancy. In a preliminary study conducted in the fall, whole blood was collected from estrus synchronized, nulliparous beef heifers and challenged with various placental secreted products. Following the culture period, conditioned plasma was collected for quantification of various cytokines and chemokines (**Figure. 1**). Results from this study suggest that prostaglandin F2α and interferon tau (IFNT) reduce the secretion of macrophage inflammatory protein (MIP) 1α, tumor necrosis factor alpha (TNFA), and vascular endothelial factor A (VEGFA) from peripheral blood leukocytes (**Fig. 2A, 2C, 2D**).

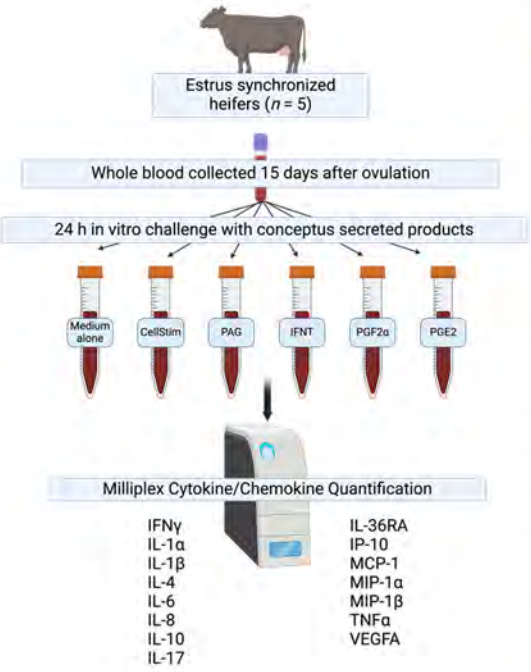

Figure 1. Experimental model to investigate effects of conceptus secreted products on peripheral blood cytokine and chemokine release. Nulliparous beef heifers (n = 5) were estrous synchronized and whole blood was collected 15 d after ovulation. Whole blood was challenged in vitro for 24 h and conditioned plasma was collected for quantification of 15 cytokines and chemokines using a Milliplex cytokine/chemokine magnetic bead assay.

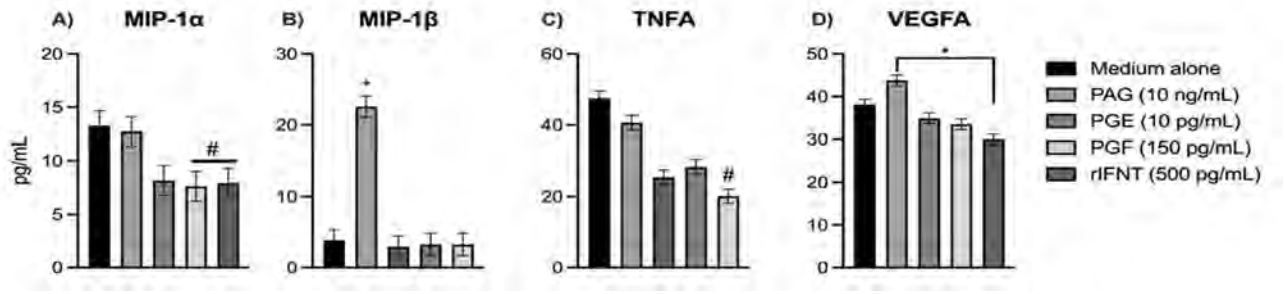

Figure 2. Cytokine and chemokine secretion following 24 h in vitro challenge and quantification with Milliplex magnetic bead assay. A) Whole blood challenged with PGF and IFNT tended to reduce the secretion of MIP-1α compared to control. B) Whole blood challenged with PAG had increased secretion of MIP-1β compared to all other treatments. C) Whole blood challenged with IFNT tended to have reduced secretion of TNFA compared to control. D) Whole blood challenged with IFNT had reduced secretion of VEGFA compared to PAG. * denotes a statistically significant effect (P < 0.05) while # denotes a statistical tendency (P < 0.10).

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TEXAS A&M UNIVERSITY

IFRB Trainee News

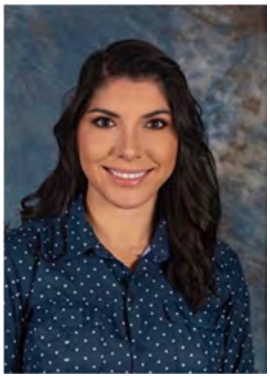
Frontiers in Reproduction Course: Molecular and Cellular Concepts and Applications

http://www.mbl.edu/fir/
Course Date: Apr 27, 2025 - Jun 08, 2025

Submission Deadline: January 13, 2025

Course Director: Daniel Bernard, McGill University

RECENT GRADUATES



***Viviana Garcia** earned a Ph.D. degree in Physiology of Reproduction under the mentorship of **Drs. Rodolfo Cardoso** and **Gary Williams** in December 2024. Her dissertation title was, "Impacts of pre- and postnatal nutrition on reproductive neuroendocrine function in heifers: basal gonadotropin secretion, estradiol feedback, and KNDy neuron responsiveness". Viviana is now a Postdoctoral Research Fellow in the Division of Endocrinology, Diabetes, and Hypertension at Harvard Medical School with the Brigham and Women's Hospital in Boston, MA under the mentorship of Dr. Ursula Kaiser.

***Lacey Quail** completed a Physiology of Reproduction Ph.D. Degree in March 2024 with **Dr. George Perry.** Her dissertation title was "The impact of preovulatory estradiol on the oviductal and uterine environments, and profit per pregnancy associated with estrus detection." She is currently Extension Livestock Management Specialist at North Dakota State University.

***Jaclyn Ketchum** completed a Physiology of Reproduction Ph.D. Degree in March 2024 with **Dr. George Perry.** Her dissertation title was "The impact of sperm borne epigenetic marks on bull fertility and early embryo development" She has returned to her family operation (Milk Creel Reds) in Plevna, Montana where she is managing/expanding their Red Angus cattle business.

***Joe Cain completed** his Biomedical Sciences Ph.D. degree under the mentorship of **Dr. Greg Johnson** and **Dr. Heewon Seo** in December 2024. His dissertation was titled: "Transport mechanisms used by the porcine conceptus for Interferon Gamma-mediated communication, and SPARC expression in the mouse decidua, placenta, and fetus."

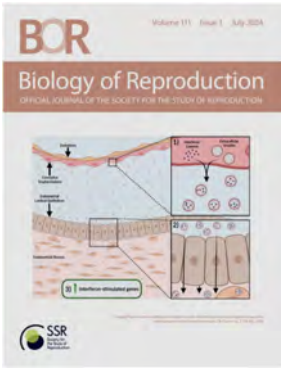
***Carlie Lefevre,** completed a Biomedical Sciences M.S. degree working with **Dr. Greg Johnson** in May 2024. The title of her thesis was "Evidence for metabolism of creatine by the conceptus, placenta, and uterus for production of ATP during conceptus development in pigs." She is currently working on her DVM degree at Texas Tech University School of Veterinary Medicine..

AWARDS AND HONORS

***Viviana Garza,** Ph.D. recipient in Physiology of Reproduction, under the mentorship of Drs. Rodolfo Cardoso and Gary Williams was awarded a 2024 Burroughs Wellcome Fellowship through the Society for the Study of Reproduction. Viviana also was the 2024 recipient of the Dr. A.M. Tony Sorenson Jr. Achievement Award.

