

IFRB 2017

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: 23rd Annual R.O. Berry Lecture, 24 year old IFRB Repro Forum Seminar Series, 23rd Texas Forum on Reproductive Sciences, Annual IFRB Retreat

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2017, ISSUE 1

New IFRB Faculty Spotlight



Dr. Tracy Clement joined the Department of Veterinary Physiology and Pharmacology as an Assistant Professor in 2017 and is a new member of the IFRB. Current research focuses on molecular and cellular mechanisms of spermatid morphogenesis, to better understand male fertility and high fidelity transmission of genetic and epigenetic information to the next generation.

Dr. Clement received her Doctoral degree in Genetics and Cell Biology at Washington State University. There, with Dr. Michael Skinner, she studied programs in gonadal fate decisions at sex determination. Subsequently, she joined the National Institute of Environmental Health Sciences (NIEHS) working with Dr. Mitch Eddy for postdoctoral studies focused on adult testis function, before joining Texas A&M University.

Dr. Clement's current research on Actin Related Protein (ARP) roles in cellular and nuclear morphogenesis, has implications for basic cellular processes as well as male fertility. Novel investigations of male fertility are important because there remains a need for novel male contraceptive options. Conversely, approximately seven percent of couples experience infertility due to male factor infertility contributions. Nearly half of the cases of male infertility are idiopathic and frequently associated with abnormal sperm morphology. Morphogenesis of the mammalian spermatid includes significant cytoskeletal remodeling, including rearrangements unique to spermiogenesis which contribute to the development of the sperm and fertility. These spermiogenic cytoskeletal rearrangements give rise to a microtubule based intracellular transport organelle called the Manchette, and an F-actin plate between the acrosome and the nucleus called the acroplaxome, both of which are dynamic during spermatid morphogenesis (see Figure 1, page 2).

The family of ARPs at the heart of Dr. Clement's current investigations are known to play roles in both cytoskeletal regulation and chromatin remodeling processes in somatic cells. Dr. Clement hypothesized that novel testis enriched ARP family members contribute to the



uniquely adapted cytoskeletal and chromatin remodeling processes in the spermatid. She has shown that spermatid specific Actin Like 7B (ACTL7B) is required for spermiogenesis and male fertility, and more specifically for association of cytoskeletal structures with spermatid membranes including nuclear and acrosomal membranes. Specific disruptions in filamentous actin structures and microtubule structures in the developing spermatids are seen in ACTL7B-null mice. Dr. Clement has identified protein-protein associations relevant to the observed defects and is now using cell-free protein dynamics assays to assess the associations on a molecular and biochemical level in her on-going studies funded through an NIH K99/R00

Pathways to independence grant. The relevance of these associations in spermiogenesis and the overall cytoskeletal dynamics during spermiogenesis are also being investigated in a testis explant culture system and through generation of additional mouse models.

In addition to the cytoskeletal regulation in spermatids, Dr. Clement is investigating ARP mediated regulation of chromatin dynamics during spermiogenesis. Recent evidence suggests that nuclear actin and ARPs can modulate the function of chromatin interacting complexes in somatic cells. Chromatin remodeling in spermatids is unique where histone-like protamines replace most nucleosomal complexes. Nucleosome-to-protamine exchange results in chromatin six times more compact than metaphase chromosomes. Evidence suggests that these rearrangements are required for high fidelity transmission of the genome to the next generation, and for epigenetic regulation, alterations of which can be inherited. Despite the importance of these chromatin rearrangements, mechanisms involved in spermatid histone replacement are not well understood. Dr. Clement is investigating how testis enriched ARPs contribute to nucleosomal dynamics during spermiogenesis and the consequences for male fertility.

Dr. Clement's long term goal is to elucidate mechanisms regulating spermiogenesis by integrating molecular and cellular biology, and in vivo, ex situ, and in vitro

(continued on page 2)



New Faculty, Tracy Clement (cont'd from page 1)

Texas Forum for Reproductive Sciences (TFRS)



SAVE THE DATE

The Twenty-Fourth TFRS meeting Honoring Dr. Barbara Sanborn will be held on April 5-6, 2018 at the MD Anderson Onstead Auditorium, 6550 Bertner, Houston, TX

Thursday Plenary Speaker, Dr. Dolores J. Lamb, PhD, HCLD, Professor, Scott Department of Urology and Molecular and Cellular Biology, Baylor College of Medicine

Friday Plenary Speaker Dr. Mala Mahendro, Professor, Department of Obstetrics and Gynecology, University of Texas Southwestern Medical Center

