

IFRB 2022

POINTS OF INTEREST:

- The IFRB was organized in 1992 and is one of the largest Reproductive Biology Programs in the US
- Membership includes 39 faculty from 9 departments, 4 colleges and 2 system components
- IFRB sponsored activities: 27th Annual R.O. Berry Lecture, 32 year old IFRB Repro Forum Seminar Series, 27th Texas Forum on Reproductive Sciences, and 15th Annual IFRB Retreat

INSIDE THIS ISSUE:

New IFRB Faculty Spotlights	1,3 & 6
IFRB Seminar Series	5
IFRB Trainee News	7
IFRB Faculty News	8
TFRS	9
IFRB Research	10
27th Raymond O. Berry Lecture	11
IFRB Graduate Student and Post-doc Spotlights	13,14 & 16
Faculty Activities	14
Faculty Transitions	19



2022, ISSUE 1

New IFRB Faculty Spotlights



***Dr. Heidi Vanden Brink** is one of three new Assistant Professors to Join the IFRB over the past year. Dr. Vanden Brink joined the Department of Nutrition as an Assistant Professor in August 2022. Dr. Vanden Brink earned her Bachelor of Science (Physiology) from the University of Saskatchewan and Master of Health Sciences (Reproductive Physiology & Endocrinology) in Dr. Angela Baerwald's lab also at the University of Saskatchewan. She then worked as a research scientist in Dr. Marla Lujan's lab at Cornell University while simultaneously becoming credentialed as a diagnostic medical sonographer in obstetrical and gynecological ultrasound prior to beginning her PhD in Human Nutrition in the Lujan Lab at Cornell. Dr. Vanden Brink worked as a postdoctoral fellow jointly with Dr. Lujan at Cornell University and with Dr. Tania Burgert, a pediatric endocrinologist at Children's Mercy Kansas City. Across all three stages of her graduate and postdoctoral career, Dr. Vanden Brink received funding from the Canadian Institutes of Health Research and was recently honored with the Azziz-Baumgartner Family Early Career Investigator Award from the Androgen Excess and PCOS Society Annual Meeting in October.



Dr. Vanden Brink has spent her research career leveraging ultrasound imaging techniques to study unique defects in antral folliculogenesis, improving standardization in ultrasound image analysis of ovarian features, and pursuing the role of ovarian morphology as biomarkers for reproductive and metabolic dysfunction in adults and adolescents. Research highlights and future directions as a new faculty member at Texas A&M University are described below.

Non-invasive modeling of the reproductive axis
Only until the advent of ultrasonographic imaging were in vivo studies of ovarian antral folliculogenesis possible. Dr. Angela Baerwald (University of Saskatchewan) was the first to describe antral follicle dynamics in healthy women of reproductive age. As Dr. Baerwald's first graduate student, we then sought to model the repro-

ductive axis in vivo during the transition to menopause. We discovered that dominant follicles emerged at atypical times in a subset of women specifically during the transition to menopause. Specifically, dominant follicles emerged around the time of ovulatory follicle selection such that atypical dominant follicles had achieved dominance – and plausibly LH responsive at the time of ovulation. After the LH surge and ovulation, these atypical dominant follicles exhibited abnormal growth trajectories (**Figure 1, top row, See page 2**) in conjunction with atypical luteal phase rises in estradiol production and lower luteal progesterone (**Figure 1, Page 2, middle and bottom**

row). For the first time, we also characterized a natural ovulation that occurred during menses (**Figure 1, Page 2, Subject 4**).

Establishing reproducible imaging methods to evaluate ovarian morphology
Despite the widespread use of ultrasound imaging to obtain quantitative and qualitative endpoints of ovarian morphology, standardized measures by which to evaluate features of ovarian morphology have not been widely adopted. Dr. Vanden Brink's physiological research questions have been paralleled by the development and testing of various methods to evaluate ovarian morphology using 2D and 3D ultrasonography. In our first investigation, we focused on 2D and 3D methods to obtain follicle number and measure distinct follicle populations. Critically, we found that the most common approach to obtain ovarian follicle counts, using 2D in real time, resulted in significant misclassification of polycystic ovarian morphology (PCOM) compared with using the 2D-Grid Method, which was developed by Dr. Marla Lujan and deemed highly reliable among multiple raters (**Figure 2, Page 2**). Although we also found that 3D methods performed well to classify ovaries as meeting criteria for polycystic ovary morphology (PCOM), significant disagreement existed with the 2D grid method. Ultimately, we upheld use of the grid method when precise follicle counts were needed and recommended real-time assessments of follicle number be discontinued. In a separate (continued on page 2)



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

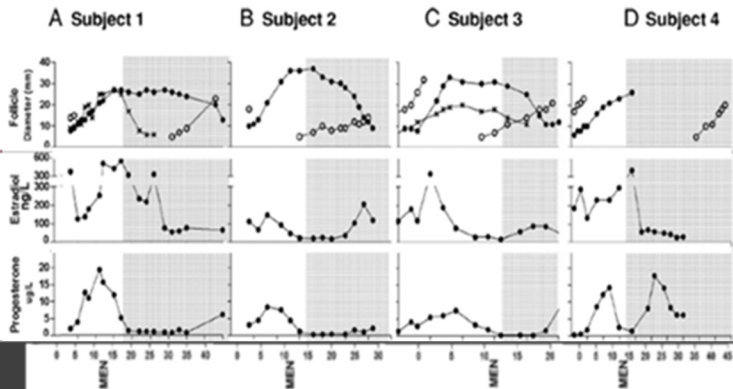


Figure 1. (above) Unique follicle profiles along with estradiol and progesterone concentrations depict atypical follicle and endocrine dynamics during the transition to menopause. Top row: unique follicle growth trajectories in the luteal phase (white background) and follicular phase (grey background) of the Inter-Ovulatory Interval (IOI). Middle row: estradiol concentrations across IOI. Bottom row: progesterone concentrations across the IOI. Subject 4 ovulated during the early follicular phase, as demonstrated by the collapse of the luteal phase dominant follicle (top panel), drop in estradiol (middle panel), and secondary rise in progesterone (bottom panel). MEN, menses. Adapted from Vanden Brink et al., *J Clin Endocrinol Metab* 100: 4553-62, 2015.

The ovary as a biomarker of reproductive and metabolic disturbance During her doctoral and postdoctoral years, Dr. Vanden Brink began pursuing the utility of ovarian morphology as a biomarker for reproductive and metabolic health in adults and adolescents. In adolescents with PCOS, we found that ovarian size and follicle number reflected degree of biochemical hyperandrogenism and LH or LH:FSH ratio (Figure 3).

Associations between ultrasonographic markers of ovarian morphology and reproductive and metabolic features in adolescents with PCOS

Marker	Mean OA	Mean OV	Mean FNPS	FDP
Reproductive				
Total T (ng/dL)	.515**	.451**	.394*	.089
Free T (ng/dL)	.282	.222	.072	-.054
Percent-free T	-.114	-.071	-.166	.024
Androstenedione (ng/dL)	.422*	.382*	.474**	.112
LH (mIU/mL)	.496**	.404*	.343	.122
FSH (mIU/mL)	.304	.303	.242	.131
LH:FSH ratio	.520**	.409*	.320	.033
Metabolic				
BMI (kg/m ²)	-.306	-.288	-.503**	-.281
Fasting glucose (mg/dL)	-.193	-.248	-.393*	-.315
2-h Glucose (mg/dL)	-.117	-.100	-.078	.002
Fasting insulin (μIU/L)	-.173	-.181	-.204	-.013
2-h Insulin (μIU/L)	-.215	-.197	-.168	-.081

Values are expressed as Spearman's rho.

influences on the reproductive axis and folliculogenesis, and by consequence ovarian morphology. We summarized literature in the field in an invited review on nutritional status and ovarian morphology (Figure 4) and put forth the hypothesis that metabolic and reproductive tipping points may coincide with distinct features of PCOM. We also tested the hypothesis of reproductive and metabolic tipping points by asking whether the diagnostic potential of ovarian morphology for anovulatory conditions in adults improved when we partitioned women by hyperandrogenic and normoandrogenic anovulatory state, and further by BMI category. We found that the ovary can be used to distinguish between normoandrogenic and hyperandrogenic anovulatory states with some improvements in diagnostic power gained by using BMI-specific thresholds (manuscript under review).

(continued on page 4)

study, we pursued whether different methods of ovarian stroma and stromal echogenicity were reproducible in our own laboratory. Enlarged, hypertrophic central ovarian stroma is thought to reflect ovarian hyperandrogenism and is a frequent, but not consistent, finding in women with Polycystic Ovary Syndrome (PCOS). To study the reproducibility of various methods used to ascertain stromal area, we recruited five raters, which included a radiologist, endocrine fellow, graduate students, and an undergraduate student with extensive training in ultrasound image analysis of follicle number and tested three methods published to obtain ovarian stromal area and one qualitative method to assess stromal echogenicity. Although we found that increased stromal area is a consistent and pathophysiologic finding of anovulatory conditions, methods to ascertain stromal area or echogenicity were not reproducible using ultrasonography.

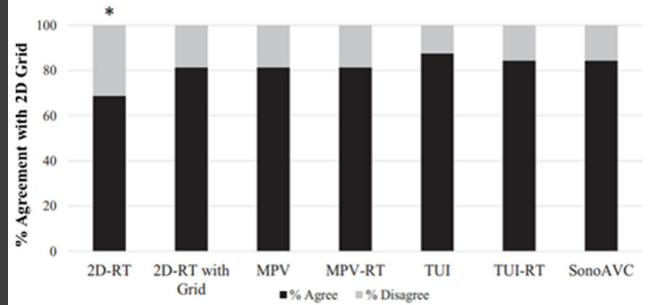


Figure 2. (above) Agreement in classification of polycystic ovarian morphology by method. The proportion of instances in which each test method agreed with the reference method (2D-Grid) on the classification of PCOM (follicle number per ovary 2-9mm > 25) is shown. The black columns represent the percent agreement. MPV = multiplanar view; RT = real-time; SonoAVC = semiautomated volume calculation; TUI = tomographic ultrasound imaging. * Denotes significant disagreement in classification between methods at P<0.05. Adapted from Vanden Brink et al., *Fertil Steril* 115(3): 761-70,

Figure 3. Associations between reproductive and metabolic features of 33 adolescents 12-18 years of age with PCOS and ovarian area (OA), ovarian volume (OV), follicle number in a single ultrasonographic cross-sectional image (FNPS), and follicle distribution pattern (FDP). *P<0.5, **P<0.01. Adapted from Rackow et al., *J Adolesc Health* 62(3): 288-93, 2017

In contrast, we noted negative associations between ovarian features and degree of obesity and dysglycemia in adolescents, which was consistent with our previous publications in adults with PCOS. These studies revealed that metabolic status may have competing

New IFRB Faculty Spotlight: Dr. Lacey Luense



***Dr. Lacey Luense** is an Assistant Professor of Epigenetics in the Department of Animal Science at Texas A&M University. Dr. Luense was born and raised in LeMars, IA and received a B.A. in Biology at Augustana University, in Sioux Falls, SD. She then received a M.S in Genetics at Iowa State University before receiving her Ph.D. in Molecular and Integrative Physiology at the University of Kansas Medical Center. Dr. Luense then conducted her postdoctoral training in the Epigenetics Institute and Department of Cell and Developmental Biology at the University of Pennsylvania's Perelman School of Medicine. Dr. Luense is a member of the Society for the Study of Reproduction (SSR). During her postdoctoral studies she received a Ruth Kirschstein National Research Service Award Postdoctoral Fellowship from the National Institute of Child Health and Development. Dr. Luense received awards for winning the Cornell Reproductive Genomics Symposium Platform Competition and was a Platform Trainee Award Finalist and Lalor Merit Award winner from the SSR. Dr. Luense also received the award for Top Reviewer for the journal *Biology of Reproduction*.