***Dallas Soffa,** PhD student with **Dr. Rebecca Poole**, was the recipient of a USDA-NIFA Predoctoral Grant (#2024-67011-42913) titled "Examining Reproductive Microbiome and Embryonic Loss from Embryo Transfer in Heat Stressed Cattle". She also placed 1st in the 3MT PhD Student Competition at the 2024 Southern Section for the American Society of Animal Science meeting, and was awarded a 2024 Student Scholarship Award from the American Embryo Transfer Association."

***Joe Cain, Ph.D.** placed second in the Trainee Research Award Poster Competition at the 57th Annual meeting of The Society for the Study of Reproduction in Dublin, Ireland. His poster was titled "Pig conceptuses utilize extracellular vesicles for interferon gamma-mediated communication with the endometrium".



Joe's recent paper in Biology of Reproduction was selected for the Cover Image of Biol Reprod Vol 111, Issue 1 for his work entitled "Pig conceptuses release extracellular vesicles containing IFNG for paracrine communication with the endometrium. " Biol Reprod, 2024, 111:174-185.

(continued on page 9)

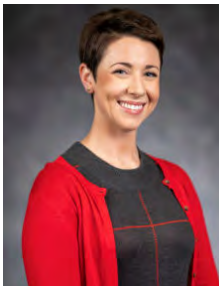
IRFB Faculty Activities, Awards, etc.

NEW GRANTS:

***Drs. Heewon Seo PI, G.reg Johnson Co-PI, K. Pohler Co -PI, Robert Burghardt Co-PI** received a USDA/ AFRI 2024, Early placental development in cattle, , $650,000.

***Drs. Lacey Luense, PI, and Ky Poehler Co-PI,** received a NIH R01, 2024, "Contribution of the paternal histone epigenome to embryo development and pregnancy loss, 8/2/24 – 7/31/29, $1,652,006.

***Dr. Brett Michell is Co-PI** on a T32: NHLBI, 2024-2029, "LYMphatics in Pathology and Health (LYMPH) Training Program."



***Dr Rebecca Poole** was selected for a Society for the Study of Reproduction, Emerging Investigator Grant of $10,000 for the project titled "Unraveling the influence of estradiol on reproductive tract microbiota and fertility in beef cattle."

***Dr. Yatta Boakari, Yatta Boakari, Laurent Gautron, Erica Macon,** received a 2024 -2025 UT Southwestern CTSA program partner award titled "Transcriptional profiling of the obese uteri."

Dr. Yatta Boakari, PI and Co-PIs: Hossam El-Sheikh Ali, Erica Macon, Nancy Ing, Claudia Fernandes received an internal grant from the project titled "Discovery of altered endometrial gene expression in mares with equine metabolic syndrome" from the Department of Large Animal Clinical Sciences.

AWARDS & HONORS:

***Dr. Fuller W. Bazer** was selected as recipient of the Marshall Medal in 2024 and will present a lecture and receive the Marshall Medal on January 8, 2025 at the Fertility 2025 meeting in Liverpool, England. Fertility 2025 is a joint meeting between the British Fertility Society, Association of Research and Clinical Scientists, and Society for Reproduction and Fertility.

***Dr. Guoyao Wu** was the recipient of a 2024 Top Agri-Food Pioneer Award, World Food Prize Foundation in the area of Livestock Nutrition. The recognition notes that he is renowned for his pioneering research in amino acid metabolism. His work has greatly advanced the understanding of how amino acids affect growth, development, and health in both livestock and humans. The award recognizes his research which spans key areas such as reproduction, lactation, and fetal development, with significant implications for improving animal production and human nutrition. He is also recognized for his innovative contributions to nutritional biochemistry, making a lasting impact on the fields of animal and human health.

***Dr. Greg Johnson** was an invited speaker January 11, 2024, Placentation in Ruminants, Fetal Growth and Placental Function Session, 50th Annual Conference of International Embryo Technology Society, Denver, Colorado, USA , and at the Dr. Robert A. Godke Translational Reproductive and Developmental Biology (TRDB) Seminar Series, Louisiana State University, Baton Rouge, Louisiana., January 2024 where he presented, "Understanding placentation in livestock."

Dr. Johnson was also an invited speaker November 17, 2024 at the Warnick Lecture Series, University of Florida, Gainesville, Florida where he presented "Where are we now with conceptus elongation, implantation, and placentation in livestock, "

Dr. Johnson, served as Session Chair, Fetal-Maternal Interactions on Pregnancy Outcomes, Mammalian Reproduction Gordon Research Conference, Barcelona, Spain. In July, 2024.

Drs. Greg Johnson and Ky Pohler participated in a 2024 Podcast, "Conceiving the Future for the Society for the Study of Reproduction, Challenging Scientific Dogma.

***Dr. Brett Mitchell** was an invited presenter at American Society of Nephrology Kidney Week, Lymphatics and Immune Cell Activation in Cardiorenal Disease, October 25, 2024 The title of his presentation was "Lymphatics and the Renin-Angiotensin System."

***Dr. Rebecca Poole** participated in a the Cattle HQ Podcast titled "The Research and Impact of Uterine Microbiome on Livestock Fertility" and available on Spotify on October 15th, 2024.

***Dr. Lacey Luense** was an invited speaker at the Plant and Animal Genomics annual conference in San Diego, CA, January 2024. Her talk was titled, "Investigating the effects of an abnormal sperm histone retention on preimplantation embryo development."

***Dr. Yatta Boakari** was the Richard H. Davis Teaching Award; College of Veterinary Medicine and Biomedical Sciences, The award honors early-career faculty members who possess enthusiasm, and excellent teaching ability, and create a positive teaching environment.

***Dr. Terje Raudsepp** had several invited presentations in 2024 including a Plenary presentation, "The Alpaca: from Chromosomes to DNA Sequence". III International Seminar on Sustainable Production of South American Camelids. July 10-12, National Agricultural University La Molina, Lima, Peru.

IRFB Trainee News continued from page 7

***Ashton Dodd** (*see Graduate Student Spotlight, page 14*) was the recipient of the John and Judy Northcut Fellowship through the Department of Animal Science.

***Carli Lefevre,** received the 3rd place award for a Poster Presentation, at the 29th Annual Texas Forum for Reproductive Sciences, Dallas, Texas.

***Sophia Marchio, DVM,** was elected as Vice-president for the VMBS-PDA Executive Committee (2024-2025). Sophia was the recipient of a Texas A&M University Walter W. Lechner Estate Scholarship and designation as a Lechner Scholar. Sophia also was selected for an oral presentation at the American Association of Equine Practitioner's in Orlando, Florida. The title of her presentation was "Review of Pituitary Pars Intermedia Dysfunction Effects on Mare Reproductive Performance."

NEW TRAINEES

***Thainá Minela** is a veterinary medicine graduate from the Federal University of Santa Maria, Brazil. Thainá joined **Drs. Greg Johnson's** and **Ky Pohler's** laboratories in July, as a postdoctoral associate. See Postdoctoral Spotlight article page 13.

***Dr. Zachary (Zack) Seekford** is a postdoctoral research associate in the laboratories **of Drs. Ky Pohler and Dr. Cliff Lamb.** (see Postdoctoral Spotlight article page 6.

***Indira P. Saravanan** is a new trainee working on her Ph.D. in Biomedical Sciences with **Dr. Sakhila Banu** since Spring, **2024** She received her B. Tech in Biotechnology from Kalasalingam University, India. Her goal is to investigate the adverse effects of hexavalent chromium on female reproduction, focusing on how Cr(VI) exposure impairs placental growth, development, and function, leading to fetal growth restriction and preterm labor. Indira will utilize 10X Genomics and bioinformatics techniques (single-nucleus sequencing (SnSeq) or single-cell RNA sequencing) to study the cell populations impacted by chromium exposure. She aspires to contribute to the field of women's reproductive health.