2018 TFRS Meeting Chairpersons Drs. Shaye Lewis and Gary Newton

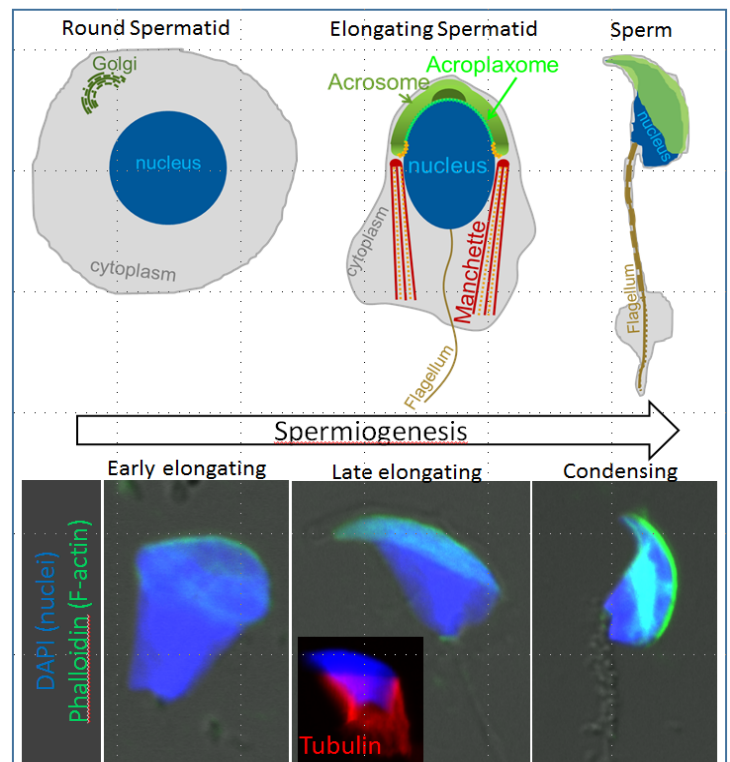
2018 TFRS Meeting Organizers Drs. Marie-Claude Hofmann, PhD and Chandra Yallampalli, PhD-

approaches to investigate cytoskeletal and nuclear restructuring processes with the goal of increasing our understanding of male fertility and more generally, mechanisms of cellular restructuring. This line of research was influenced by, and built from, her previous research experiences. In Dr. Clement's work with Dr. Skinner, she used transcriptomics, gonadal tissue culture models of testis differentiation, and promoter mutational assays to identify novel direct transcriptional targets for the gonadal sex determining gene SRY, and identified developmental alterations in the transcriptome of gonads differentiating into testis or ovary in normal and toxicant exposed gonads. For these studies, Dr. Clement was awarded support through the peer reviewed NIH-CRP-LRP grant program. Dr. Clement's current interests were influenced by the work in Dr. Skinner's Laboratory on the phenomenon of environmental exposure induced transgenerational phenotypes. Identifying mechanistic links for such phenomena has proven challenging because we still have so much to learn about epigenetics in general including the regulation of chromatin dynamics. Dr. Clement says, this is one of the reasons that the ARP family of proteins is of interest as they are involved in chromatin remodeling and have the potential to mediate chromatin dynamics and epigenetics. Dr. Clement's work at the NIEHS with Dr. Mitch Eddy was also influential. Here, she investigated genetic factors in meiotic and post-meiotic germ line development, identifying consequences of spermatocyte meiotic arrest in nuclear remodeling and novel factors in spermiogenic cytoskeletal regulation for morphogenesis gaining an appreciation for the unique and complex process of spermiogenesis which has shaped her research program.

genesis which has shaped her research program.

In addition to Dr. Clement's research and grantsmanship, she has a history of contributing through service, outreach, and leadership. This includes serving on institutional strategic planning committees, leading student and postdoctoral career development committees in government and academic institutions, and serving on the board of directors for the Society for the Study of Reproduction as Trainee Representative to oversee the activities of, and develop opportunities for, all of the societies graduate and postdoctoral trainee members. Dr. Clement particularly enjoyed developing needs based programming such as facilitating grants workshops, networking events, and career fairs. One of Dr. Clement's major service-leadership accomplishments was the development of an industry exploration program partnering with local industry in Research Triangle Park NC. It started as a program for trainees at the NIEHS and has grown into a consortium serving multiple institutions including the NIEHS, University of North Carolina Chapel Hill, and Duke University. This program gets trainees on-site exposure to a variety of industry career options to facilitate career exploration and development. Dr. Clement is passionate about helping to train the next generation of scientists for academia and beyond in a broad range of careers. She is currently recruiting graduate students for 2018 and looking forward to opportunities to contribute to the TAMU graduate education and research missions. Dr. Clement is also open to additional collaborations investigating male germline development, maturation, and fertility, and is enthusiastic to be starting her lab at Texas A&M University with so many fantastic colleagues in the IFRB faculty across the TAMU Colleges and Departments.

Figure 1. The Dynamic Cytoskeleton of the Developing Spermatid. Upper panel: During spermiogenesis drastic restructuring of the haploid round spermatid is required to form fertilization competent sperm. Among the alterations required for morphogenesis are the formation of spermatid specific cytoskeletal structures. The F-actin containing acroplaxome forms between the developing acrosome and the nuclear surface, and the microtubule based Manchette extends caudally from the post-acrosomal nucleus. **Bottom panel:** Cytoskeletal restructuring is regulated to facilitate spermatid morphogenesis. The f-actin underlying the acrosome forms a circumferential nuclear cap during the capping phase. During elongation, the F-actin dynamics are thought to contribute to spermatid head shaping, culminating in a drastic reorganization in early condensing spermatids before the F-actin in the acroplaxome is depolymerized. The Manchette is also dynamically regulated, forming in the elongating spermatid and facilitating spermatid elongation and intracellular transport.