Throughout her post-graduate training, Dr. Luense has studied the molecular regulation of reproduction and fertility in a number of different species, including mouse, cattle, sheep, and humans. During her MS and PhD studies, Dr. Luense focused on understanding the molecular underpinnings of ovulation and ovarian function, including the hormonal regulation of microRNA function. For her postdoctoral research, Dr. Luense started to investigate the epigenetic regulation of spermatogenesis and the subsequent contribution to embryo development. Epigenetics is broadly defined as 'above or beside' genetics, or put another way, as changes to our genes, commonly through the addition of covalent modifications, that are not the result of genetic changes to the DNA. Epigenetic regulation is a critical mediator of molecular function in all cells, however it plays an especially unique role in reproduction due to the transmission of germline material to the next generation.

Dr. Luense's research is focused on understating the epigenetic regulation of the paternal genome, how it directly affects male fertility, and how it ultimately influences embryonic development and developmental programming. Approximately 15% of couples attempting to conceive are affected by infertility and in 50% of these cases, some form of male factor is involved. However, male reproductive biology is severely understudied and relatively little is known about the causes of male infertility and potential treatments, with many cases falling into the category of unexplained infertility. The paternal epigenome is likely to be a key mechanistic driver of male infertility, largely due to the unique chromatin organization of mammalian sperm that is achieved by replacing over 90% of nucleosomes (composed of histone proteins wrapped around DNA) with small, basic, male germ cell specific proteins called protamines. During this process the male germ cell undergoes histone hyperacetylation to "loosen" and open the chromatin structure, subsequently leading to eviction of nucleosomes. The location of retained nucleosomes in sperm is of

great interest, with numerous studies finding that histones are retained at genes important for embryonic development. This further suggest that sperm chromatin harbors more information than simply DNA sequence, and that sperm histones transmitted to the egg at fertilization are 'poised' at genes necessary for the embryo. Importantly, abnormal nucleosome retention and protamine insufficiency are correlated with male infertility and unexplained poor embryogenesis, although the underlying mechanism – whether this is due to excess histones, abnormal histone post-translational modifications (PTMs), or aberrantly packaged DNA – has not yet been elucidated. Thus, in spite of its likely profound importance, the requirement and role of specific nucleosome retention is still poorly understood and remains to be explicitly tested.

To address these questions, Dr. Luense has developed a research program (**Figure 1**) that studies the enzymatic mechanisms that mediate the dynamic changes in histone post-translational modifications during spermatogenesis. Her research utilizes conditional mutant mouse models for various histone modifying enzymes to determine the molecular and physiological effects on spermatogenesis and male fertility. One of these mouse models harboring a conditional deletion for the histone acetyltransferase *Gcn5* (*Gcn5cKO*), exhibits a severe reproductive phenotype with reduced testes size, sperm count, abnormal sperm morphology and motility, and subfertility. These mice also display altered chromatin dynamics during spermatogenesis, resulting in increased histone retention and an altered histone PTM (continued on page 4)

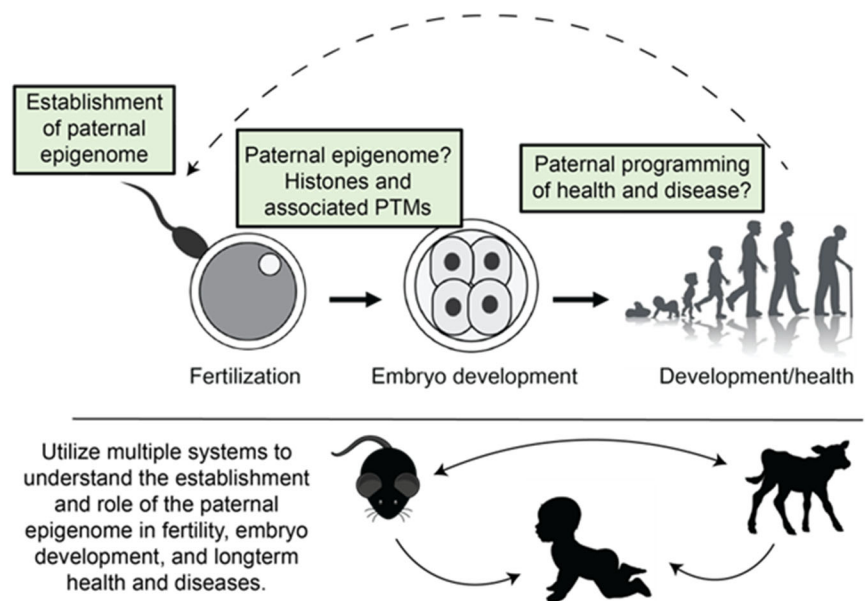


Figure 1. Schematic overview of Dr. Luense's research program to understand the establishment of the paternal epigenome and how it regulates embryo development and long-term health and development of offspring.



New Faculty Spotlight, Lacey Luense (cont'd from page 3)

profile in mature sperm (**Figure 2**), mirroring abnormal chromatin signatures in abnormal human sperm.

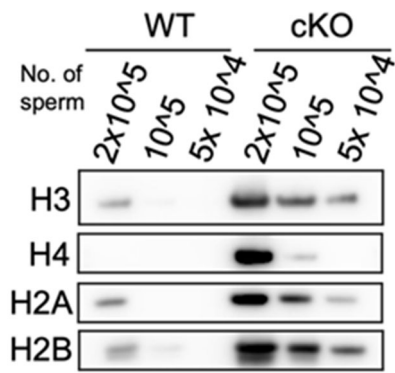


Figure 2. Increased histone retention in sperm from mice lacking the histone acetyltransferase Gcn5 in male germ cells.

One particular challenge to understanding the effects of paternal chromatin on the embryo are the justifiable ethical concerns leading to the inability to alter human genetics or perform systematic investigation on human embryos. This in turn leads to the necessity of developing animal models that serve as a proxy to study these critical early embryonic mechanisms that eventually lead to a successful and healthy pregnancy. Dr. Luense is currently utilizing the Gcn5cKO model to study the effects of increased histone retention and aberrant histone PTMs on preimplantation embryo development and potential long-term developmental consequences (Figure 1). Utilizing intracytoplasmic sperm injection (ICSI), Dr. Lu-

ense is generating embryos from sperm with abnormal sperm chromatin to study the developmental and molecular consequences, including determining changes to embryonic chromatin dynamics and transcription through next-generation sequencing technologies.

Dr. Luense will also utilize cattle as an additional system to study the paternal epigenome and how it regulates the embryo, pregnancy establishment, and the long-term health and development of offspring through paternal programming. Dr. Luense will be investigating the bull epigenome to determine if histone PTM and chromatin signatures are conserved with other mammalian species, including human and mice. Subsequent studies will focus on understanding how the sperm epigenome regulates fertility and reproductive efficiency in cattle and how epigenetic signatures can be used as biomarkers for reproductive success. While we have long understood how maternal factors can influence the developmental programming of offspring, our understanding of how paternal programming affects long-term offspring health and development is only beginning. Dr. Luense is interested in exploring a variety of questions regarding how the environment, including diet and stress, affects the paternal epigenome and how this in turn can adversely affect fertility and offspring health.

Dr. Luense is also interested in other areas of reproductive epigenetics and looks forward to continuing her studies in male and female reproductive biology. Feel free to email Dr. Luense at lacey.luense@ag.tamu.edu or stop by Kleberg 442B to further chat.

New Faculty Spotlight: Dr. Vanden Brink (cont'd from page 2)



Building a research program with a focus on nutrition, obesity, and adolescence reproductive health At Texas A&M, Dr. Vanden Brink's research program intersects human nutrition, metabolism, and reproductive physiology and is guided by the overarching aim: to detect, understand, and prevent the integrative mechanisms responsible for aberrant reproductive development during the adolescent reproductive transition. The transition through puberty and the early post-menarcheal years, (termed the adolescent reproductive transition) represents a window of vast physiologic change which, when perturbed, can result in lifelong reproductive and metabolic dysfunction, psychological disturbances, and reduced quality of life.

The Vanden Brink Lab is particularly interested in the manifestation of PCOS during the adolescent reproductive transition and the role of modifiable factors such as diet and metabolic health in disrupting reproductive maturation towards miscalibration and PCOS. Although there is recognition that regular menstrual cycles are a vital sign of health and wellbeing, the factors that underlie the calibration of the hypothalamic-pituitary-ovarian (HPO) axis leading to the cyclic release of an oocyte and menstruation remain largely undefined. Accordingly, the factors that underlie miscalibration and a trajectory towards persistent menstrual irregularity and PCOS are also undefined. The Vanden Brink Lab is focusing on the peri-menarcheal years to define divergences in HPO axis calibration and antral folliculogenesis and the nutritional and intermediary metabolic mechanisms that underlie abnormal trajectories in female reproductive development.

To begin to study the trajectory of the adolescent reproductive transition, she and collaborators recently completed an NIH-funded prospective cohort study of adolescents within approximately 6-10 months of menarche and followed them every six months through two years of menarche. Alongside intensive reproductive and metabolic phenotyping, including 3D trans-abdominal ultrasonography, menstrual cycle tracking, and fasting blood draws to measure serum reproductive hormones, Dr. Vanden Brink and her team also conducted serial dietary assessments, collected stool samples, and urine. Analyses are underway in her lab to identify nutritional and physiological predictors of reproductive axis miscalibration in this longitudinal cohort. Dr. Vanden Brink is also currently establishing her clinical research program which will launch in 2023. The ultimate goals of Dr. Vanden Brink's research program are to define the role of precision nutrition for optimal adolescent reproductive maturation, establish early biomarkers of reproductive axis miscalibration before conditions such as PCOS manifest, and identify targeted interventions for PCOS prevention.

IFRB Seminar Series, 2022

The IFRB Seminar Series, Reproductive Biology Forum, has been held during the Fall and Spring Semesters since 1990. The IFRB Seminar series is coordinated by **Dr. Sakhila Banu**.

Spring 2022

January 28, **Karen Schindler, Ph.D.**, Associate Professor, Department of Genetics, Rutgers, The State University of New Jersey, "Understanding the genetic contributions to making a healthy egg."



February 25, **Satish Kumar, Ph.D.**, Associate Professor, Department of Comparative Biosciences, School of Veterinary Medicine, University of Wisconsin-Madison. "Testosterone: a critical player in the pathophysiology of maternal vascular and placental dysfunction."



March 22, **Romana A. Nowak, Ph.D.**, Professor, Department of Animal Sciences, University of Illinois. "The effects of environmentally relevant toxicants on early embryo development."



April 1, **James Pru, Ph.D.**, Professor and Curtis and Marian Rochelle Endowed Chair, University of Wyoming. "PGRMC proteins in reproductive physiology and disease."



April 8, **A. Phillip West, Ph.D.**, Assistant Professor Microbial Pathogenesis & Immunology, Texas A&M University College of Medicine. "Mitochondrial control of innate immunity and inflammation."



April 22, **Rajesh Miranda, Ph.D.**, Shelton Professor of Neuroscience, Department of Neuroscience and Experimental Therapeutics, Texas A&M University College of Medicine. "Non-protein-coding RNA biomarker-based approaches for diagnosing fetal alcohol spectrum disorders."



April 29, **Kanako Hayashi, Ph.D.**, Professor, Washington State University School of Molecular Biosciences, Washington State University. "Niclosamide as a new promising therapy for endometriosis."



Fall 2022

September 2, **Günter P. Wagner, Ph.D.**, Research Professor Yale Systems Biology Institute Professor Emeritus of Ecology and Evolutionary Biology Yale University. "The evolution of inflammatory pathways and the origin of implantation."