***Haley Weidman** is a first-year M.S. student in Physiology of Reproduction with **Dr. George A. Perry** at the Texas A&M AgriLife Research Center in Overton, Texas. Haley is from Pennsylvania where she received her Bachelor of Science in Animal Science from The Pennsylvania State University in May 2024. Haley's research will focus on the immune response and cytokine profile of vaccination on luteal function in Bos indicus cattle. After the completion of her program, she hopes to pursue a career in extension.

***Elizabeth Moore**, is a new trainee in the laboratory of **Dr. Fuller W. Bazer**. She received a B.S. Animal Science from Kansas State University. Her research will investigate expression of genes in the pathway for glycolysis/fructolysis in ovine conceptuses during the peri-implantation period of pregnancy, as well as effects of lactate on proliferation, migration and gene expression by ovine trophectoderm cells in vitro. (continued on page 23)

***Sierra Stephens** is a new trainee in the laboratory of Dr. Lacey Luense working on a Master of Science in Physiology of Reproduction in the Department of Animal Science. Her project will examine the effect of low-fertility sperm on the epigenome of preimplantation bovine embryos. Sierra received her bachelor's degree in animal science from Colorado State University before working for two years in the cattle reproduction industry. She is originally from Blackjack, Texas, where she was raised on a small, family-run cattle ranch.

***Hailey Anderson** is a new trainee in the laboratory of Dr. Terje Raudsepp in the Biomedical Sciences PhD program. Her research program is focused on the Genomics of equine disorders of sex development and reproduction.

***Kira Sayre** is a first-year M.S. student in Physiology of Reproduction under the guidance of Dr. Thomas Welsh (Animal Science) and Dr. George Perry (AgriLife Research-Overton). Kira is from Illinois and received her Bachelor of Science degree in Animal Science and Equine Science from Colorado State University in May 2023. Kira's two initial research projects focus on 1) ovarian neurohormone production in cattle and 2) immuno-endocrine links in foals. After completion of her degree, she plans to pursue a career in academia.

***Megan Ohrt** is a new trainee in the laboratory of Dr. Nancy Ing working on a M.S. degree in the Physiology of Reproduction. Her research is focused on the impact of dietary arginine on the function of stallion spermatozoa. She is from Victoria, Texas and received a B.S. degree in Animal Science in 2023. Following the completion of her M.S. degree she intends to seek a career as an embryologist and continue to pursue research in reproductive biology.

A Snapshot of IFRB Research, 2024

The IFRB is recognized as one of the most productive interdisciplinary research and education programs in reproductive biology in the U.S. The following "snapshot" of publications illustrates the multiple investigator research activities of the IFRB, involving extensive participation of trainees during 2024:

Abbey CA, Duran CL, Chen Z, Chen Y, Roy S, Coffell A, Sveeggen TM, Chakraborty S, Wells GB, Chang J, Bayless KJ. Identification of new markers of angiogenic sprouting using transcriptomics: New role for RND3. Arterioscler Thromb Vasc Biol . 2024 May;44(5):e145-e167. doi: 10.1161/ATVBAHA.123.320599.

Affonso FJ, Alonso MA, Bringel B, Douglas R, de Paula Nogueira G, Boakari YL, Fernandes CB. The influence of lactation on insulin and glucose metabolism, lipid profile, and cytokines in pregnant mares. Theriogenology. 2024 Dec;230:107-114. doi: 10.1016/j.theriogenology.2024.09.003. Epub 2024 Sep 10. PMID: 39293172

Arneson AG, Stewart JW, Byrd MH, Perry GA, Rhoads ML. Plasma γ-aminobutyric acid (GABA) concentrations in lactating Holstein cows during thermoneutral and heat stress conditions and their relationships with circulating glucose, insulin and progesterone levels. Vet Sci. 2024 Mar 21;11(3):137. doi: 10.3390/vetsci11030137. PMID: 38535871; PMCID: PMC10975163.

Ahmad I, Gupta S, Faulkner P, Mullens D, Thomas M, Sytha SP, Ivanov I, Cai JJ, Heaps CL, Newell-Fugate AE. Single-nucleus transcriptomics of epicardial adipose tissue from female pigs reveals effects of exercise training on resident innate and adaptive immune cells. Cell Commun Signal. 2024 Apr 6;22(1):243. doi: 10.1186/s12964-024-01587-w. PMID: 38671495; PMCID: MC11046969.

Baker EC, Riley DG, Cardoso RC, Hairgrove TB, Long CR, Randel RD, Welsh TH Jr. Assessment of prenatal transportation stress and sex on gene expression within the amygdala of Brahman calves. Biology (Basel). 2024 Nov 11;13(11):915. doi: 10.3390/biology13110915. PMID: 39596870

Basanta S, Stadtmauer DJ, Maziarz JD, McDonough-Goldstein CE, Cole AG, Dagdas G, Wagner GP, Pavličev M. Hallmarks of uterine receptivity predate placental mammals. bioRxiv [Preprint]. 2024 Nov 6:2024.11.04.621939. doi: 10.1101/2024.11.04.621939. PMID: 39574771

Basel A, Bhadsavle SS, Scaturro KZ, Parkey GK, Gaytan MN, Patel JJ, Thomas KN, Golding MC. Parental Alcohol Exposures Associate with Lasting Mitochondrial Dysfunction and Accelerated Aging in a Mouse Model. Aging Dis. 2024 Jul 27. doi: 10.14336/AD.2024.0722. PMID: 39122451

Bazer FW, Wu G and Johnson GA. Fructose metabolism is unregulated in cancers and placentae. Exp Biol Med, 2024, 249:10200.

Bazer FW and Johnson GA. Early embryonic development in agriculturally important species. Animals, 2024, 14:1882.

Bazer FW, Geisert RD. Pregnancy and parturition. Encyclopedia of Reproduction, 2nd Edition, Vol 2, pp (in press)

Bazer FW and Johnson GA. Allantois. 2024. In M. K. Skinner (Ed.), Encyclopedia of Reproduction. Academic Press: Elsevier, (in press).

Bhadsavle SS, Scaturro KZ, Golding MC. Maternal 129S1/SvImJ background attenuates the placental phenotypes induced by chronic paternal alcohol exposure. Reprod Toxicol. 2024 Jun;126:108605. doi: 10.1016/j.reprotox.2024.108605. Epub 2024 May 10. PMID: 38735594

Brandão AP, Donaldson JP, Dunlap KA, Wiegert JG, Kao S, Paudyal S. Design thinking for engaged learning in animal science: lessons from five semesters of a senior capstone course. Transl Anim Sci. 2024 Feb 15;8:txae020. doi: 10.1093/tas/txae020. PMID: 38572174; PMCID: PMC10990053.

Bugno-Poniewierska M, Jankowska M, Raudsepp T, Kowalska K, Pawlina-Tyszko K, Szmatola T. Molecular cytogenetic screening of sex chromosome abnormalities in young horse populations. Equine Vet J. 2024 Jul;56(4):786-795. doi: 10.1111/evj.14097. Epub 2024 May 24. PMID: 38785417

Cain JW, Seo H, Bumgardner K, Lefever C, Burghardt RC, Bazer FW and Johnson GA. Pig conceptuses release extracellular vesicles containing IFNG for paracrine communication with the endometrium. Biol Reprod, 2024, 111:174-185.