IFRB Faculty Spotlight: Dr. Dickson Varner



Dr. Dickson Dr. Varner is Professor and Pin Oak Stud Chair of Stallion Reproductive Studies in the Department of Large Animal Clinical Sciences, College of Veterinary Medicine & Biomedical Sciences, and the Director of the Stallion Reproductive Studies program at A&M. He is considered one of the leading experts on stallion reproduction – from both clinical and physiological standpoints – in the world. Throughout his career, he has focused on increasing our understanding of the biology of equine sperm, and on factors related to its effective function in the field. He has been recognized nationally and internationally for both his research findings and his clinical expertise in diagnosis and management of stallion subfertility/infertility. Among the awards he has received are the Bartlett Lifetime Achievement Award from the Society for Theriogenology; selection for the prestigious Milne Lecture of the American Association of Equine Practitioners, the Bain Fallon Memorial Lecture (Australia) and the Nick Mills Memorial Lecture, Lloyd's Market Association (London); and Theriogenologist of the Year from the American College of Theriogenologists. In addition to his academic and clinical duties, Dr. Varner is active in both veterinary and equine societies, including serving as the President of the American College of Theriogenologists, on the Board of Directors of the American Association of Equine Practitioners and the American Quarter Horse Association, and on the Legislative Committee of the Texas Veterinary Medical Association, the Editorial Board of *Clinical Theriogenology*, and the International Equine Reproduction Symposium Committee.

Dr. Varner received his B.S. and D.V.M. degrees from the University of Missouri, then worked as a resident veterinarian at a top breeding farm in Kentucky before completing a Residency in Large Animal Reproduction at the University of Pennsylvania and obtaining his M.S. from TAMU. Dr. Varner joined the faculty in the College of Veterinary Medicine at TAMU in 1986; since then, he has conducted research into factors affecting stallion sperm during processing, including effects of fractionation and extender dilution ratios, extender pH and osmolality, and centrifugation and density gradient separation techniques. He performed some of the first and most critical evaluations of the

effects of cooling and transport on stallion sperm parameters and on fertility, including examining the effects of presence and types of seminal plasma, container type, extender type, and antibiotic type. These studies led to formulation of the popular TAMU semen extender. His work on sperm cryopreservation has established the effects of various factors involved in this technique on sperm membranes, acrosome integrity, DNA integrity and fertility after insemination.

To facilitate evaluation of stallion sperm parameters, Dr. Varner has pioneered work to apply instrumentation to allow objective analysis in this area. He worked closely with the company that first produced a computerized system for sperm motility analysis (CASA) and was integral in developing its use in stallion semen evaluation. Dr. Varner and his colleagues also instituted the use of flow-cytometric analysis to evaluate acrosome status, membrane integrity, DNA structural integrity, and oxidative injury in stallion sperm (Fig. 1). His laboratory has validated the use of a revolutionary fluorescence-based instrument for not only evaluation of sperm concentration, but also for analysis of sperm membrane integrity (Fig. 2).

Knowledge of stallion sperm physiology has benefited immensely from work that Dr. Varner has conducted starting in the 1980s. He

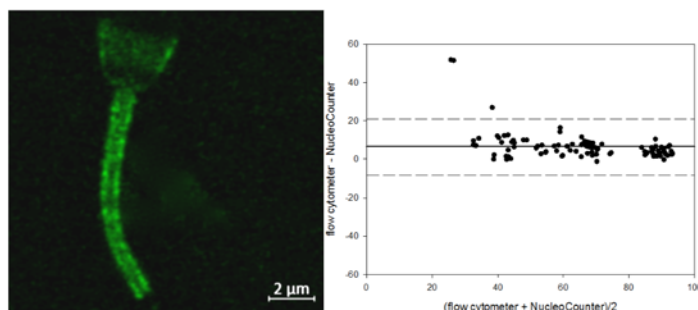


Fig. 1 (left). Microscopic image of stallion sperm stained with OxyDNA assay kit for the DNA adduct, 8-oxoguanine, following exposure to positive control conditions (10 μ M iron sulfate and 10 μ M hydrogen peroxide). Photo courtesy of Dr. Rosanna Serafini. **Fig. 2 (right)** Bland and Altman plot comparing the difference in sperm viability between the flow cytometer and the NucleoCounter® SP-100TM (y axis) to the mean of the flow cytometer and the NucleoCounter® SP-100TM (x-axis; N=108); dashed lines represent ± 2 standard deviations (lower and upper limits of agreement); solid line represents mean difference (From Foster et al, 2009).

performed the first study on induction and characterization of the acrosome reaction in equine spermatozoa, and followed that up by evaluating the effects of heparin and other glycosaminoglycans on capacitation and acrosome reaction, looking at both sperm parameters and fertility after insemination. Dr. Varner was the first to identify an inherited defect in stallion sperm acrosome reaction as a cause of pronounced familial subfertility (Fig. 3 next page), and went on to work with Dr. Terje Raudsepp to identify the genetic locus implicated in the defect, testis-sperm specific FKBP6 (Figs. 4 & 5 next page) parameters involved in normal sperm function in the stallion, including the cholesterol-to-phospholipid ratio in sperm and seminal plasma, relationships of morphologic characteristics to both membrane integrity, fertility, and sperm mRNA content and identity as it relates to fertility. (continued on page 8)

IFRB Postdoctoral Trainee Spotlight



Dr. Heewon Seo has been a Postdoctoral Research Associate in laboratory of **Dr. Greg Johnson** since 2013. He received a B.S. in Biotechnology from Yonsei University and completed a M.S. and a Ph.D. under the direction of former IFRB trainee, **Dr. Hakhyun Ka**, who is a professor in the Department of Biological Science and Technology, Yonsei University, Wonju, Republic of Korea.