September 9, **Shameena Bake, Ph.D.**, Research Assistant Professor, Department of Neuroscience and Experimental Therapeutics, School of Medicine, TAMHSC. "Prenatal alcohol exposure and adult health consequences: Evidence from a rat FASD model."



September 16, **Quinton A. Winger, Ph.D.**, Associate Professor, Department of Biomedical Sciences, Colorado State University, "Investigating placental function and fetal growth in sheep using RNAi."



September 23, **Jeff Jones, Ph.D.**, Assistant Professor, Department of Biology, Center for Biological Clocks Research, Texas A&M Institute for Neuroscience, Texas A&M University. "Ins and outs of circadian time."



October 15, **Erdogan Memili, D.V.M., Ph.D.**, Professor and Executive Associate Director, Cooperative Agricultural Research Center, College of Agriculture and Human Sciences, Prairie View A&M University. "Sperm Tales."



October 21, **Leslie Myatt, Ph.D., FRCOG**, Professor of Obstetrics and Gynecology, School of Medicine, Endowed Professor and Associate Director, Bob and Charlee Moore Institute of Nutrition and Wellness, Director of Perinatal Research, Obstetrics and Gynecology, School of Medicine, Oregon Health & Science University, "Sexual dimorphism of placental metabolism: Consequences for fetal growth and pregnancy outcomes in adverse conditions."



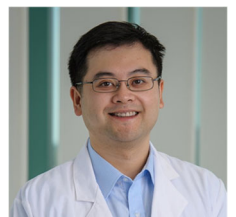
November 3, **George Osol, Ph.D.**, Cardiovascular Research Institute Distinguished Professor Emeritus, Department of Obstetrics, Gynecology and Reproductive Sciences, University of Vermont Larner College of Medicine. "Effective Use of Graphics in the Presentation of Scientific Data."



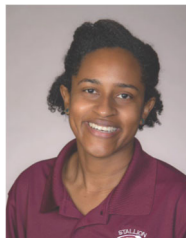
November 11, **Juliano Coelho da Silveira, Ph.D.** Associate Professor, Department of Veterinary Medicine, University of São Paulo, Brazil. "Extracellular Vesicles in Reproduction."



November 18, **Xin Liu, Ph.D.**, Associate Professor, Cecil H. and Ida Green Center for Reproductive Biology Sciences, Division of Basic Research, Department of Obstetrics and Gynecology, UT Southwestern Medical Center. "Polycomb repressive complex 2 and chromatin regulation of gene expression."



December 2, **Yatta Boakari, D.V.M., Ph.D.**, Assistant Professor, Department of Large Animal Clinical Sciences, Texas A&M University. "Effects of a high protein model on reproduction of mares."





***Dr. Yatta Boakari** is a new Assistant Professor of Theriogenology in the Department of Large Animal Clinical Sciences, School of Veterinary Medicine and Biomedical Sciences at Texas A&M University. Dr. Boakari is originally from Brazil and finished a bachelor's in psychology from the University of the In-carnate Word, Texas in 2006. She then received her Doctor of Veterinary Medicine degree at the Federal University of Piaui, Brazil in 2012. After graduation she worked briefly in an Equine Theriogenology private practice and then returned to academia to complete a masters at Sao Paulo State University, Brazil in 2014 under the mentorship of Dr. Cezinande de Meira and Dr. Jair Ferreira. There, she used Doppler ultrasound to evaluate ovarian structures during the pre-ovulatory period in mares.



Dr. Boakari then began her PhD program at the Gluck Equine Research Center, University of Kentucky under the supervision of Dr. Barry Ball that she completed in 2019. Her doctoral work focused on the effects of a high protein diet on reproductive transcriptomics of mares. Additionally, she researched possible biomarkers to diagnose placentitis. During this time, she received a number of awards for her scientific work, such as a third-place poster presentation J1/F1 Scholars at the Fourth Annual Postdoctoral Research Symposium, Kentucky, 2018, Best Abstract Award at the XII International Symposium of Equine Reproduction in Cambridge, 2018, and third place in the 3 Minute-Thesis Competition, Gluck Equine Research Center, 2019.

Her main research involved using a high protein model experimental model to elevate blood urea nitrogen (BUN) in mares. Using

RNA-sequencing of endometrium samples there were differently expressed genes when samples from mares with high BUN were compared to control mares **Figure 1**.

Additionally, using RNA sequencing Dr. Boakari showed differentially expressed genes in Day 14 embryos (**Figure 2**) from mares with high BUN that were involved in neurological development, urea transport, vascular remodeling and adhesion showing that increased BUN resulted in transcriptome changes in equine embryos of genes important in normal embryo development.

Overall, as summarized in **Figure 3** (see page 9), her studies showed that an experimental high BUN in mares, simulating a high protein diet, resulted in molecular changes to the endometrium and embryos and lower pregnancy rates with embryos recovered from mares with higher BUN concentrations.

Figure 2 (below): Principal component analysis plot of genes expressed in Day 14 equine embryos recovered from mares receiving a control or urea diet analyzed by RNA sequencing. Each dot represents one embryo, with the variances shown inside parentheses on the x- and y-axes .

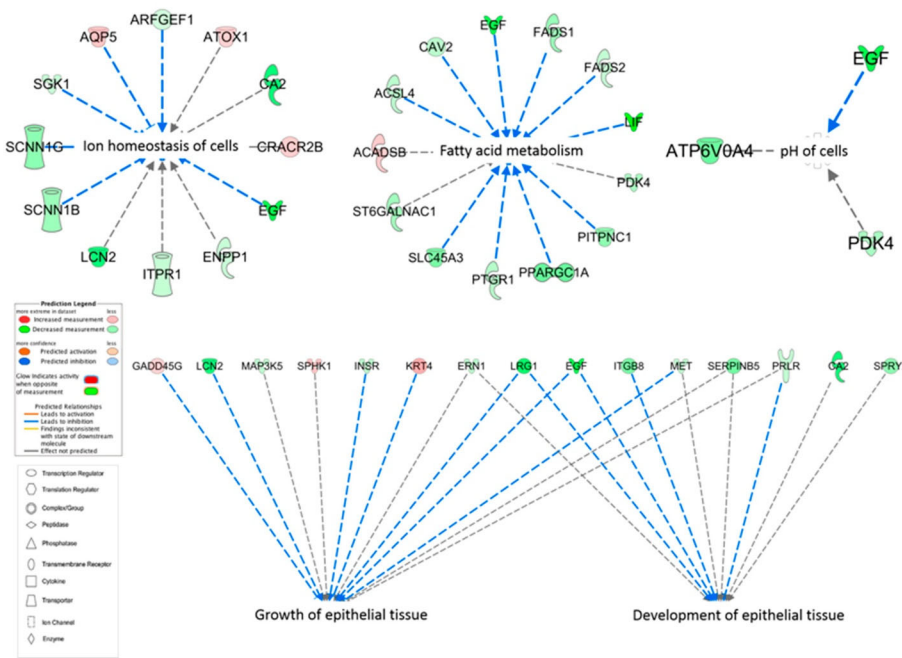
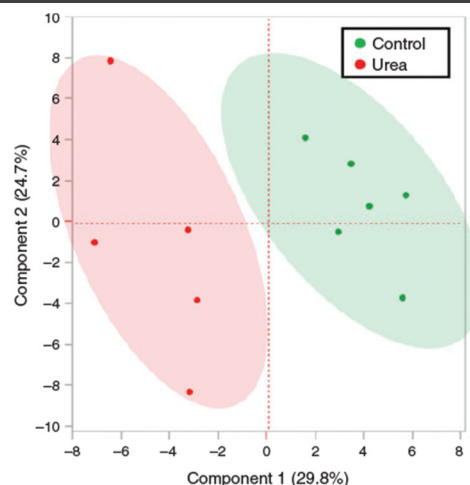


Figure 1. Endometrial genes differentially expressed in response to elevated blood urea nitrogen in mares. Genes of interest were related to ion homeostasis of cells (12 genes related), fatty acid metabolism (13 genes related), and pH of cells (3 genes).

Subsequently, Dr. Boakari completed a comparative Theriogenology residency and a postdoctoral fellowship at Auburn University in 2021 under the supervision of Dr. Julie Gard and Dr. Richard Hopper. Her research during this time was funded with a grant from the American Association of Bovine Practitioners under the supervision of Dr. Manuel Chamorro. Dr. Boakari recently became a Diplomate of the College of Theriogenology.

She then started as an Assistant Professor here at Texas A&M. Her main research lines are to better characterize and develop treatment options for subfertility in older and metabolic mares and in subfertile stallions.

(continued on page 9)

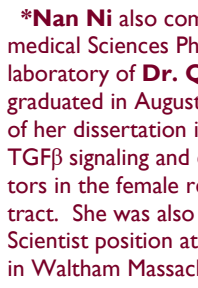
IFRB Trainee News

RECENT GRADUATES

***Katherine Halloran** completed her Physiology of Reproduction Ph.D. degree in the laboratory of **Dr. Fuller Bazer** and graduated May, 2022. Her dissertation title is "The importance of amino acids, polyamines, and hexose sugars for conceptus development during the peri-implantation period of pregnancy in sheep." She currently is a postdoctoral fellow at the University of Michigan under the mentorship of Dr. Vasantha Padmanabhan investigating the multi- and transgenerational effects of polycystic ovarian syndrome and environmental disrupting chemicals on fetal reproductive and metabolic programming.



***Xin Fang** completed her Biomedical Sciences Ph.D. degree in the laboratory of **Dr. Qinglei Li** and graduated in August, 2022. The title of her dissertation is "Using conditional gene manipulation to study reproductive physiology and pathology." She has taken a Scientist position at Sanofi-Genzyme in Waltham Massachusetts.



***Nan Ni** also completed her Biomedical Sciences Ph.D. degree in the laboratory of **Dr. Qinglei Li** and graduated in August, 2022. The title of her dissertation is "The role of TGF β signaling and epigenetic regulators in the female reproductive tract. She was also recruited into a Scientist position at Sanofi-Genzyme in Waltham Massachusetts.



***Brie Myre** completed her Biology Ph.D. degree in the laboratory of **Dr. Duncan MacKenzie** and graduated in August, 2022, receiving Biology's Larry Dillon Award for excellence in graduate research and teaching. Her dissertation is "Energy allocation and use in reproducing olive ridley sea turtles." In September, she started a tenure-track position as Assistant Professor of Biology at Hastings College in Nebraska.

***Nirvay Sah, D.V.M.** completed a Physiology of Reproduction Ph.D. in the laboratory of **Dr. Fuller Bazer** in April and graduated in August, 2022. He has continued as a Postdoctoral Research Associate with Dr. Bazer (see page 12). The title of his dissertation is "Metabolism of one-carbon units and creatine in uterine-placental tissues during pregnancy in sheep."

AWARDS AND HONORS

***Dr. Nirvay Sah** received a Society for the Study of Reproduction (SSR) trainee travel award for the 2022 annual meeting in Spokane, Washington in July to present poster titled "Ovine endometrium and placentomes express components of the creatine-creatine kinase-phosphocreatine system during pregnancy."

***Robyn Moses** was the recipient of a USDA-NIFA-AFRI Merit Award to attend the 2022 annual SSR meeting where she gave a flash talk titled "Characterizing enzymes and transporters involved in fructose and lactate metabolism in the ovine conceptuses during the peri-implantation period of pregnancy."

***Mackenzie Newton** began a M.S. degree program in Physiology of Reproduction with **Dr. Fuller Bazer** in January, 2022. Her work focuses on understanding how amino acids and their derivatives impact early gestation in ruminants. Mackenzie received a USDA-NIFA-AFRI Merit Award at the SSR meeting in Spokane, WA and was selected to participate in the SSR Pre-Doctoral Platform Competition where she presented her research, "Regulation of expression of enzymes for synthesis of polyamines by the uterus during the estrous cycle of sheep."



Above: Mackenzie, Nirvay and Robyn receiving their SSR awards.