Cain JW, Lefevre C, Ross A and Johnson GA. Hormones and reproductive cycles in ungulates. In Hormones and Reproduction of Vertebrates. Eds. David O. Norris and Kristin H. Lopez. Academic Press. 2024.

Castillo SR, Simone BW, Clark KJ, Devaux P, Ekker SC. Unconstrained Precision Mitochondrial Genome Editing with αDdCBEs. Hum Gene Ther. IF: 3.9Q12024 Oct;35(19-20):798-813. doi: 10.1089/hum.2024.073. Epub 2024 Sep 24.

Clarke MT, Remesal L, Lentz L, Tan DJ, Young D, Thapa S, Namuduri SR, Borges B, Kirn G, Valencia J, Lopez ME, Lui JH, Shiow LR, Dindot S, Villeda S, Sanders SJ, MacKenzie TC. Prenatal delivery of a therapeutic antisense oligonucleotide achieves broad biodistribution in the brain and ameliorates Angelman syndrome phenotype in mice. Mol Ther. 2024 Apr 3;32(4):935-951. doi: 10.1016/j.ymthe.2024.02.004. Epub 2024 Feb 6. PMID: 38327047

Cushman RA, Akbarinejad V, Perry GA, Lents CA. Developmental programming of the ovarian reserve in livestock. Anim Reprod Sci. 2024 May;264:107458. doi: 10.1016/j.anireprosci.2024.107458. Epub 2024 Mar 19. PMID: 38531261.

Denis-Robichaud J, Oliveira AP, Sica A, Soriano S, Araújo RL, Pereira MHC, Pohler KG, Cerri RLA, Vasconcelos JLM. Is prolonged luteal phase a problem in lactating Holstein cows? J Dairy Sci. 2024 Oct;107(10):8582-8591. doi: 10.3168/jds.2024-24792. Epub 2024 May 23. PMID: 38788835.

Derry PJ, Liopo AV, Mouli K, McHugh EA, Vo ATT, McKelvey A, Suva LJ, Wu G, Gao Y, Olson KR, Tour JM, Kent TA. Oxidation of Hydrogen Sulfide to Polysulfide and Thiosulfate by a Carbon Nanozyme: Therapeutic Implications with an Emphasis on Down Syndrome. Adv Mater. 2024 Mar;36(10):e2211241. doi:10.1002/adma.202211241. Epub 2023 Jul 23. PMID: 37272655; PMCID: PMC10696138.

Dias NW, Poole R, Soffa DR and Brown KJH (2024) Dynamic principles of the microbiome and the bovine vagina: a review. Front. Microbiol. 15:1434498. doi: 10.3389/fmicb.2024.1434498

Dodd AR, Luense LJ. Contribution of the paternal histone epigenome to the preimplantation embryo. Front Cell Dev Biol . 2024 Nov 12:12:1476312. doi: 10.3389/fcell.2024.1476312.

Dudley JS, Renfree MB, Wagner GP, Griffith OW. The extension of mammalian pregnancy required taming inflammation: Independent evolution of extended placentation in the tammar wallaby. Proc Natl Acad Sci U S A. 2024 Oct 15;121(42):e2310047121. doi: 10.1073/pnas.2310047121. Epub 2024 Oct 8. PMID: 39378090

Dutta S, Lee J, Banu SK, Arosh JA. Dual inhibition of AKT and ERK1/2 pathways restores the expression of progesterone Receptor-B in endometriotic lesions through epigenetic mechanisms. Mol Cell Endocrinol. 2024 Oct 1:592:112290. doi: 10.1016/j.mce.2024.112290.

Dutta S, Sivakumar KK, Erwin JW, Stanley JA, Arosh JA, Taylor RJ, Banu SK. Alteration of epigenetic methyl and acetyl marks by postnatal chromium(VI) exposure causes apoptotic changes in the ovary of the F1 offspring. Reprod Toxicol. 2024 Jan:123:108492. doi: 10.1016/j.reprotox.2023.108492.

(continued on page 12)

IFRB Postdoctoral Trainee Spotlight

Dr. Thainá Minela is a veterinarian from Brazil (2017). She obtained her master's (2018-2020) and PhD (2020-2024) at Michigan State University, under the mentorship of Dr. Richard Pursley. She was trained in reproductive physiology and management of dairy cattle, with specific focuses on optimizing synchronization programs and timed artificial insemination (AI), understanding the physiology of luteolysis and early pregnancy, applying the use of monitoring systems for estrus detection, and expanding the use of pregnancy associated glycoproteins (PAGs) as markers of pregnancy establishment and viability.

Dr. Minela is currently a postdoctoral research associate in the laboratories of Dr. Greg Johnson and Dr. Ky Pohler. She is leading projects outlined on the USDA proposal #2023-08342 "Early Placental Development in Cattle". At the onset of placentation, preliminary observations by Seo and collaborators (2024) demonstrated a complete disruption of the luminal epithelium driven by PAG-positive trophoblast cells. This pioneering study raised many new questions regarding the physiology of placentation in cattle. More importantly, the necessity of describing "normal" synepitheliochorial placentation in cattle has become a priority. Overall, this proposal aims to characterize early placentation events in cattle utilizing novel techniques including single-cell RNA sequencing, laser capture microdissection, and immunohistochemistry of the placental interface at different stages of gestation. Dr. Minela will start collecting these data starting Fall 2025.

Dr. Minela is also interested in the associations of PAGs and early pregnancy loss in lactating dairy cows. In 2019, Dr. Pursley's laboratory began exploring within-cow profiles of pregnancy specific protein B (PSPB, a PAG) as a model to capture early pregnancy establishment and viability. Alongside her peers, she was involved in the collection of daily samples from ~2,800 lactating dairy cows, surpassing 33,500 blood samples in 8 randomized controlled trials. The characterization of within-cow daily PSPB concentrations revealed that delayed PSPB increase in maternal circulation (Figure 1A) and decreased PSPB concentrations (Figure 1B) were phenotypes highly incompatible with successful pregnancy.

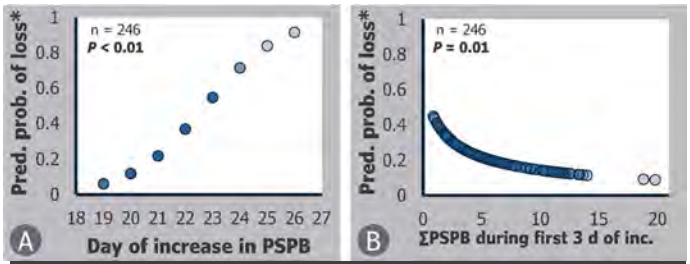


*Figure 1. Predicted probability of pregnancy loss in lactating dairy cows that received first service following the Double-Ovsynch program. *Pregnancy loss was estimated between the initial PSPB increase up to 62 days post-AI. Probabilities were estimated in relation to day of increase in PSPB (A) and summation of PSPB concentration during the first 3 days of continuous increase in PSPB (B).*

In collaboration with MSU, a subset of multiparous lactating dairy cows were selected to further characterize associations between PAG (PAG-21 specifically) and pregnancy outcomes. All selected cows (n = 68) received timed-AI during synchronization programs. Daily serum samples were collected between days 18 and 28 post-AI. The study was designed as a matched case-control study. "Cases" were cows that experienced pregnancy loss up to 36 days in gestation, while the matched "controls" maintained pregnancy during this period. Pregnancy status was diagnosed with ultrasound on days 33, 34 or 36 post-AI. To aid comparisons, non-pregnant cows (n = 8) were included in the analyses. This study aimed to investigate if other PAGs were risk factors for pregnancy loss in the selected population. The hypothesis was that decreased PAG-21 concentrations would be associated with pregnancy loss in multiparous lactating dairy cows.