Dr. Seo's work focuses on embryonic implantation and placentation in domestic animals including sheep and pigs. Sheep develop synepitheliochorial placentae in which two distinct trophoblast cell types are present at the uterine-placental interface; the mononucleated trophoblasts and the multinucleated syncytia. For over 20 years the scientific consensus has been that, during trophoblast syncytialization in sheep, binucleate trophoblast giant cells (BNCs) differentiate from the mononuclear trophoblast cells (MTCs), and individual BNCs fuse with individual uterine luminal epithelial (LE) cells to form trinucleate cells. In sheep, BNCs are thought to continue to develop and migrate to the LE layer and fuse with these growing trophoblast-LE syncytial cells to eventually form extensive syncytial plaques. These syncytial



Another interest of Dr. Seo is to understand the mechanism by which embryos adapt to a hypoxic uterine environment. Implantation and early placentation in humans takes place in a hypoxic, nutrient restricted environment. Sheep and pig conceptuses face similar barriers to survival, and his work has determined that hypoxia inducible factor 1 alpha (HIF1 α) is highly expressed by the trophectoderm of sheep and pigs during the peri-implantation period. Additionally, results of the temporal and cell-type specific expression of glycolytic enzymes including PHGDH, PSPH, SHMT2 and MTHFD2 are identical between sheep and pigs during the peri-implantation period of pregnancy, highlighting the likely importance of glycolytic metabolism to the development of free-floating conceptuses that elongate and attach to the uterine LE. This research is

relevant to a recently funded grant entitled "Roles of fructose and glucose in growth and development of ovine and porcine conceptuses" with Dr. Bazer (PI) and Drs. Johnson and Wu (co-PIs).

During postdoctoral training at Texas A&M, Dr. Seo presented his

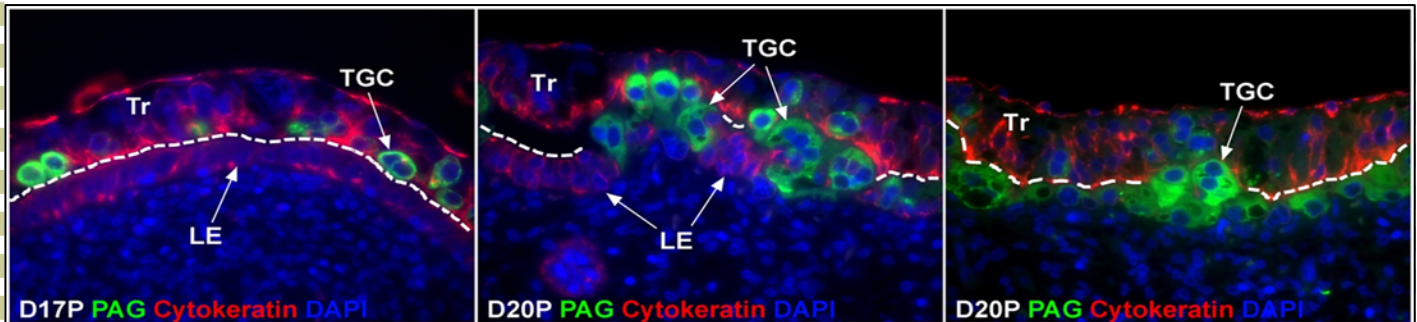
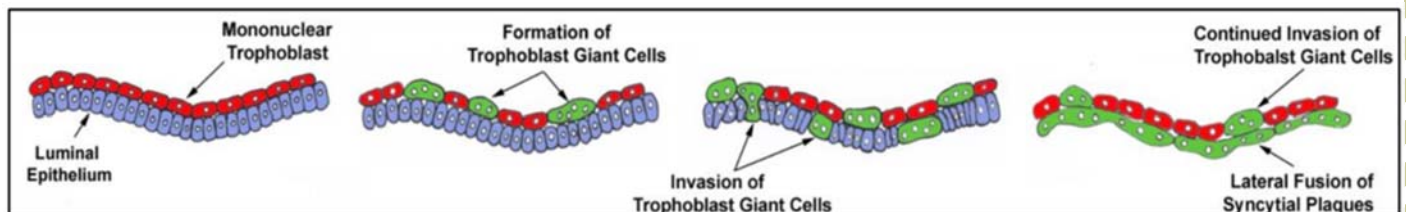


Figure 1. Double immunofluorescence staining for pregnancy associated glycoprotein (PAG; stains TGCs; green) and cytokeratin (stains mononuclear Tr and luminal epithelium (LE); red) at implantation sites showing growing syncytial plaques in sheep.

plaques of sheep placentae are believed to be conceptus-maternal hybrid cells that are composed of LE and BNCs. However, Dr. Seo's work suggests that the current dogma for placental syncytialization in sheep should be revised. Results of his work indicate that fusion of adjacent trophoblast cells occurs to generate multinucleated trophoblast giant cells (TGCs) with two or more nuclei, and TGCs migrate and engulf apoptotic LE cells to eliminate LE, resulting in a multinucleated syncytial layer that is entirely of TGC origin (**Figure 1**).

research to local, national, and international audiences including the Annual Meeting of the Society for the Study of Reproduction, where he received a USDA-NIFA-AFRI Merit award and was chosen as a finalist in the Trainee Research Award Oral Competition in 2016.