***Dr. Katherine Halloran** received the 2022 Dept. Animal Science, Tony A.M. Sorensen award and the American Society for Animal Science, Wettemann Graduate Scholar in Physiology Award, presented during the 2022 ASASCAS Annual Meeting and Trade Show, Oklahoma City in June. She also gave an invited oral presentation titled Progesterone regulates the abundance of mRNAs and proteins involved in polyamine metabolism in the sheep endometrium at the ASAS national meeting.



***Lacey Quail and Jacklyn Ketchum**, Ph.D. students in Dr. George Perry's lab, were selected as Lauderdale Scholars at the Applied Reproductive Strategies in Beef Cattle Conference in August, 2022. (continued on page 17)



Frontiers in
Reproduction
Course:

Molecular and
Cellular Concepts and Applications

<http://www.mbl.edu/fir/>
Course

Date: Apr 29,
2023 - Jun 11,
2023

Submission
Deadline:
January 16, 2023

Course
Director: Rafael
Fissore, University of Massachusetts, Amherst

IRFB Faculty Activities, Awards, etc.

NEW GRANTS:

***Drs. Fuller Bazer (PI) and Greg Johnson and Guoyao Wu (Co-PIs)**, received notification of a USDA/AFRI award, "Arginine and Creatine Kinase: Key Roles in Conceptus Development." 01/01/2022-12/31/2026. \$650,000.



\$500,000.

***Drs. Greg Johnson (PI), Fuller Bazer (Co-PI)** received notification of a USDA/AFRI award, "Metabolic adaptation of conceptuses to a hypoxic environment." 01/01/2022 - 12/31/2026; \$650,000.



research, 8-/25/22. \$210,425.

***Drs. Guoyao Wu (PI) and Drs. Delbert Gatlin (Co-PI), Greg Johnson (Collaborator)** received notification of a USDA/NIFA grant "Biosynthesis and nutritional roles of glycine in hybrid striped bass." 2/1/2022-1/31/2025.



***Dr. Ky Pohler (PI)** received notification of a USDA/NIFA grant, "Biennial Reproduction Symposium American Society of Animal Science: Honoring the Legends and Shaping the Future." 7/8/2022

***Dr. Qinglei Li, PI.** Received notification of an NIH R03 award, "UTX: A novel regulator of decidualization?" 02/11/2022-01/31/2024. The major goal of the application is to identify the demethylase-dependent vs. independent function in the uterus.



***Dr. Sakhila Banu** received notification of a NIH R21 award, "Evaluating the effects of hexavalent chromium on uterine vascular remodeling." 01/01/2023 - 12/31/25. \$416,625.

***Drs. Pedro Fontes (U. Georgia) . Cliff Lamb, K.G. Pohler, J Bloomfield,** received a USDA/AFRI award, "Paternal origin of offspring fetal and postnatal development in cattle."

***Drs. Lannett Edwards PI, K.G. Pohler, F.N. Schrick, Co-PIs** received a USDA/AFRI award, "Functional importance of higher estrus-associated body temperatures (HEAT) to maximize cattle fertility."

***Drs. Ky G. Pohler and G. C. Lamb,** Co-PI received a grant from Merck Animal Intel. "Data collection for heat detection improvement with eSense."

***Dr. Ky Pohler** received a grant from Idexx Labs, "New generation testing; Idexx Pregnancy line." Idexx Labs.

***Drs. G. Cliff Lamb, and Ky G. Pohler, R. Poole, R. Cooke, and S. Dass** received a grant from HelixNano, "Use of mRNA vaccine to reduce methane."

AWARDS & HONORS:

***Dr. Rodolfo Cardoso** received the 2022 Distinguished Achievement Award – College Level Teaching by the TAMU Association of Former Students.

***Dr. Cardoso** also was an invited speaker at the 2022 American Society of Animal Science Biennial Reproduction Symposium in Park City, UT. His talk was titled "Effects of Prenatal Androgen Excess on Reproductive and Metabolic Function in a Sheep Model of PCOS", September, 2022.

***Dr. Ky G. Pohler** was the 2022 recipient of the American Society of Animal Science (SSASAS) Outstanding Young

Animal Scientist Award – Education, presented to him during the 2022 Southern Section Meeting held in Fort Worth, TX in January.

***Dr. Ky Pohler** was also the recipient of the Animal Industry Innovation Award from the American Society of Animal Science, sponsored by Zoetis, presented during the 2022 ASAS-CSAS Annual Meeting and Trade Show held in Oklahoma City in June. His awardee talk was



titled "Innovations in Bovine Reproductive Management: What the Future Holds."

***Dr. George Perry** was an invited speaker at the Society for Theriogenology annual meeting, July, 2022 Bellevue, Washington. The title of his presentation was "Improving reproductive management in cow herds." Dr. Perry also served on the 2022 SSR Annual Meeting Program Committee.

***Dr. Greg Johnson** was an invited speaker at the Uterine Workshop organized by Dr. Franco DeMayo. His presentation was titled "Deciphering Pregnancy in Livestock by Focusing on Interactions between the Placenta and Uterus."

***Dr. Becky Poole** was an invited speaker in the University of Wyoming Departmental Seminar Series: "Reproductive microbiomes and fertility in domestic livestock."



INTERNATIONAL ACTIVITIES & LECTURES

***Dr. Heewon Seo** was an invited speaker at the Asian-Asian-Australasian Association of Animal Production, South Korea, in August, 2022. The title was "New hypotheses for placental entation in pigs, sheep, and cattle."

***Dr. Greg Johnson** was an invited Plenary Speaker at the Asian-Australasian Association of Animal Production Societies, South Korea, in August, 2022. The title was "Metabolic Pathways Utilized by Cases," 2022, respectively.

(continued on page 17)

27th Texas Forum for Reproductive Sciences

***The 27th Annual Texas Forum for Reproductive Sciences regional reproductive biology meeting was hosted by Texas Children’s Hospital, The Jan and Dan Duncan Neurological Research Institute, Houston, TX on June 2-3, 2022.**



TFRS was established in 1995 to encourage the exchange of scientific knowledge and collaborations among scientists in Texas in the area of female reproduction. Several years later, this cooperative group expanded to include male reproduction and began an all-inclusive Forum for Reproductive Sciences.

The two Plenary Speakers for the 2022 meeting included:

Stephanie Pangas, M.D. Ph.D., Associate Professor, Dept of Pathology & Immunology, Baylor College of Medicine. “New mouse models for studying mammalian ovary development and female reproductive disease.”

Swathi Arur, Ph.D., Dept of Genetics, UT MD Anderson Cancer Center, “Environmental signaling and control of oocyte production.”

Texas A&M trainees selected for Platform Presentations included:

Xin Fang, “EZH2 and Endometrial Cancer Development: Insights from a Mouse Model.”

Shobana Navaneethalakrishnan, ‘Altered Testicular Macrophage Polarization is Associated with Reproductive Dysfunction in Hypertensive Mice.’

Joe W. Cain, “Pig Conceptuses Secrete Exosomes Containing IFNG into Uterine lumen for Paracrine Communication with the Endometrium.”

Nirvay Sah, D.V.M., “Inhibition of Translation of Mitochondrial SHMT2 mRNA Decreases Cell Proliferation and Migration, and Survival of Ovine Conceptuses During the Peri-implantation Period of Pregnancy.”

Texas A&M IFRB members presenting posters included:

Gabriela Dalmaso de Melo, “Using Pregnancy Associated Glycoproteins as a Novel Approach to Study Late Embryonic Mortality in Cattle.”

Robyn Moses, “Characterizing Enzymes and Transporters Involved in fructose and Lactate Metabolism in the Ovine Conceptus During the Peri-implantation Period of Pregnancy.”

Makenzie Newton, “Regulation of Expression of Enzymes for Synthesis of Polyamines by the Uterus During the Estrous Cycle of Sheep.”

Claire Stenhouse, Ph.D. “Regulation of Uterine Phosphate, Calcium and Vitamin D Signaling During the Estrous Cycle of Sheep.”

Members of the TFRS Steering Committee for the 2022 meeting included Drs. Brian Hermann (UTSA), Greg Johnson (TAMU), Qinglei Li (TAMU), Mala Mahendroo (UTSW), John McCarrey (UTSA), Joanne Richards (BCM), Chandra Yallampalli (BCM), Marie-Claude Hofmann (MD Anderson) Stephany Pangas (BCM) and Annie Newell-Fugate (TAMU).

Save The Date

**28th Annual Texas Forum for Reproductive Sciences
April 13-14, 2023**

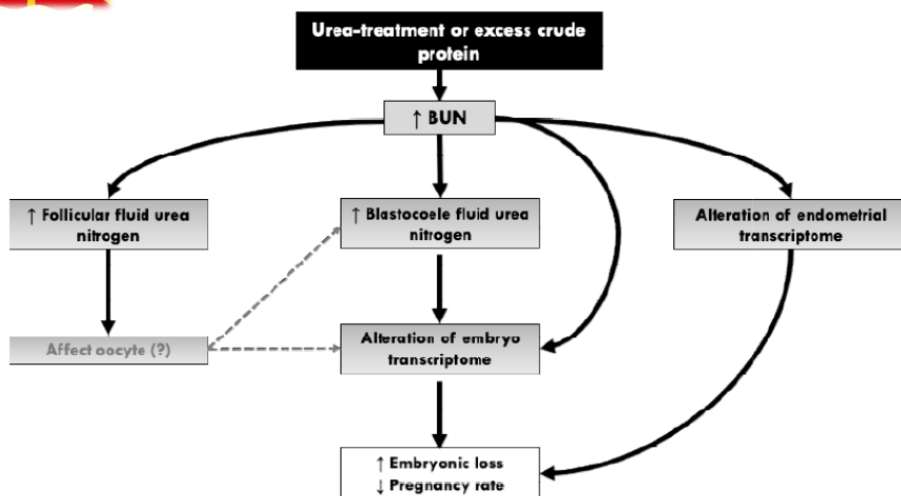
Location: Texas Children’s Hospital, The Jan and Dan Duncan Neurological Research Institute, Houston, TX

Plenary Speakers:

Francesca Cole, PhD, Department of Epigenetics and Molecular Carcinogenesis, UT MD Anderson Cancer Center
Lacy J Barton, PhD, Department of Neuroscience, Developmental and Regenerative Biology, University of Texas at San Antonio



New Faculty Spotlight, Yatta Boakari (cont'd from page 6)



Dr. Boakari has continued collaborations with researchers at USP University (Sao Paulo, Brazil), the University of Kentucky, VERO, and Auburn University. She looks forward to conducting her research program at Texas A&M University and to new collaborating with many IFRB members.

To date, Dr. Boakari has published 25 peer-reviewed manuscripts in journals including Theriogenology, Genes, and Biology of Reproduction in addition to 2 book chapters, 8 conference proceedings as a first author, and 5 oral conference presentations.

Figure 3: Diagram representing the effects of high blood urea nitrogen (BUN) in the reproductive system and embryos of mares.