When compared to non-pregnant cows, PAG-21 concentrations significantly increased in cows that lost or maintained pregnancy starting on day 26 post-AI. Cows that lost pregnancy had decreased PAG-21 concentrations between days 26 to 28 post-AI (Figure 2A) compared to cows that maintained pregnancy. The concentration of PSPB was greater in cows that lost or maintained pregnancy in comparison to non-pregnant counterparts starting on day 23 post-AI. On days 24 to 28 post-AI, cows that lost pregnancy had lower PSPB concentrations in comparison to cows that maintained pregnancy (*Figure 2B*).

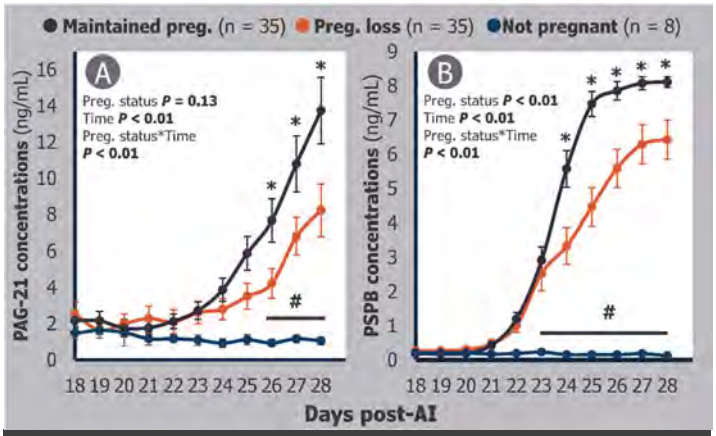


*Figure 2. Concentrations of PAG-21 (A) and PSPB (B) in multiparous lactating dairy cows that either maintained or lost pregnancy up to 36 days in gestation. The * denote P ≤ 0.04 for comparisons between maintained vs. lost pregnancy groups. The # denote P ≤ 0.03 for comparisons between maintained/lost pregnancy vs. non-pregnant cows.*

Overall, PAG-21 seemed to significantly increase in maternal circulation ~2 days later in comparison to PSPB. Nonetheless, PAG-21 concentrations were significant predictors of pregnancy loss on days 26, 27 and 28 post-AI (see Figure 3, page 16).

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Reproduction **Research Snapshot,** cont'd from page 10 Journal of ANIMAL SCIENCE

Eldridge LK, Soffa D, Hickman-Brown KJ, McAnally BE, Smith MS, Wiegert JG, Poole RK. Maternal versus environmental contributions to the piglet pioneer microbiome. Reprod Fertil. 2024 Jun 1;5 (3):e240009. doi: 10.1530/RAF-24-0009.

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Fiorenza MF, Bridi A, Dos Santos G, Rosa PM, Alves L, Ferst JG, Ferraz PA, Pugliesi G, Pohler K, Perecin F, Meirelles FV, da Silveira JC. Labeled extracellular vesicles can be found in the blood plasma shortly after intrauterine infusion in bovine. Anim Reprod. 2024 Aug 26;21 (3):e20240064. doi:10.1590/1984-3143-AR2024-0064. PMID: 39286366; PMCID: PMC11404864.

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Haimon MLJ, Estrada-Cortes E, Amaral TF, Martin H, Jeensuk S, Block J, Heredia D, Venturini M, Rojas CS, Gonella-Diaza AM, DiLorenzo N, Scheffler TL, Dufour P, Sirard MA, de Melo GD, Pohler KG, Hansen PJ. Provision of choline chloride to the bovine preimplantation embryo alters postnatal body size and DNA methylation. Biol Reprod. 2024 Sep 14;111(3):567-579. doi:10.1093/biolre/ioae092. PMID: 38857381.

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He W, Connolly ED, Cross HR, Wu G. Dietary protein and amino acid intakes for mitigating sarcopenia in humans. Crit Rev Food Sci Nutr . IF: 7.3Q12024 May 27:1-24. doi: 10.1080/10408398.2024.2348549.

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17th Annual IFRB Retreat, 2024

The 17th Annual IFRB Retreat was held on November 1 in conjunction with the 29th Annual Dr. Raymond O. Berry Memorial Lecture. Over 60 IRFB faculty and trainees from the School of Veterinary Medicine & Biomedical Sciences and Colleges of Agriculture and Life Sciences, Science and Medicine, along with Prairie View A&M (PVAMU) participated in the Retreat which was held at the Texas A&M **Institute for Preclinical Studies (TIPS) Auditorium. Drs. Rodolfo Cardoso and Rebecca Poole** presided over the meeting.

Three IFRB faculty members and six trainees provided platform research reports. Our new IFRB faculty member, **Dr. Carl Clark,** Associate Professor, Animal Science presented, "Methods of gene editing for functional and applied genetics in livestock."

Drs. George Perry, Professor Animal Science, presented "A molecular approach to male fertility" and **Dr. Dana Gaddy**, Professor, Veterinary Integrative Biosciences presented "Gene editing at RSL: Generating large animal models of human disease."

Trainee & research scientist presenters included:

Sanat Bhadsavle, Veterinary Physiology and Pharmacology (VTPP), "Epigenetic inheritance and the sperm: more than just a carrier of paternal DNA."

Dr. Sudipta Dutta, Veterinary Integrative Biosciences (VIBS), "The interactions of ERK1/2 and AKT pathways on PR-B regulation in endometriosis."

Jessica Monroe, Animal Science, Reproductive function characterization of F1 generation androgenized ewes."

Destani Derrico, Veterinary Physiology and Pharmacology (VTPP), "Mitigating the impact of paternal binge drinking on fetal alcohol spectrum disorders through antioxidant supplementation"

Brette Poliakiwski, Animal Science, "The physiological effect of inhibiting prostaglandins during the period of late embryonic development"

Karina Hissen, Veterinary Pathobiology (VTPB), "Glutamate effects on reactive oxygen species in intestinal mucosal leukocytes of juvenile hybrid striped bass."

Retreat participants also attended a trainee poster session that included from TAMU and PVAMU.

Support for the Annual IFRB Retreats and Dr. Raymond O. Berry Memorial Lecture Series was provided by Dr. Fuller Bazer and from and from VIBS, VTPP, Animal Sci, and Large Animal Clinical Sciences Departments.