Dr. Seo was awarded a CVM-Postdoc Research Trainee grant in 2015, and has published 26 peer-reviewed manuscripts in journals including *Biology of Reproduction*. Heewon appreciates the advice and guidance from Dr. Greg Johnson and the opportunities for collaboration with Drs. Bazer, Burghardt and Wu.



Revised hypothesis for placental syncytialization in sheep. The new idea here is that the syncytial plaques are entirely of the trophoblast lineage, not a mixture of trophoblast and uterine LE cells, making the syncytial plaques of sheep similar to the syncytiotrophoblasts of other species, including humans and rodents that secrete hormones essential for successful pregnancy.

IFRB Seminar Series, 2017

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

Spring Semester Speakers Included:

January 20, **Dr. Milo Wiltbank**, Professor,



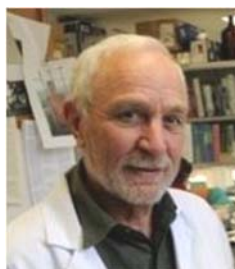
Endocrinology-Reproductive Physiology Program, University of Wisconsin-Madison, "Pregnancy loss in dairy cattle and embryo recipients: Critical stages and strategies for prevention."

January 27, **Dr. Brett Mitchell**, Associate Professor, Department of Medical Physiology, "The Toll of hypertension during pregnancy."

February 3, **Dr. Gamal Akabani**, Department of Nuclear Engineering, "Small animal imaging in developmental biology."

February 10, **Dr. Bruce Murphy**, Director

Réseau Québécois en reproduction (RQR) Center of Research in Reproduction Animals, University of Montreal, "Embryonic Diapause: the real arrested development."



February 17, **Dr.**

Gary Williams, Animal Reproduction Laboratory- AgriLife Research Center, "Seasonal breeding and circannual responses of mares to the environmental zeitgeber: evidence for and against a multi-pathway regulatory cascade"

February 24, **Dr. Natalie Johnson**, Assistant Professor, Environmental and Occupational Health, "Prenatal air pollution exposure and childhood respiratory disease"

March 10, **Kelle Moley, MD.**, Professor, Cell

Biology and Physiology, Director of Basic and Translational Science Research Division, Department of Obstetrics and Gynecology, Washington University School of Medicine, "The obesity epidemic: Could it be an oocyte issue?"



March 24, **Dr. Mohamed Ahmed Elmetwally**, Postdoctoral Fellow, Bazer laborato-

ry, "In vitro model for early and late Intrauterine fetal cross talk," **Dr. Katie Davis-Anderson**, Postdoctoral Fellow, Ramadoss laboratory, "iBAQ/LFQ approach for quantifying alcohol-induced placental and fetal brain protein profiles."

March 31, **Guichun Han, MD, PhD**, Clinical Assistant Professor, "Estrogen and Vascular Tone: relaxation or contraction."

April 7, **Dr. T. Rajendra Kumar**, Edgar L. & Patricia M. Makowski Professor, Division of Reproductive Sciences, Department of Obstetrics & Gynecology, University of Colorado, "The 'Sweet Sugars' on FSH: are they dangerous?"



September 1, **Gonzalo Rivera, DVM, PhD**, Associate Professor, Veterinary Pathobiology, "Connecting the dots: from cytoskeletal remodeling to cancer progression."

September 8, **Dr. Paul Hardin**, Professor and John W. Lyons Jr. '59 Chair in Biology, Department of Biology and Director of Center for Biological Clocks Research, "Molecular architecture of the Drosophila circadian clock."

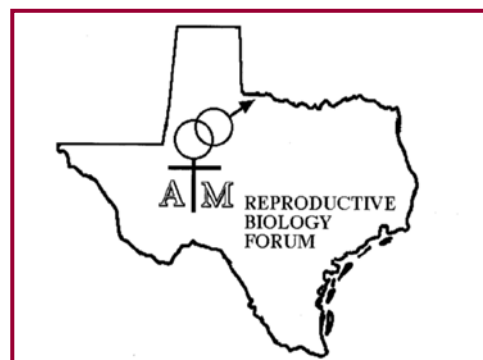


September 15, **Jerrie S. Refuerzo, MD**, Division of Maternal Fetal Medicine, Department of Obstetrics, Gynecology and Reproductive Sciences, "Innovations in preterm labor management." **Dr. Arun Mani**, Senior Research Associate, UT Health-McGovern Medical School, "Mesenchymal stem cells and preterm labor."



September 22, **Dr. Brenda Alexander**, Associate Professor, Department of Animal Science, University of Wyoming, "Male Reproductive Behavior: pathways and messengers."

September 29, **Dr. Max Costa**, Professor and Chair, Department of Environmental Medicine, NYU School of Medicine, "Metals, Epigenetics and Cancer."