A Snapshot of IFRB Research, 2022

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 2022:

- Ahmad I, Newell-Fugate AE. Role of androgens and androgen receptor in control of mitochondrial function. *Am J Physiol Cell Physiol.* 2022 Sep 1;323(3):C835-C846. doi: 10.1152/ajpcell.00205.2022.
- Almutlaq RN, Newell-Fugate AE, Evans LC, Fatima H, Gohar EY. Aromatase inhibition increases blood pressure and markers of renal injury in female rats. *Am J Physiol Renal Physiol.* 2022 Sep 1;323(3):F349-F360. doi: 10.1152/ajprenal.00055.2022.
- Anabtawi F, Mahmoud N, Al-Khatib IA, Hung YT. Heavy Metals in Harvested Rainwater Used for Domestic Purposes in Rural Areas: Yatta Area, Palestine as a Case Study. *Int J Environ Res Public Health.* 2022 Feb 25;19(5):2683. doi: 10.3390/ijerph19052683.
- Araújo ACR, Cooke RF, Claro Junior I, Sá Filho OG, Borges CMS, Sampaio PSL, Cocenza BB, Romero RSR, Tanner JHLM, Vasconcelos JLM. Impacts of postpartum length at the initiation of the fixed-time artificial insemination protocol on pregnancy rates of *Bos indicus* beef cows. *Transl Anim Sci.* 2022 Sep 10;6(3):txac095. doi: 10.1093/tas/txac095.
- Arsh JA, Lee J, Banu SK. Effects of dual inhibition of AKT and ERK1/2 pathways on endometrial pro-inflammatory, hormonal, and epigenetic microenvironment in endometriosis. *Mol Cell Endocrinol.* 2022 Jan 1;539:111446. doi: 10.1016/j.mce.2021.111446.
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- Arroyo E, Patiño C, Ciccarelli M, Raudsepp T, Conley A, Tibary A. Clinical and Histological Features of Ovarian Hypoplasia/Dysgenesis in Alpacas. *Front Vet Sci.* 2022 Mar 25;9:837684. doi: 10.3389/fvets.2022.837684.
- Bake S, Hurst DA, Miranda RC, Sohrabji F. Prenatal alcohol exposure exacerbates acute sensorimotor deficits and impedes long-term behavioral recovery from the effects of an adult-onset cerebrovascular ischemic stroke. *Alcohol Clin Exp Res.* 2022 Oct 6. doi: 10.1111/acer.14952.
- Baker EC, Earnhardt AL, Cilkiz KZ, Collins HC, Littlejohn BP, Cardoso RC, Ghaffari N, Long CR, Riggs PK, Randel RD, Welsh TH Jr, Riley DG. DNA methylation patterns and gene expression from amygdala tissue of mature Brahman cows exposed to prenatal stress. *Front Genet.* 2022 Aug 5;13:949309. doi: 10.3389/fgene.2022.949309.
- Bedi YS, Roach AN, Thomas KN, Mehta NA, Golding MC. Chromatin alterations during the epididymal maturation of mouse sperm refine the paternally inherited epigenome. *Epigenetics Chromatin.* 2022 Jan 6;15(1):2. doi: 10.1186/s13072-021-00433-4.
- Bedi YS, Wang H, Thomas KN, Basel A, Prunier J, Robert C, Golding MC. Alcohol induced increases in sperm Histone H3 lysine 4 trimethylation correlate with increased placental CTCF occupancy and altered developmental programming. *Sci Rep.* 2022 May 25;12(1):8839. doi: 10.1038/s41598-022-12188-3.
- Behlen JC, Lau CH, Pendleton D, Li Y, Hoffmann AR, Golding MC, Zhang R, Johnson NM. NRF2-Dependent Placental Effects Vary by Sex and Dose following Gestational Exposure to Ultrafine Particles. *Antioxidants (Basel).* 2022 Feb 10;11(2):352. doi: 10.3390/antiox11020352.
- Blachier F, Wu G. Dietary amino acids and intestinal microbiota. *Amino Acids.* 2022 Oct;54(10):1337-1338. Bowhay CM, Wickersham TA, Richardson R, Dunlap KA. Texas panhandle beef production tour, a high-impact compressed course in animal science. *Transl Anim Sci.* 2022 May 4;6(2):txac054. doi: 10.1093/tas/txac054.
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- Boakari Y. L., Legacki E, Augusta Alonso M, Francisco dos Santos AC, Nichi M, Conley AJ, Barbosa Fernandes C. Postnatal dynamics of circulating steroid hormones in mule and equine neonates. *Veterinary Sciences.* 2022, 9(11):598.
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27th Annual Dr. Raymond O. Berry Memorial Lecture

The Twenty-Seventh Annual Dr. Raymond O. Berry Memorial Lecture, sponsored and organized by the Interdisciplinary Faculty of Reproductive Biology, was held at Prairie View A&M University, on October 7 2022. Dr. Donald S. Torry, Professor, Department of Medical Microbiology, Immunology and Cell Biology, Clinical Professor of Obstetrics and Gynecology, Department of Obstetrics and Gynecology; Director, Basic and Translational Research, Simmons Cancer Institute, and Associate Dean for Research, Southern Illinois University (SIU) was selected by IRFB faculty to give the presentation, “Mechanisms Regulating Angiogenic Growth Factor Expression at the Maternal-Fetal Interface.”

Professor Torry received his Ph.D. in Reproductive Immunology from Southern Illinois University and postdoctoral training at Harvard University School of Medicine in Molecular and Cellular Pathology. He served as Assistant and Associate Professor in the Department of Obstetrics and Gynecology and the University of Tennessee Graduate School of Medicine between 1993 and 2000. Dr. Torry joined the faculty of Southern Illinois University School of Medicine in 2000 as Associate Professor, Department of Medical Microbiology and Immunology and Associate Clinical Professor of Obstetrics and Gynecology, Department of Obstetrics and Gynecology, Southern Illinois University School of Medicine and has risen through the ranks to his current positions. Dr. Torry has over 30 years of experience in the field of molecular immunology with expertise in reproductive immunology, obstetrical complications, and angiogenesis. His laboratory was the first to show that expression of a placenta-derived angiogenic factor and placenta growth factor was significantly altered in pre-eclampsia, one of the most common human obstetrical complications. Based on his combined interests in reproductive immunology and cancer biology his laboratory is currently investigating molecular mechanisms regulating tumor-induced NK cell differentiation and function with particular interests in the discovery that human NK cells lose their ability to carry out cytotoxic reactions and instead produce angiogenic growth factors that may augment successful implantation during human pregnancy. Current studies are to determine the functional ability of the NK cells to induce angiogenesis/lymphangiogenesis in renal cell carcinoma. From that research, Dr. Torry's team validated a novel gene array of inflammatory and angiogenic genes and identified key molecular signatures that characterize conversion of NK cells from tumor-destructive to tumor-promoting phenotypes. Dr. Torry's recent research has been supported by funding from the National Institute of Child Health and Human Development, the National Cancer Institute, William E. McElroy Charitable Foundation, and Memorial Medical Center Foundation Grants. He has a strong record of publishing in high impact journals. As an advocate for reproductive immunology research, Dr. Torry has served in several executive roles, including President, of the American Society for Reproductive Immunology. He has re-

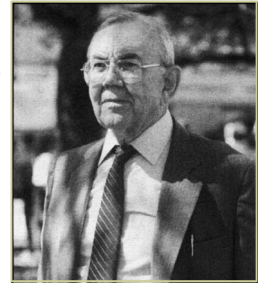


ceived the American Society for Reproductive Immunology Distinguished Service Award, and the American Journal of Reproductive Immunology Award for Outstanding Contributions to Reproductive Immunology. He serves on the editorial board of the American Journal of Reproductive Immunology. He has served as a standing member, as well as an ad hoc member on the Pregnancy and Neonatology Study Section at NIH. He has also reviewed reproductive biology projects for the Lalor Foundation, Pennsylvania Department of Health and Florida Department of Public Health Final Performances administered via Oak Ridge Associated Universities, amongst others. He served on both the Task Force for COVID19 Serological Testing and the Task Force on COVID19 Vaccine Implementation for the State of Illinois.

For his outstanding contributions, Texas A&M University recognizes the work of Dr. Torry 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. Duane Kraemer, who worked with Dr. Berry, has for over 25 years led off the Lecture by providing an entertaining presentation that included memories of Dr. Berry. For the past two years Dr. Bill Foxworth, a doctoral trainee of Dr. Kraemer, presented Dr. Kraemer's slides and comments on Dr. Berry's seminal contributions that launched the reproductive immunology field.

Below: Meeting organizers and presenters (left to right), Drs. Rodolfo Cardoso, Donald Torry, Greg Johnson, Fuller Bazer, members of Dr. Berry's family, Mrs. Dorothy McLemore, Dr. Berry's daughter and Alecia Smith granddaughter, Dr. Dana Gaddy and Dr. Bill Foxworth).



“Dr. Berry's pioneering studies contributed basic knowledge about maternal immune recognition of the fetal-placental unit.”

-Fuller W. Bazer



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(continued on page 15)

IFRB Postdoctoral Trainee Spotlight



***Dr. Nirvay Sah** began his postdoctoral training in the laboratory of **Dr. Fuller W. Bazer** in June 2022. He is working on the USDA-NIFA project, "Creatine kinase: Key Roles in Conceptus Development." His current research aims to characterize the expression of components of the Creatine (Cr)-Creatine kinase (CK)-Phosphocreatine (PCr) system in uterine and placental tissues of pigs and to determine the associations between porcine fetal sex and creatine metabolism at the uterine-placental interface.

Dr. Sah is originally from the south-central part of Nepal, where he completed his DVM in 2016. He then moved to the USA to pursue MS in Animal Science from University of Hawaii with Dr. Birendra Mishra. His master's research examined the transcriptome of laying-, molting- and non-laying hens to determine the genes responsible for formation of egg in the chicken oviduct. Findings of his master's research were published in *Scientific Reports* and *BMC genomics*.

Dr. Sah moved to Texas A&M to begin his PhD education with Dr. Fuller W. Bazer in January 2019, where he investigated the roles of one-carbon and creatine metabolism in ovine conceptus development. His findings showed that the knockdown of serine hydroxymethyltransferase 2 (SHMT2), an enzyme that initiates the one-carbon metabolism pathway, in ovine conceptuses decreased the proliferation and migration of trophoblast cells and reduced pregnancy rates during the peri-implantation period of pregnancy. His doctoral research also demonstrated that ovine uterine and conceptus tissues express components of the Cr-CK-PCr system, which potentially maintains homeostasis of ATP in those tissues



during pregnancy. Findings of his doctoral studies were published in *Biology of Reproduction* in 2022.

After earning his PhD in August of 2022, Dr. Sah continued his training in reproductive biology as a postdoctoral research associate with Dr. Bazer. His current research indicates that inhibition of creatine biosynthesis in ovine conceptus may inhibit conceptus elongation leading to decreased pregnancy rates during the peri-implantation period (**Figure 1**), which suggests a critical role for this pathway in conceptus development. His ongoing work investigates the associations between fetal sex and size with the expression of mRNAs and proteins of the Cr-CK-PCr system in the endometrium and placenta of sows.

Dr. Sah received a travel award from the Society for Study of Reproduction (SSR) to present his work titled "Ovine endometria and placentomes express components of the creatine-creatine kinase-phosphocreatine system during pregnancy" in a flash talk and poster presentation at the 2022 SSR annual meeting in Spokane, Washington. As a trainee member for the Publications Committee of SSR, he also co-organized a panel discussion on "Demystifying the publication process" for trainees during the annual meeting. He also presented his work on one-carbon metabolism at the 2022 Gordon Conference on Mammalian Reproduction in West Dover, Vermont. He has presented his research regularly at the Interdisciplinary Faculty for Reproductive Biology retreats and at Texas Forum for Reproductive Sciences annual meetings since 2019.

Dr. Sah's research has been supported by USDA grants (2018-67015-28093 and 2022-67015-36376) awarded to **Dr. Fuller W. Bazer (PI)** and **Drs. Gregory A. Johnson and Guoyao Wu (Co-PIs)**.