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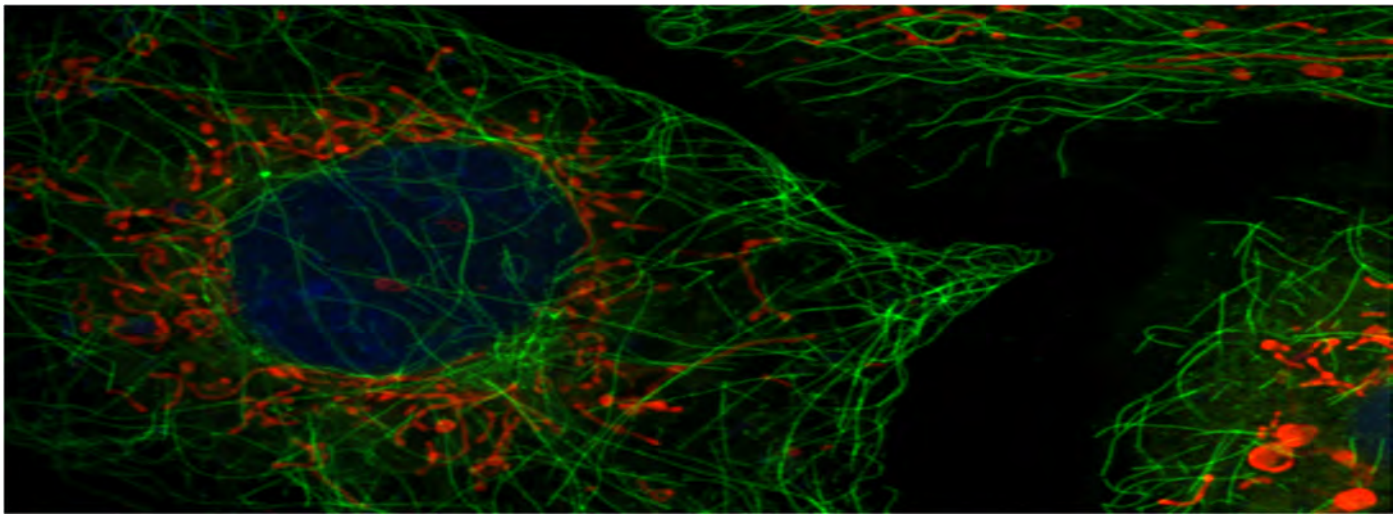
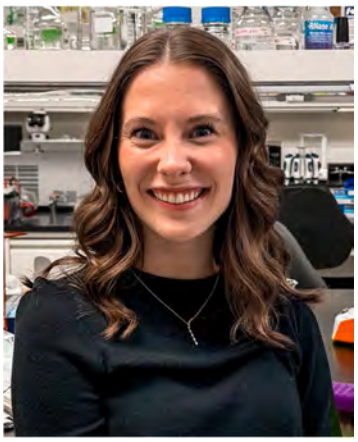
Registration is now open for the 30th Annual Texas Fourm for Reproductive Sciences Meeting.

This year's meeting will be held on April 10-11, 2025 at the Texas Children's Hospital Facility, Jan and Dan Duncan Neurological Research Institute, 1250 Moursund St. Houston TX 77030, Located next to the MD Anderson, Onstead Auditorium & across from John P. McGovern Texas Medical Center Commons. Plenary lectures given by Dr. Mariana Giassetti, PhD, Baylor University and Ramakrishna Kommagani, PhD, Baylor College of Medicine. For registration/abstract submission visit the TFRS web site: https://texasforumforreproductivesciences.org/



IFRB Graduate Student Spotlight



***Ashton Dodd** is a M.S. student in the Department of Animal Science mentored by **Dr. Lacey Luense**. She received her B.S. in Biomedical Sciences with a minor in Psychology from Texas A&M University in 2022. She began at Texas A& M as the first graduate student in Dr. Luense's lab in the Spring of 2022, where her research has focused on the paternal epigenome in cattle and subsequent effect on preimplantation embryo development. Ashton's project investigates the presence of activating post-translational histone modifications (PTMs) and associated chromatin modifying enzymes in the bovine testis and bovine preimplantation embryo. The unique process of histone eviction and protamine incorporation during spermatogenesis provides a distinct source of epigenetic regulation. Upon fertilization, this regulation may impact the function of the embryo. Resulting changes to the epigenetic landscape during the different stages of the preimplantation embryo development is vital to the transcriptional regulation of genes necessary for embryo viability and lineage differentiation. The addition of PTMs to histone tails is an essential mechanism of epigenetic regulation that alters chromatin accessibility and can induce or activate gene transcription. Histone acetylation, or the covalent attachment of acetyl groups to lysine residues of histone tails, activates transcription by opening the chromatin and allowing the binding of DNA polymerase and other transcription factors. In addition to the important role histone acetylation plays in the activation of transcription, hyperacetylation of histones in sperm during spermatogenesis elicits a unique mechanism whereby histones are evicted and replaced by protamines. Ashton's work, using immunofluorescence staining, characterizes histone acetylation throughout bovine spermatogenesis and tracks possible conservation of these PTMs through the cell cleavages of bovine preimplantation embryos. Ashton's current project characterizes multiple histone PTMs, including acetylation of lysine 27 on histone 3 (H3K27ac), H3K9ac, and H3K14ac. Immunofluorescence on paraffin embedded testis sections indicates that H3K27ac is localized to all stages of germ cells during spermatogenesis, including spermatogonial stem cells, spermatocytes, and spermatids. H3K27ac is also found in the nuclei of the bovine embryo at all stages of preimplantation embryo development. Continued work on identifying these histone acetylation PTMs will utilize IVF generated embryos collected and stained at the 2-cell, 4-cell, 8-cell, 16-cell, morula, and blastocyst stages of the preimplantation bovine embryo. Evaluating the normal patterning of PTMs offers information on potential biomarkers for assessing both embryo and sperm quality and viability and whether these epigenetic marks are conserved across species. Ashton has presented at the annual Society for the Study of Reproduction (SSR) and the Texas A&M Gene Editing Symposium (GES). She has served on the executive team as a Member at Large for the Animal Science Graduate Student Association (ASGSA), and is a continuing St. David's Neal Kocurek Scholar. She has served as a graduate teaching assistant for ANSC 108, ANSC 111, and ANSC 334. Ashton has enjoyed the opportunity to mentor undergraduate students in the lab and collaborate with other graduate students. In her free time, Ashton enjoys baking, reading, and traveling to new places with her spouse.

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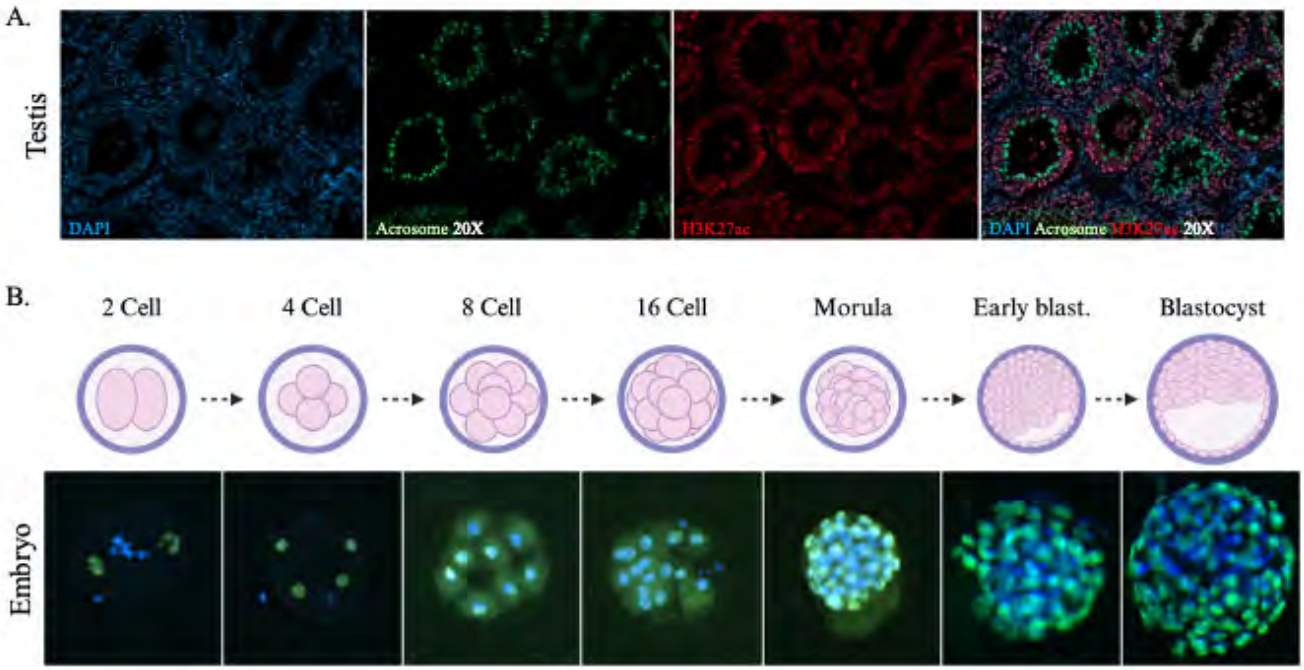