October 6, **Dr. Tod R. Hansen**, Director,

Animal Reproduction and Biotechnology Laboratory and Equine Reproduction Laboratory, Department of Biomedical Sciences, Colorado State University, "Fetal and postnatal health consequences of maternal infection with virus."



October 13, **Dr. Tracy Clement**, Assistant Professor, Department of Veterinary Physiology and Pharmacology, "Discovering spermiogenic programs required for actin' like a sperm."

October 20, **Dr. Andrew Hillhouse**, Research Assistant Professor, Molecular Genomics Workspace and **Kranti Konganti, M.S.**, Associate Director, Bioinformatics Workspace, Texas A&M Institute for Genome Sciences and Society, "Campus Resources for Genomics and Bioinformatics Support."



October 27, **Dr. Jacquelyn Kaye Schmit Grace**, Assistant Professor, Department of Wildlife and Fisheries Sciences, Texas A&M University, "Long-term effects of postnatal glucocorticoid exposure in wild birds."

November 3, **Katrin Hinrichs, DVM PhD**, Professor and Patsy Link Chair in Mare Reproduction, Department of Veterinary Physiology & Pharmacology, "Evaluation of procedural factors affecting blastocyst rates after ICSI in the horse."

November 10, **Dr. G. Cliff Lamb**, Professor and Head, Department of Animal Science, "Assessing the interaction of fetal and maternal contributions of Bos indicus and Bos taurus genetics on early embryonic development."



November 17, **Dr. Joanne Kwan-Kwok**, Dr. R.O. Berry Memorial Lecture, "Recurrent pregnancy losses and implantation failures: consequences of immune inflammation."

IFRB Trainee News

RECENT GRADUATES

***Yang Gao**, who worked in the laboratory of **Dr. Qinglei Li**, completed his Ph.D. degree in Biomedical Sciences in August 2017. his dissertation was "Understanding the Role of Transforming Growth Factor-beta Signaling in the Uterus Using Genetically Modified Mouse Models." He has recently joined the Lester and Sue Smith Breast Center in the laboratories of Drs. Jeffrey Rosen and Xiang Zhang's as a post-doctoral fellow at the Baylor College of Medicine.



***Emily Ginn** completed the M.Agr. in ANSC in May 2017 working with Dr. David Forrest. The title of her professional paper was: "Artificial insemination and embryo transfer protocols in bovine and the influence of breed." Emily just finished her first semester in the professional curriculum in veterinary medicine at Texas A&M University. Following graduation in 2021, Emily plans to join a mixed animal practice.

***Jacob Calloway** completed the M.Agr. in ANSC in December 2017 working in the lab of **Dr. Forrest**. The title of his professional paper was: "Comparison of artificial insemination by estrus detection or by fixed-time in superovulated cattle." Jacob is currently seeking employment in the bovine embryo transfer industry.



***Camille Duran**, who trained in the lab of **Dr. Kayla Bayless**, received her Ph.D. in Genetics. Her dissertation was entitled, "Noncanonical NF-KB signaling drives glioma invasion by promoting MT1-MMP activation, pseudopodia formation, and ITGA11 expression." She has accepted a post-doctoral position in John Condeelis' laboratory at Albert Einstein University where she will use intravital imaging to better understand breast cancer metastasis. To date, she has nine publications resulting from her efforts at TAMU.

***Meaghan M. O'Neil** who trained with **Dr. Gary Williams** defended her M.S. thesis entitled, "The effects of estradiol-17 β in modulating pituitary-ovarian responsiveness to continuous infusion of gonadotropin-releasing hormone in winter anovulatory mares." She will begin her Ph.D. program in Physiology of Reproduction in Spring 2018 under the mentorship of **Drs. Rodolfo Cardoso** and **Gary Williams**.



***Christian L. Cook** graduated with a M.S. in Physiology of Reproduction in December 2017. **Drs. Tom Welsh** and **Ron Randel** served as Co-chairs. Chris was a recipient of a COALS Graduate Merit Fellowship. She is now a Ph.D. student at Kansas State University. The title of her thesis was "Antibody mediated immune response and cellular mediated immune response characterization in Brahman cattle."



NEW TRAINEES & STAFF

***Alexis Roach** is a new M.S. student in Physiology of Reproduction in laboratory of **Dr. David Forrest**. Alexis is a TA for the undergraduate reproduction in farm animals and general animal science labs. She also works part-time at STgenetics, livestock reproduction facility, in Nava-sota. Alexis will be conducting her research on sexed semen quality in beef and dairy bulls. She aspires to become A.I. and E.T. certified in order to work at the E.T. Center at STgenetics after she completes her M.S., and Ph.D. degrees.



***Emma Britain Caraway**, a 2016 TAMU graduate with an MS in Plant Pathology and Microbiology and BA in Biology, Wellesley College, MA 2013) joined the Cardoso Lab in 2017 as a Research Assistant.

***Mrs. Sarah Sharpton**, M.S., joined the Dunlap and Satterfield laboratories in March, 2017 as a Research Associate supporting the National Institutes of Health/USDA Dual Purpose with Dual Benefit Research Grant: Placental adaptation to maternal malnutrition.

***Catherine Wellman** joined the **Randel/Welsh** labs as a Research Associate in November 2017. Catherine earned B.S. degree in zoology and chemistry at Oregon State University and the MBIOT degree from TAMU.