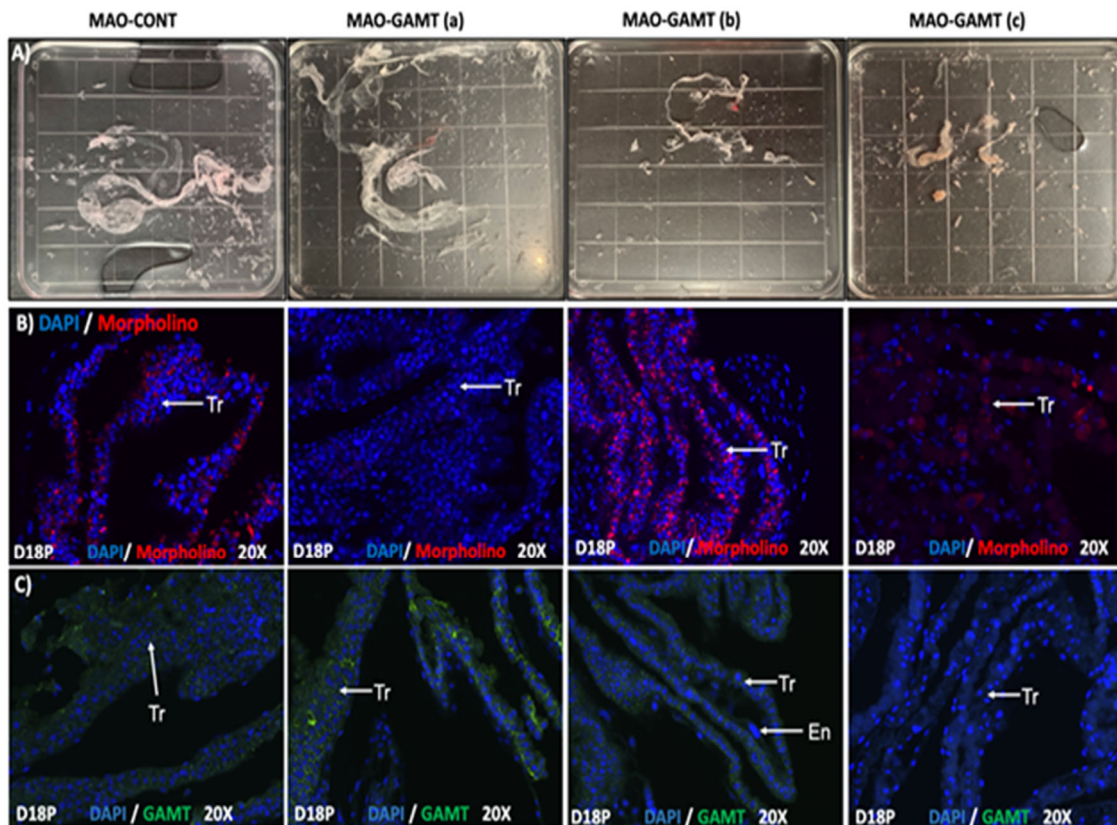
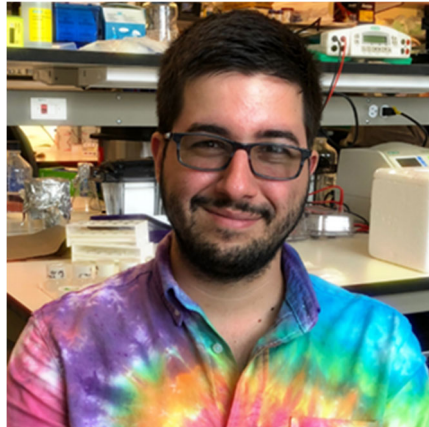


Figure 1. Effect of inhibition of creatine biosynthesis in ovine conceptuses using morpholino antisense oligonucleotide (MAO) targeted to inhibit translation of guanidinoacetate methyltransferase (GAMT) mRNA. A) Conceptus recovered from ewes treated with control morpholino (MAO-CONT) were elongated but conceptuses from ewes with MAO-GAMT treatment had three phenotypes: elongated conceptus, MAO-GAMT (a); growth restricted conceptus, MAO-GAMT (b); and degenerating conceptus, MAO-GAMT (c). B) Normal elongation of MAO-GAMT (a) conceptus was associated with failure to take-up the lissamine-tagged morpholino. C) The degeneration of MAO-GAMT (c) conceptus was associated with the successful knockdown of GAMT protein.



IFRB Graduate Student Spotlight

***Pierre Ferrer** is a Ph. D candidate of the Toxicology program in the school of Veterinary Medicine & Biomedical Sciences mentored by **Dr. Tracy Clement**. Pierre received his BS in Biochemistry and Molecular Biology at Trinity University in San Antonio in 2018. During his undergraduate studies he worked in the Beaudoin Electrophysiology Lab at Trinity where he researched the molecular effects of cocaine on the expression and regulation of NMDA and AMPA receptors of dopaminergic neurons. Shortly after joining the TAMU family Pierre joined Dr. Clement's laboratory in 2018 where his research has focused on characterizing the effects of pharmaceutical compounds on male fertility as well as elucidating the structural functions of testis-specific cytoskeletal proteins. In particular, Pierre has devoted a large part of his studies utilizing a dual approach of in silico computer models and in vitro molecular techniques to better understand the functionality of two particular testis-specific actin-like proteins: ACTL7A and ACTL7B.



spaces and cytoskeletal supra structures (including the nucleoplasm, acroplaxome, manchette, and post-acrosomal sheath) at distinct stages of spermatogenic development – implicating their importance in many different cellular processes. One of such distinct functions was observed on Actl7a deficient mice where Pierre discovered that the acroplaxome (a dense cytoskeletal structure anchoring the developing acrosome to the nucleus) was completely devoid of filamentous actin leading to severe acrosomal instability. Currently, Pierre is investigating the potential intranuclear roles of ACTL7A and ACTL7B as well as their viability as a male contraceptive target for future pharmaceutical development.

His work has demonstrated the imperative presence of these actins for male reproduction as separate male KO mice of these proteins have shown to not only have acrosomal defects but are also completely infertile. Additionally, Pierre's work has demonstrated these proteins to be dynamically expressed and associated with very different intracellular

Pierre has presented his research at the annual American Society of Andrology meeting (2021-2022), Lone Star Society of Toxicology meeting (2020), Toxicology and Regulatory Science Symposium (2019-2022), and the CVM Trainee Research Symposium (2019-2022). He also received the J.D. McCrady Stellar Presentation Award as well as the Toxicology T32 travel award. In addition to his research, Pierre has thoroughly enjoyed teaching male reproduction and gametogenesis as a guest lecturer on the Human Physiology II course (VTPP 427) as well as undertaking several undergraduate student researchers through the Aggie Research Program. Outside of the lab, you can find Pierre dabbling with computer hardware, playing jazzy toons on the piano, and enjoying the few cold wintery days that Texas can provide. ***

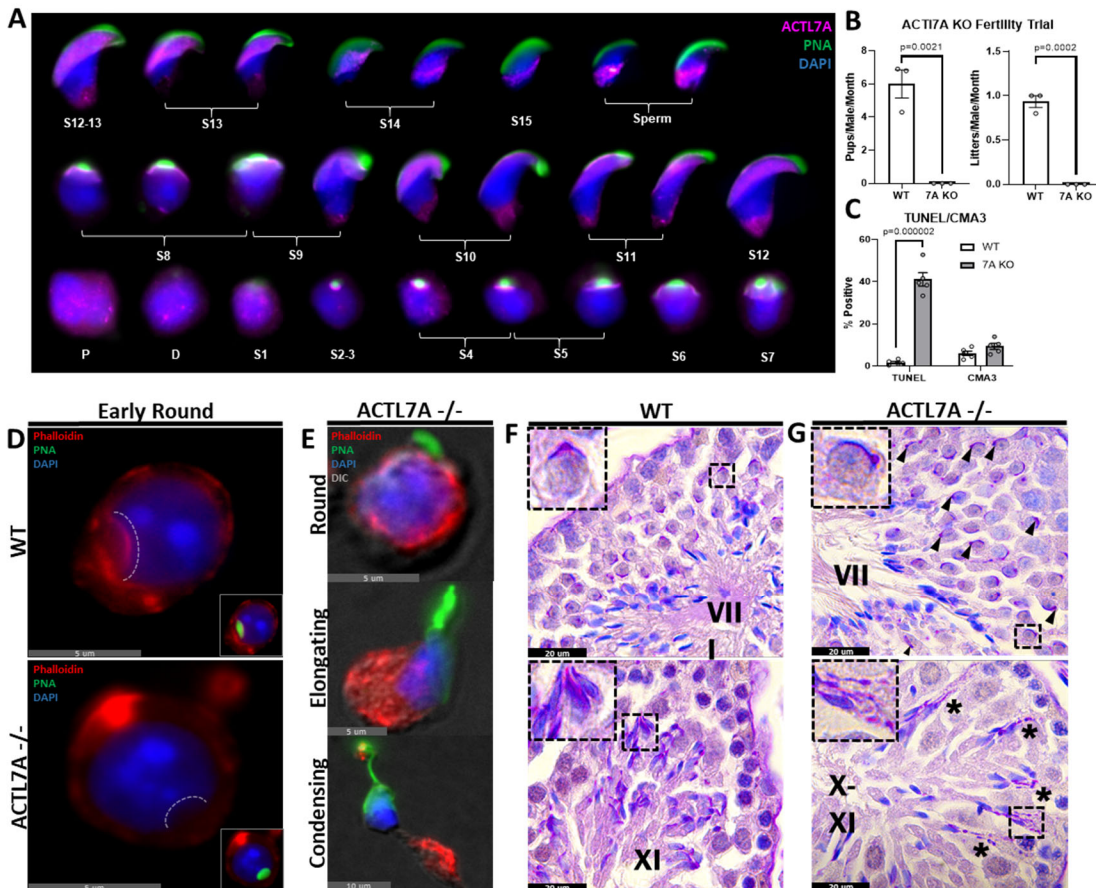


Figure legends

- A) Dynamic expression of ACT1A in murine Pachytene spermatocytes (P), Diplotene spermatocytes (D), and spermatids (S1-S15).
- B) 6-month fertility trial of ACTL7A KO mice showing complete infertility.
- C) TUNEL assay showing a drastic increase of DNA damage in ACTL7A KO sperm.
- D) WT and KO round spermatids showing a complete lack of subacrosomal F-actins in KO spermatids delineated by the white dashed line.
- E) KO spermatids demonstrating peeling acrosomal and abnormal morphology.
- F) (and G) PAS-H stained seminiferous tubules showing abnormal acrosomal granules (black arrowheads) and peeled acrosome residing in Sertoli cell crypts (black asterisks) in ACTL7A KO testis compared to WT.

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IFRB Graduate Student Spotlight



***Joe Cain** is a PhD student in the Department of Veterinary Integrative Biosciences in **Dr. Greg Johnson's** lab. He received his BS in Biological Sciences from the University of California Santa Barbara in 2018. While at UC Santa Barbara, Joe worked as an undergraduate researcher studying evolutionary biology and competed as a collegiate rower. After graduation, he worked as a research associate for a contract research organization

in San Diego and then began his graduate education at Texas A&M in 2019. Joe first enrolled as a master's student in the biomedical sciences non-thesis program, offered by the School of Veterinary Medicine and Biomedical Sciences, before transferring to a thesis track and then to a PhD track in Dr. Johnson's lab.

Joe's current research is on the expression and regulation of interferon-stimulated genes in the endometrium during the peri-implantation period of porcine pregnancy. The major interferon that is secreted by the pig conceptus is interferon gamma (IFNG), which tightly regulates endometrial genes and is necessary for the survival of the conceptus. Joe is particularly interested in how conceptus-derived IFNG is transported across the endometrial luminal epithelium. His work suggests that the conceptus uses Extracellular Vesicles (EVs) as a paracrine signaling mechanism and that IFNG is transported via EVs from the conceptus to the endometrium during the peri-implantation period (**Figure 1**). IFNG from these EVs can then induce

expression of interferon stimulated genes in endometrial tissue (**Figure 2**).