***Localization of acetylation of lysine 27 on histone 3 (H3K27ac):** (A) immunofluorescence staining for H3K27ac (red) and acrosome (green) in adult, bovine PFA fixed testis. (B) Schematic of bovine preimplantation embryo development above immunofluorescence staining analysis of correlating cell stage for H3K27ac (green). Nuclei are stained with DAPI for histologic reference. The use of Texas A&M University Image Analysis Laboratory (RRID): SCR_022479 is acknowledged. Graphical abstract was created using Biorender.*

Placenta

Research Snapshot, cont'd from page 12

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(continued on page 18

Postdoctoral Spotlights continued

Dr. Zach Seekford, continued from page 6

Moreover, PAGs appear to strongly increase secretion of the MIP-1β, suggesting a possible role for immune cell recruitment to the uterus during placentation. His ongoing work will investigate if the endometrial distribution and populations of immune cells, in particular, neutrophils, T cells, macrophages, and natural killer cells, change during placentation in cattle (**Fig. 3A and B**).

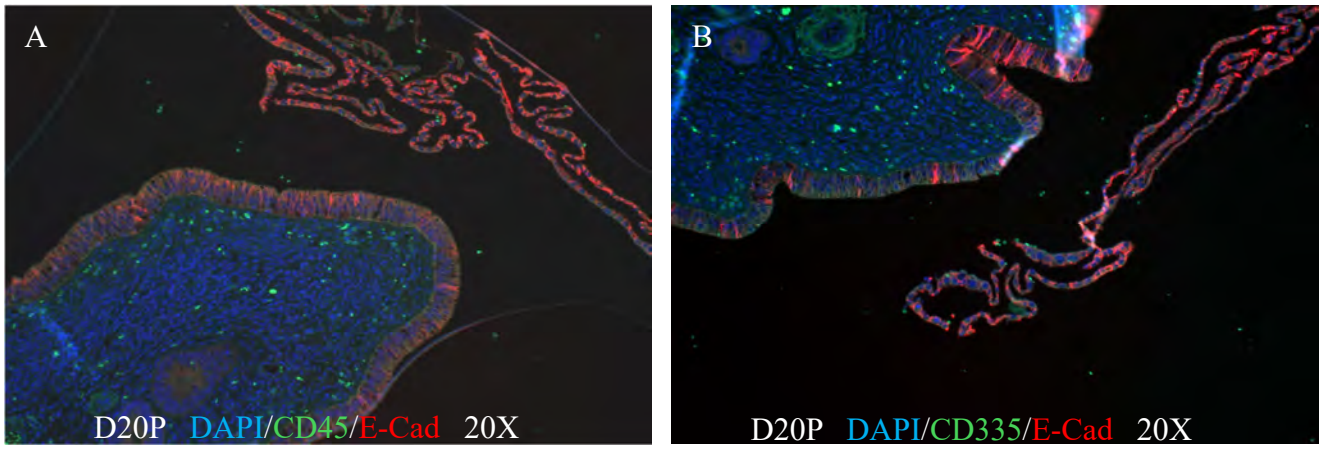

Figure 3. Immunofluorescence localization of immune cells within the day 20 pregnant bovine uterus. A) Immunofluorescence localization of total immune cells (CD45+), epithelial cells/trophectoderm (E-cadherin), and nuclei (DAPI). B) Immunofluorescence localization of natural killer cells (CD335+), epithelial/trophectoderm (E-cadherin), and nuclei (DAPI).

Lastly, Dr. Seekford submitted a USDA-NIFA-AFRI postdoctoral fellowship to study in greater depth the interactions between pregnancy, PAGs, and maternal immunomodulation. In this grant, Dr. Seekford proposed to use a single cell RNA sequencing approach to identify the molecular signature of immune cells within the caruncular endometrium during placentation in cattle. Furthermore, this grant aims to determine if PAGs alter the innate immune function of endometrial epithelial and luteal cells, collectively working to promote tolerance of the semi-allogenic pregnancy. While Dr. Seekford has only been in College Station a few months, he is incredibly enthusiastic to contribute to the robust research programs within the IFRB and is keen to continue building outstanding collaborations across the Texas A&M system.

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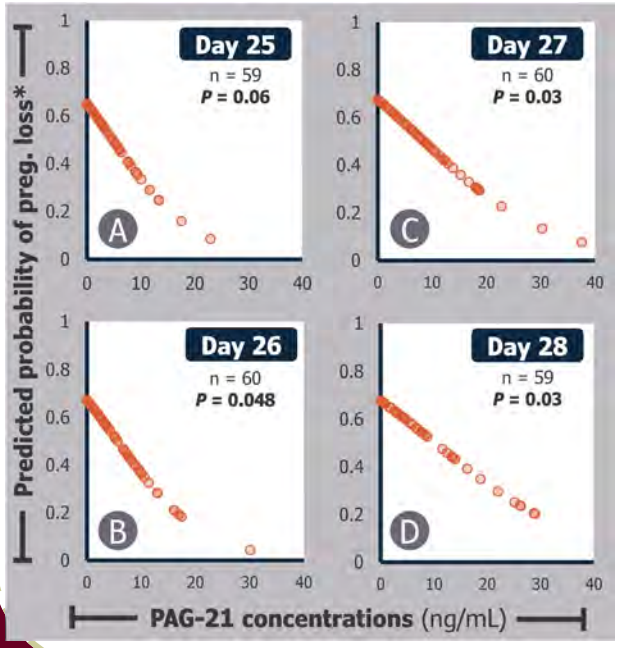

Dr. Thainá Minela continued from page 13

Figure 3. Predicted probabilities of pregnancy loss in multiparous lactating dairy cows. Logistic regression models utilized PAG-21 concentrations on days 25 (A), 26 (B), 27 (C) and 28 post-AI (D) as a predictor of pregnancy loss. *Pregnancy loss was estimated between the initial PSPB increase up to 36 days post-AI".

These results reiterate that quantifying PAGs in maternal circulation can be a powerful tool to predict pregnancy fate. Divergent PSPB and PAG-21 profiles suggest a regulatory role involving their temporal release and further suggest that different members of the PAG family play distinct physiological roles during early gestation in cattle. A later increase in PAG-21 concentrations in maternal circulation, concurrent with the period of placentation onset, suggests PAG-21 as an important biological marker for proper placenta development and function. The identified profiles of PSPB/PAG in maternal circulation may be a snapshot of in-utero events such as conceptus attachment, remodeling and disruption of the luminal epithelial led by PAG-positive cells. A phenotype of insufficient PAG reaching maternal circulation may be an indicator of insufficient remodeling of the maternal interface which is likely incompatible with placental morphogenesis.