***Sydney O'Daniel** started her M.S. PREP program in May 2017 with **Drs. Randel** and **Welsh**. Sydney earned B.S. degrees in Animal Science and Crop Science from TAMU in 2017. She received a COALS Merit Fellowship for 2017-2018.

***Geina Iskander** is an undergraduate trainee working in the Laboratory of **Dr. Brett Mitchell** who participates in the Collaborative Initiatives in Maternal, Perinatal and Infant Health Research (CIMPIR) Tier One Program coordinated by **Dr. Jay Ramadoss**. Geina is a member of the Biomedical Engineering class of 2019. (cont'd page 10)



Frontiers in
Reproduction
Course:

[http://
www.mbl.edu/
firl](http://www.mbl.edu/firl)

April 28 to June
10, 2018.

Application
deadline Janu-
ary 18



A Snapshot of IFRB Research, 2017

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 research productivity illustrates the multiple investigator research activities of the IFRB, involving extensive participation of trainees during 2017:

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Faculty Spotlight, Dr. Varner (cont'd from page 3)

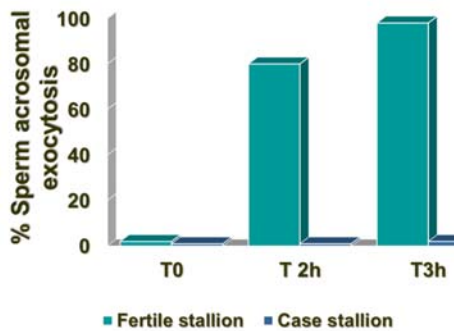


Fig. 3. Effect of the calcium ionophore, A23187 (10 μ M; 37 $^{\circ}$ C incubation temperature), on percentage of sperm with acrosome reactions in subfertile and fertile (control) stallions following exposure times of 0, 2, and 3 hours.

His team has also developed methods to critically analyze breeding data of stallions, and the methodology has had enormous clinical and research applications.

Dr. Varner has collaborated closely with the Equine Embryo Laboratory at TAMU in the development of methods for use of stallion

spermatozoa for assisted reproduction techniques, including in vitro fertilization and intracytoplasmic sperm injection (ICSI). Their study on the effect of two sperm freeze-thaw cycles on blastocyst production after ICSI paved the way for amplification of available semen stores by thawing, dilution and refreezing of frozen semen for use in ICSI. Dr. Varner also developed methods for lyophilization of stallion spermatozoa that enabled the production of a foal from injection of lyophilized sperm, the first such offspring in a non-laboratory species, in 2011 (see photograph on page 14).

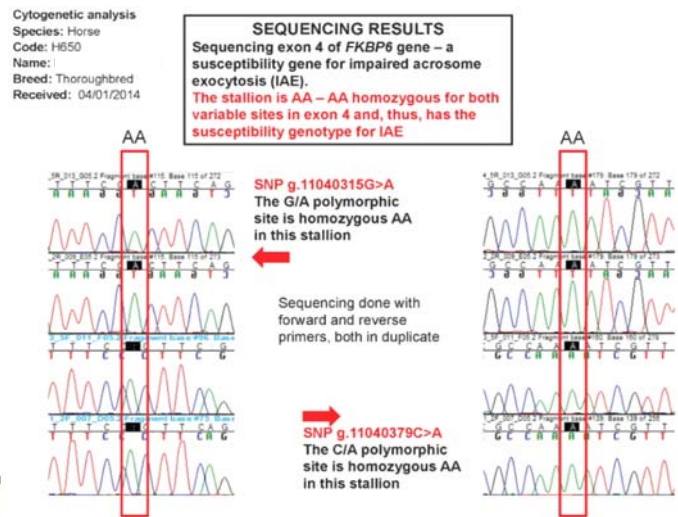


Fig. 5 (above) Cytogenetic analysis results for stallion suspected of having a familial form of impaired sperm acrosomal exocytosis, based of clinical history and reduced sperm response to a potent inducer of acrosomal exocytosis.

In addition to study of sperm itself, Dr. Varner has applied his extensive knowledge to the evaluation and management of stallion fertility in the field. He is the “go to” expert for stallion owners and managers around the world regarding fertility issues of these extremely valuable individuals. He has had the opportunity to work with preeminent American-based Thoroughbreds such as Cigar, Storm Cat, Gone West, Distorted Humor, Giant’s Causeway, American Pharoah, and more recently, Gun Runner and Arrogate, as well as a large number of distinguished stallions overseas. Dr. Varner’s research is truly translational as he applies his knowledge of breeding behavior, mating ability, and assisted reproduction techniques daily in his evaluation of subfertile stallions to determine causation, and in his recommendations for stallion management, semen processing, and insemination techniques to utilize these stallions.