His future work will further examine the mechanics of EV and IFNG uptake by the endometrium, and the downstream effects of IFNG signaling. He will also be expanding his animal model portfolio to include mice as he studies the expression of osteonectin in the mouse placenta. Outside of the lab, Joe has quickly adapted to working with large animal species and contributes to the animal husbandry, surgeries, and necropsies of his lab's research animals.

Joe has presented his work at the annual Society for the Study of Reproduction meeting and has given oral presentations at the Texas Forum for Reproductive Sciences and the annual IFRB retreat. He has served as a graduate teaching assistant for both the VIBS 343/602 and VIBS 443/602 histology courses, which has given him the opportunity to educate and mentor students of all levels. Joe values every chance he gets to learn new things from his students, co-workers, and instructors, and he is grateful for the mentorship of Drs. Greg Johnson, Heewon Seo, Fuller Bazer, and Guoyao Wu. In his free time, Joe enjoys cooking, traveling, and being outdoors. ***

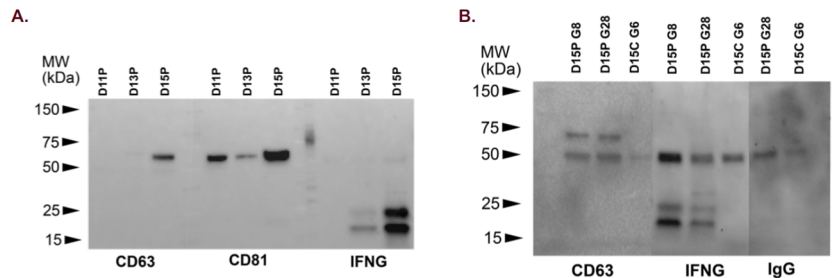


Figure 1. Western Blot analyses of EV markers (CD63 and CD81) and IFNG within (A) uterine flushes taken from day 11, 13, and 15 of pregnancy and (B) extracellular vesicles isolated from uterine flushes from day 15 of pregnancy (D15P) and day 15 of the estrous cycle (D15C). D, Day; P, Pregnancy; C, Cyclic; G, Gilt

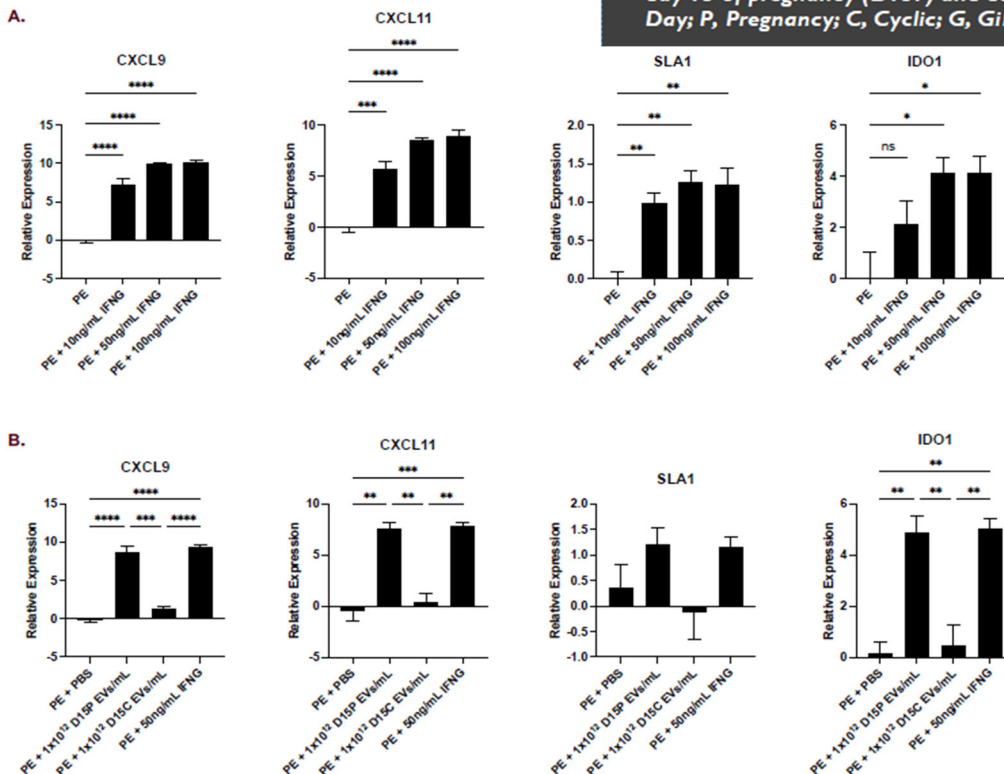


Figure 2. Quantitative real-time PCR of IFNG-stimulated genes from D11P endometrial explants treated with progesterone (P), estrogen (E), and (A) increasing concentrations of IFNG or (B) extracellular vesicles isolated from uterine flushes from day 15 of pregnancy (D15P) and day 15 of the estrous cycle (D15C). All relative expression data have undergone Log2 transformation. D, Day; P, Pregnancy; C, Cyclic

IRFB Faculty Activities, Awards, etc. continued from page 8

***Dr. Yatta Boakari** had two invited articles in Veterinary Academic Week, University of Brasilia, Brazil and University of Franca, Brazil entitled "Mare Theriogenology Cases" and Theriogenology Cases", 2022, respectively. the Conceptus, Uterus and Placenta."

***Dr. Qinglei Li** gave an invited presentation at the UT Southwestern Medical Center's Reproduction, Development and Cancer Seminar Series in May 2022

***Dr. Sakhila Banu** was an invited speaker at the Dr. Elizabeth Matthai Endowment Lecture held at the Department of Endocrinology, Dr. ALM Post Graduate Institute of Basic Medical Sciences, University of Matras on December 16, 2002. The title of her lecture was "Hexavalent chromium induces transcriptomic changes in the rat placenta in a spatio-temporal manner."

***Dr. Fuller Bazer** was the Distinguished Lecturer, University of Florida, 20th annual Animal Molecular and Cellular Biology Symposium in May 2022.

Dr. Bazer also presented three other invited lectures including: "Interferon Tau: Influences on growth and development of the

conceptus," 19th International Congress on Animal Reproduction, Bologna, Italy and at the Department of Obstetrics and Gynecology, Michigan State University Health Science Center, Grand Rapids, and at the

H. Allen and Ann Tucker Lectureship

Seminar Series. "Interferon Tau: Pregnancy recognition signaling and inducer of genes required for development of the conceptus," Michigan State University, East Lansing, Michigan.

***Dr. Ky Pohler** was an Invited lecturer at a number of meetings including: CEA Paraguay: "Novel technologies to reduce pregnancy loss in cattle."

The Brazilian Society of Embryo Transfer: "Pregnancy loss in cattle, what's new?"

The World Dairy Expo: "Tools for heat detection and reducing pregnancy loss."

The European Animal Science Meetings: "Causes of embryonic mortality and pregnancy loss in cattle."

American Society of Animal Science: "Award talk: Novel technologies to improve reproductive efficiency." ****

IRFB Trainee News continued from page 8



***Dr. Shobana Navaneethabalakrishnan**, postdoctoral fellow in the laboratory of **Dr. Brett Mitchell**, was first author on one and co-author on two other invited research presentations at the American Heart Association's Annual Scientific Sessions of the Council on Hypertension, September 7, 2022. She also won the Trainee Advocacy Committee Poster Award at the Hypertension Scientific Sessions

during the same meeting. Shobana was also first author on two and co-author on 6 papers in high-impact journals in 2022.

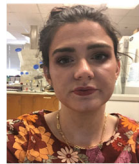
***Dr. Alice Brandão** from the laboratory of **Dr. Reinaldo Cooke** was the recipient of the 2022 Southern Section of the American Society of Animal Science (SSASAS) Emerging Young Scholar Award, presented to her this week during the 2022 Southern Section Meeting held in Fort Worth, TX.

***Audrey Earnhardt, Ph.D.** student with **Drs. Tom Welsh and Ron Randel** in Animal Science, was selected as a participant in the American Physiological Society's "Preparing Effective Physiology Educators Program" (June-September 2022).

***Viviana Garza, a Ph.D.** student under the mentorship of **Drs. Gary Williams and Rodolfo Cardoso**, was the recipient of an Area of Excellence Assistantship for the current academic year, the 2022 David Forrest Outstanding ASGSA Member Award, and the 2022 Dan F. Jones Memorial Fund Scholarship from the Department of Animal Science.

***Sara Gurule** is a M.S. student under direction of **Dr. Rodolfo Cardoso**. received travel awards from the Department of Animal Science and an Involvement Award from the Animal Science GSA. Sara's research investigates the neuroendocrine alterations in female sheep prenatally exposed to

testosterone excess, using them as a model for PCOS. She gave oral presentations at the 2022 IFRB Retreat. She also presented a poster at the 2022 SSR Annual Meeting.



***Amy Barrett**, second year graduate student in the laboratory of **Dr. Sakhila Banu**, received a Walter W. Lechner Estate Scholarship. Her research program is focused on the effects of hexavalent chromium on placental development and function. She is analyzing RNA-seq data from placental tissues exposed to hexavalent chromium using Bioinformatics tools.

NEW TRAINEES

***Sarai Milliron, D.V.M., DACVP** is a new postdoctoral fellow in the laboratory of **Dr. Tracy Clement**. She received her B.S. in biology from Eastern Washington University, earned a DVM from University of California, Davis and achieved her ACVP board certification in veterinary anatomic pathology. She will be studying drug effects on spermatogenesis with the goal of designing and/or discovering a non-hormonal male contraceptive.



***Leslie King** is a first year masters student working under the direction of **Dr. Rodolfo Cardoso**. She earned a B.S. in Animal Science from Texas A&M. in 2021 and started pursuing her M.S. in 2022 with research focused on investigating the multigenerational effects of testosterone excess on metabolic functions using sheep as a model of Polycystic Ovary Syndrome.

***Samantha Higgins** is a new student in Dr. Michael Golding's Lab from Jemison, Alabama who has a B.S. in Genetics from Texas A&M University. In the Golding Lab, Sam's research focuses on determining how various genetic factors influence the paternal epigenetic inheritance of birth defects and the role of mitochondria in mediating the impacts of paternal alcohol exposures on the developing placenta and fetus.



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IFRB Faculty Transitions



***Dr. David W. Forrest**, Professor of Reproductive Physiology retired August 31, 2021, with 41 years of dedicated service to TAMU. He graduated from Abilene Christian College (B.S. in Animal Science) in 1974 and earned a M.S. degree in Physiology of Reproduction at TAMU via the mentorship of Dr. Paul Harms (1976).

Dr. Forrest earned the doctoral degree in reproductive physiology at the University of Wyoming

(1979). He was the Beef Cattle Extension Specialist for the University of California-Davis until he returned to Texas A&M following the unexpected passing of Dr. Tony Sorensen, Physiology of Reproduction Section Leader.

Starting in 1981, Dr. Forrest taught the ANSC 433 Reproductive Physiology of Farm Animals course 3 times per year. In addition, he team-taught reproductive physiology and theriogenology courses for graduate students and veterinary residents. He has educated more than 10,000 students that the application of reproductive science and technology can efficiently increase the production of animal-derived protein for consumers (i.e., “no production without reproduction”). His lifetime commitment to animal agriculture as a researcher, extension specialist, educator, and administrator has benefitted the U.S. beef cattle. Dr. Forrest’s influence will continue onward via the efforts of the numerous undergraduate and graduate students that he inspired to become leaders.

Dr. Forrest’s research and teaching successes enabled him to progress through the professorial ranks. He was a founding member of the IFRB and served many years as Physiology of Reproduction Section Leader and as Associate Head for curriculum and graduate programs in the Department of Animal Science. He also held an academic appointment in the Department of Large Animal Clinical Sciences. He received many awards and was elected as a Fellow in the American Society of Animal Science in 2014 in recognition for his contributions to teaching.