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In Memoriam

***Qinglei Li, Ph.D., Professor of Reproductive Biology in the Department of Veterinary Integrative Biosciences, College of Veterinary Medicine, Texas A&M University, and member of the Interdisciplinary Faculty of Reproductive Biology at Texas A&M University, passed away on April 1, 2024. He was 53 years of age.**

Qinglei focused on the creation of novel mouse models that harbor genetic modifications of critical transforming growth factor β (TGFβ) signaling components using conditional loss-of-function and gain-of-function approaches in the uterus. These models yielded novel insights into the fundamental roles of TGFβ signaling in reproductive tract development and function. He also developed preclinical mouse models for both ovarian granulosa cell tumor and endometrial cancer, which is the most common gynecologic cancer in the US. Qinglei grew up near Qingdao, China. He received a B.S./M.D. degree in Clinical Medicine form Binzhou Medical College, China, in 1994. M.S. and Ph.D. degrees followed in 1997 and 2001 in Pathophysiology and Physiology respectively, from Harbin Medical University, China. Qinglei then completed three Postdoctoral Fellowships; from 2001 through 2003 at the State Key Laboratory of Reproductive Biology within the Institute of Zoology, Chinese Academy of Sciences, a second fellowship from 2003 through 2005 at the Laboratory of Mammalian Reproductive Biology and Genomics within the Department of Animal Science at Michigan State University under the supervision of Dr. George W. Smith, and lastly from 2005 through 2010 in the Martin Matzuk Laboratory within the Department of Pathology at Baylor College of Medicine. Qinglei was appointed Assistant Professor in 2011, Associate Professor in 2017, and Professor in 2023, all at Texas A&M University. His contributions to the field of reproductive biology have been recognized with honors including the 2017 Outstanding Research Achievement Award from the Texas A&M University College of Veterinary Medicine, a 2014 Outstanding Reviewer Award for Molecular Human Reproduction, the 2013 Ralph E. Powel Junior Faculty Enhancement Award from Oak Ridge Associated Universities, and charter membership on the NIH Study Section – Cellular, Molecular and Integrative Reproduction (CMIR). Qinglei was invited to give formal presentations at over 20 Institutions and/or Conferences. He served Texas A&M University through his membership on the Executive Committee and role as Chair of the Interdisciplinary Faculty of Reproductive Biology. Colleagues describe Qinglei as kind, generous, humble, thoughtful, hard-working, and dependable. Qinglei was a perfectionist, as can be seen by the very high quality of the manuscripts that he published. He was an enthusiastic, ambitious, and effective instructor both in the classroom and in the laboratory, and his talent for graduate training was admired by all who knew his trainees. Qinglei was an active participant at our annual TFRS meeting where he was a long-term member of the Steering Committee. He was also a passionate family man with two daughters.

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***Mark E. Westhusin, Ph.D., Professor of Physiology & Pharmacology, College of Veterinary Medicine, Texas A&M University, and member of the Interdisciplinary Faculty of Reproductive Biology at Texas A&M University.**

On May 21, 2024 we lost a most unique friend and faculty member with the tragic passing of Dr. Mark Westhusin. His scientific achievements were numerous and important but were second to the great amount of joy and enthusiasm he brought to every project. Mark started his scientific discovery and his A&M journey as a graduate student under the direction of Dr. Duane C. Kraemer and finishing his PhD in 1986. After five years innovating in the private sector, Mark joined the faculty of the College of Veterinary Medicine & Biomedical Sciences in 1992. His research contributed to major advancements in cloning and other assisted reproductive technologies and brought incredible notoriety to the University. Mark loved to work as a team and collaborated with many top investigators locally and around the world. Those successes continue to have major impacts on the field today. Mark and his colleagues were responsible for some of the world's firsts in the field of animal cloning and included the world-famous cat, CC and white-tailed deer, Dewey. Mark's extraordinary achievements were innovative and impactful, as recognized by numerous honors, including the National Institutes of Health Director's Award, Pfizer Research Award, and the prestigious Distinguished Achievement Award for Research from the Texas A&M University Association of Former Students. His scientific imagination had no boundaries, and he was well known by all his colleagues (and students) to aggressively propose radical ideas, some of which surprisingly worked. All his collaborators would agree that the best part of a project with Mark is the fun you would have while you worked side by side, in the field, the lab, or the operating room. Although Mark was one of the world's most internationally respected reproductive scientists, science for him was not a job, it was exciting and full of laughter with endless enthusiasm for the project at hand. He had the same passion for living a life full of adventures and he was overly successful in that as well. He loved being outdoors hunting and fishing with his friends and family and was looking forward to a retirement where he could devote his full attention to those adventures. We will miss so many things when we think of Mark; his loud voice, his thoughtful insights, his hunting and fishing stories, his last-minute chaotic scramble to meet a grant deadline, his honesty and integrity, his crazy ideas, his pride for his children, his lack of a filter from his brain to this mouth, his excitement for discovery, and most of all, his unwavering friendship. Thank you Mark for enriching our lives with so many great memories. - Chuck Long

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Research Snapshot, cont'd from page 15

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Biology of Reproduction

Research Snapshot, continued

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57th SSR Annual Meeting, Dublin, Ireland

2024 American Society for Animal Science, Oklahoma City, OK

The 57th Society for the Study of Reproduction (SSR) Annual Meeting was held Jul 15– 19, 2024 in Dublin, Ireland. .The theme of the meeting was: "Evolution of Reproductive Sciences. Where Should We Go? This year 20 trainees and 12 IFRB Faculty contributed to presentations at the annual meeting.

The 58th Society for the Study of Reproduction (SSR) Annual Meeting will be held in Washington, D.C., from July 29 to August 1, 2025. This year's theme, "Uniting Scientific Disciplines for Breakthroughs in Reproduction," The meeting will be held at the Washington D.C. Marriott Marquis.

The 2025 Program Committee is accepting abstracts for the SSR 58th Annual Meeting beginning January 2025 reporting new basic, clinical, and/or translational research findings in the field of reproduction. The deadline to submit an abstract is Saturday, February 15, 2025.

The 2024 American Society for Animal Science meeting was held in conjunction with CSAS and WSASAS at the Calgary TELSIS Convention Center in Alberta, Canada July 21-25, 2024. The 2024 program listed over 160 presentations from Texas A&M University faculty and trainees. Four Texas A&M Professors were the recipients of the major 2024 American Society of Animal Science Award including **Dr. Ronald D. Randel** for the 2024 Morrison Award, **Dr. Gary L. Williams** for the L.E. Casida Award for Excellence in Graduate Education in Reproductive Physiology, **Dr. Reinaldo F. Cooke** for the 2024 Bouffault International Animal Agriculture Award, and **Dr. Andy D. Herring** for the 2024 Animal Management Award.

The 2025 American Society for Animal Science Annual Meeting & Trade Show will be held, July 5-10, 2025 in conjunction with the Canadian Society of Animal Science at the Diplomat Beach Resort in Hollywood, Florida. Abstract submission is currently open and the deadline for abstracts is March 18, 2025 at 3:00 PM CT.

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IFRB RESEARCH AND TRAINING MISSION:
Reproductive Biology is at the epicenter of the life sciences. Focal areas of research and graduate/postdoctoral training in the IFRB are interdisciplinary and cover both genders, encompass humans, domestic animals, laboratory animals and wildlife, and include: assisted reproductive techniques, biological clocks, cloning, conservation of endangered species, contraception, developmental biology, diseases of the reproductive tract, endocrinology, fertilization, fetal growth retardation, gametogenesis, gender-biased diseases and health issues, immunology, infertility, lactation, pregnancy and pregnancy-related disorders, premature labor, recovery of function, science and health policy, stem cell biology, systems biology and functional genomics, toxicology, and uterine biology. The outcomes of this research are impacting Texas, our nation and the world.