Dr. Forrest fostered professional development of graduate students. He attributed much of his own research success (on topics of puberty regulation in bulls and heifers, estrus cycle regulation, libido testing of bulls) and student satisfaction with his courses to the efforts of graduate research and teaching assistants. The Aggie core value of “service” is exemplified by Dr. Forrest’s selfless actions as evidenced by his decades of service to students and professional science organizations. The Animal Science Graduate Student Association established a new graduate student award in his name: the “David Forrest Outstanding ASGSA Member Award”. By virtue of the mentor chain, Dr. Forrest will continue to impact the beef industry and reproductive sciences through the students he trained and educated.

Newly retired Dr. Forrest and his wife Dr. Sandra Lovering (retired Pathology Branch Chief at the Texas Veterinary Medical Diagnostic Laboratory) reside near College Station and enjoy time with their daughter and her family.



***Dr. Duncan MacKenzie** retired on June 1, 2022, after 39 years in the Department of Biology. He received his BS in Zoology from the University of California at Davis, where he developed an interest in endocrinology during a study abroad year in the Zoology Department at the University of Edinburgh. He completed a PhD in Zoology in the laboratory of Dr. Paul Licht at the University of California at Berkeley, where he participated in the development of the first radioimmunoas-

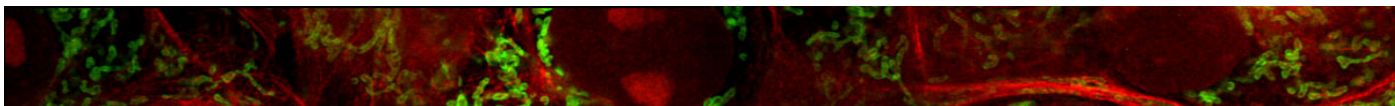
says for all three pituitary glycoprotein hormones in reptiles. He then moved to the University of Alberta as postdoctoral fellow in the laboratory of Dr. R.E. Peter, where he studied the interactions between reproductive and thyroid hormones in fish, including the first description of periovulatory changes in pituitary, steroid, and thyroid hormones during spawning in a wild species, the white sucker. Since joining Biology in 1983 his research has focused on elucidating the unexpectedly dynamic nature of thyroid function in nonmammalian vertebrates, including:

-*Thyroid endocrinology of fish.* In collaboration with Dr. Delbert Gatlin (TAMU Wildlife and Fisheries) the MacKenzie lab conducted detailed studies in red drum describing robust changes in thyroid hormones that are associated with growth and nutrition, helping to identify thyroid indicators of aquaculture performance.

-*Pituitary glycoprotein hormone function in fish.* Thyroid hormone measurement, characterization of thyroid sensitivity to pituitary hormone stimulation, and expression of pituitary glycoprotein hormone subunits revealed precisely regulated daily cycles of thyroid activation in red drum and channel catfish. Collaborations with Dr. Scott Jaques (Texas Veterinary Medical Diagnostic Laboratory) established that these were regulated by circadian cycles of thyroid hormone feedback at the pituitary.

-*Reproductive endocrinology of sea turtles.* In collaboration with Dr. David Owens (TAMU Biology), measurement of reproductive and nutritional hormones during the reproductive cycle of wild olive ridley sea turtles helped clarify how hormone measurements can be used to promote reproductive success in endangered species.

Dr. MacKenzie taught undergraduate Animal Physiology for 30 years, as well as Introductory Biology, Human Anatomy and Physiology, and graduate endocrinology. Most recently he taught Comparative Endocrinology, a course popular with many entering IFRB graduate students. In Biology, he served as Graduate Advisor and founding Director of the Biology Honors program. He has also served as Chair of the University Laboratory Animal Care Committee, Associate Director for Undergraduate Research in LAUNCH, and Co-Chair of the Marine Biology Graduate Interdisciplinary Degree Program. He received numerous teaching and mentoring awards, including University- and College-level AFS teaching excellence awards, SLATE Awards, the Wells Fargo Honors Faculty Award, and the Career Impact Award from LAUNCH. His most rewarding experience has been mentoring thirty graduate students and seventy undergraduates in studies of endocrinology in his research laboratory. Dr. MacKenzie particularly appreciated stimulating interactions with the many IFRB colleagues who share his fascination with the mechanisms of the chemical mediation of reproduction.



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15th Annual IFRB Retreat, 2022



The 15th Annual IFRB Retreat was held on October 7, 2022 in conjunction with the 27th Annual Dr. Raymond O. Berry Memorial Lecture. Over 60 IFRB 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 on the PVAMU campus.

Retreat organizers were **Drs. Bill Foxworth** from PVAMU and **Drs. Rodolfo Cardoso** and **Fuller Bazer** from TAMU. **Dr. Dana Gaddy** presided over the meeting.

Two new IFRB faculty members and seven trainee/research scientist provided platform research reports. New IFRB faculty members included: **Dr. Heidi Vanden Brink**, Assistant Professor, Nutrition, "Emerging predictors of re

-productive dysfunction in post-menarcheal adolescents" and **Dr. Lacey Luense**, Assistant Professor, Animal Science, "Abnormal sperm histone retention on preimplantation embryo development."

Trainee & research scientist presenters:

Sarah Singleton, (MS student) Parthenogenetic embryos: providing insight into parent-specific contributions to pregnancy,"

Joe Cain, (PhD student) "Pig conceptuses secrete extracellular vesicles containing IFNG into the uterine lumen for paracrine communication with the endometrium."

Lacey Quail, (PhD student) "Prenatal transportation stress did not impact ovarian follicle count for three generations of female Brahman offspring."

Sara Gurule, (MS student) "Effects of prenatal testosterone excess on puberty attainment and corpus luteum function of first-generation ewe lambs."

Kyle Hickman-Brown, (MS student) "The microbiomes of vaginal, cervical, and uterine tissues in pregnant gilts."

Dr. Claire Stenhouse, Assistant Research Scientist, "Alkaline phosphatase: an important regulator of ovine conceptus development."

Kara Thomas, (PhD student) "Developmental toxicity of dual parental alcohol consumption and the long-term effects on offspring growth, craniofacial, and neurological development."

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. ***

IFRB Trainee News continued from page 17

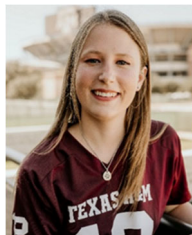
***Arianna Lopez** is a first year M.S. student in the laboratory of **Dr. Fuller Bazer**. Before joining the lab, she obtained a B.S. in Animal Science from Texas Tech University. She will be involved in research on effects of feeding dietary supplements of citrulline on reproduction and lactation in goats, expression of genes for the creatine biosynthesis pathway in uteri of pigs and cattle, and effects of sex steroids on expression of polyamines in uteri of sheep.



***Molly Smith** is a new M.S. student under the mentorship of **Dr. Becky Poole**. Molly is from Lockhart, TX and earned her B.S. in Animal Science from TAMU in December 2021. Her research focuses on the reproductive microbiome in beef cattle and its relationship with pro- and anti-inflammatory cytokines.

Mollie and Brooke McAnally (see below) were selected as finalists in the 2022 TAMU 3MT Competition.

***Brooke McAnally** is a M.S. student who joined **Dr. Becky Poole's laboratory** in January. She is earned her B.S. in Animal Science from TAMU in December 2021. Her research focuses on the semen microbiome in the boar and its relationship with sperm quality parameters. Brooke tied for 1st place in the Graduate Student Poster Competition (Master's Division) at the 2022 ASAS Annual Meeting in Oklahoma City, OK. Brooke was runner-up in the master's division for the 3MT Competition.



***Kyle Hickman-Brown** is a M.S. student who joined **Dr. Poole's laboratory** in August. Kyle is from Brisbane, Australia and moved to the Chicago, IL in 2017. He earned his B.S. in Animal Science from Illinois State University in December 2021 and interned in Dr. Poole's lab during the Spring 2022 semester. His research focuses on the microbiome of different reproductive tissues in pregnant gilts.



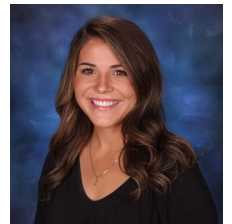
***Dallas Soffa** is a Ph.D. student starting August 2022 under the mentorship of **Dr. Becky Poole**. Dallas is originally from Charlotte, NC and earned her B.S. in Animal Science from North Carolina State University in 2019 and M.S. in Animal Science from Virginia Tech in May 2022. Her research focuses on the hormonal (estradiol and progesterone) influence on the reproductive microbiome in cattle.



Dallas was elected the 2023-2024 Graduate Student Director for the ASAS Southern Section.

***Carli Lefevre** is a new student in the laboratory of **Dr. Greg Johnson**. She earned a B.S. in Animal Science from TAMU. Her research will include examination of genes in the creatine metabolism pathway during pregnancy in swine.

***Brette Poliakiwski** is a 2nd year PhD student in **Dr. Ky Pohler's** lab and co-advised by **Dr. Cliff Lamb**. She studies the physiological effects of prostaglandin manipulation during the period of late embryonic development on pregnancy success. The long-term goals are to elucidate the physiological and molecular mechanisms that cause late embryonic mortality in cattle and to use this knowledge to develop management strategies to decrease reproductive loss. Brette grew up on a farm in Vermilion, Alberta, Canada and found a love for the agriculture at a young age having had ~400 beef cattle and farmed ~1000 acres of crop land. She spent every summer milking their ~550 Holsteins and working in the feed mill. She pursued a passion for cattle with joining 4-H Beef and each year raising a steer, heifer and cow-calf pair. At the age of 15 she joined the Canadian Judo team to pursue her judo career goals. Throughout the 3 years that she competed for Team Canada, she travelled all over the world representing Canada. After 1 retired from her judo career, she attended the University of Saskatchewan and completed an undergraduate degree in Animal Science. Since graduating from U. of S, she was accepted into a PhD program at Texas A&M University. ***



55th SSR Annual Meeting, Spokane, Washington

2022 American Society for Animal Science, Oklahoma City, OK

The 55th Society for the Study of Reproduction (SSR) Annual Meeting was held Jul 26 - 29, 2022 at Spokane Convention Center, Spokane, Washington. This year 28 trainees and 14 faculty contributed to presentations at the annual meeting.



The 2022 American Society for Animal Science meeting was held in conjunction with CSAS June 26-30, 2022 at the Oklahoma City Convention Center. Numerous presentations were given by TAMU faculty including 12 IFRB members and 20 trainees.



The 56th Annual SSR Meeting, "Reproductive Sciences: From Innovation to Impact" will be held July 11-14, 2023, Shaw Centre, Ottawa, Canada.



The 2023 American Society for Animal Science meeting will be held in conjunction with CSAS at the Albuquerque Convention Center July 16-20, 2023. The deadline for abstracts is March 21, 2023.

IFRB Committee Structure & Membership

Graduate Programs Committee

Carey Satterfield, (Chair)
Dana Gaddy
Gary Williams

Seminar Committee

Sakhila Banu, (Chair)
Robert Burghardt
Annie Newell-Fugate

Executive Committee

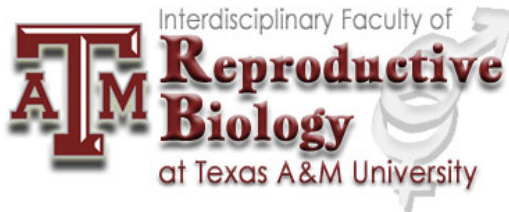
Rodolfo Cardoso (Chair)
Sakhila Banu
Gregory Johnson
Qinglei Li
George Perry
Ky Pohler
Robyn Moses, Trainee Rep.

Nominating Committee

Joe Arosh, (Chair)
Michael Golding
Shannon Washburn

Membership Committee

Nancy Ing (Chair)
Greg Johnson (EC liaison)
Kathrin Dunlap



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.

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Comments,
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