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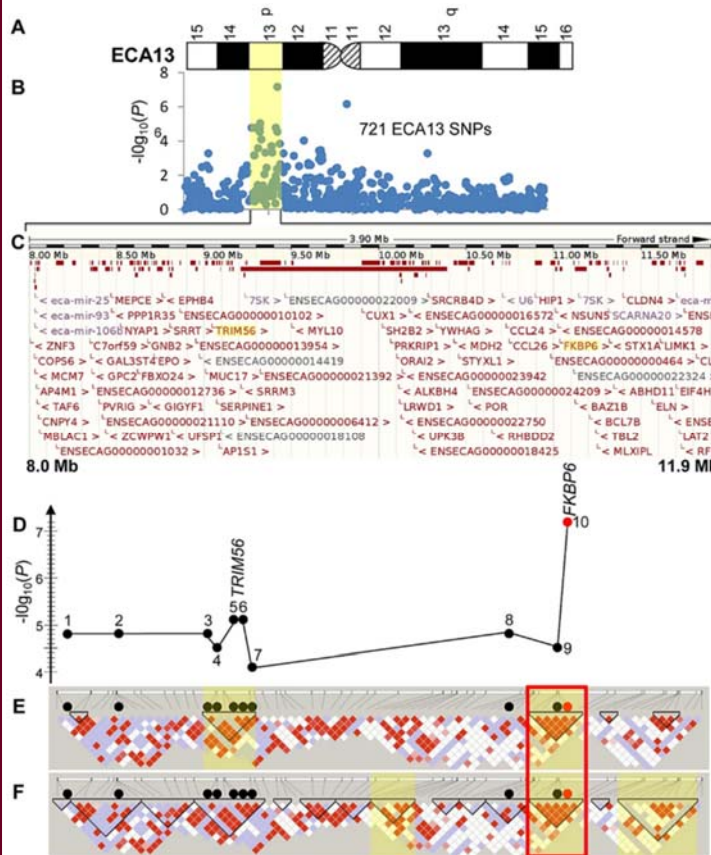


Fig. 4 (above left) Schematic of the impaired acrosome exocytosis (IAE)-associated region in ECA13p. (A) A G-banded ideogram of ECA13 (ISCNH, 1997) showing the cytogenetic location of the IAR associated region; (B) Statistical significance values for 721 ECA13 SNPs analyzed for genome wide association using chi-square; yellow shade highlights the IAE-associated ~3.9 Mb region; (C) Sequence map of chr13:8,000,000–11,900,000 showing all ENSEMBL annotated genes in the region; TRIM56 and FKBP6 are highlighted. (D) A graph showing chi-square test $-\log_{10}(P)$ values for 10 significant SNPs: 1–8027172, 2–8382955, 3–8977804, 4–8987922, 5–9034435, 6–9034502, 7–9183989, 8–10894213, 9–11043916 (black circles), and 10–11044175 (red circle); the seven SNPs above the grey line showed moderate significance also in mixed model; (E) Confidence interval LD blocks; (F) Solid spine LD blocks; blocks with significant permuted P-values ($P < 0.0005$) for association with IAR are highlighted yellow; red diamonds represent D' values equal to 1, lower values of D' are presented in blue and white; the ~306 kb highly associated haplotype in both LD analyses is in a red box. (From Raudsepp T et al, PLoS Genet, 2012).

23rd Annual Dr. Raymond O. Berry Memorial Lecture

The Twenty-Second Annual Dr. Raymond O. Berry Memorial Lecture, sponsored and organized by the Interdisciplinary Faculty of Reproductive Biology, was held at the Navasota Civic Center, Navasota, TX on November 17, 2017. Joanne Kwak-Kim, M.D., M.S., M.P.H., Professor of Obstetrics and Gynecology, and Microbiology and Immunology, Chicago Medical School at Rosalind Franklin University of Medicine and Science, and the Director of Reproductive Medicine Center at Rosalind Franklin University Health System, was selected by a vote of IFRB faculty to present the Lecture entitled, "Recurrent pregnancy losses and implantation failures: consequences of immune inflammation."



search in reproductive immunology by the ASRI in 2002. In 2009 she won the distinguished service award from the ASRI. In 2011 Dr. Kwak-Kim received the Lawrence R. Medoff Award from Rosalind Franklin University of Medicine and Science for outstanding contributions to Research, Teaching and Clinical Care. Dr. Kwak-Kim's recent honor came in 2015 at the 35th Annual Meeting of ASRI when she was presented with the American Journal of Reproductive Immunology Award given to a senior investigator who has made outstanding contributions to the area of reproductive immunology.

Dr. Kwak-Kim successfully organized and chaired both the 21st and the 22nd annual meetings of ASRI in 1999 and 2001. From 2006-2008 Dr. Kwak-Kim served as president of the ASRI. From 2013-2016, Dr. Kwak-Kim served as Secretary-General of the International Society of Immunology for Reproduction (ISIR) and in 2016 she was elected Treasurer of the ISIR. Presently (2014-2017), Dr. Kwak-Kim is also serving as Secretary of the American Society for Reproductive Immunology. She also planned the 2017 ASRI annual meeting as a co-chair.

Clinically, she has been working as the Director for Reproductive Medicine at Rosalind Franklin University Health System. The program has an emphasis on treating infertility with implantation failures, recurrent spontaneous abortions of immune etiology, and pregnancies complicated with alloimmune/autoimmune diseases. The center is well-known both nationally and internationally and serves for patients from all over the United States and other countries.



Right: Dr. Fuller Bazer presents Dr. Kwak-Kim with a plaque commemorating her presentation as the Twenty-Third Annual Dr. Raymond O. Berry Memorial Lecturer.



Above: Dr. Duane C. Kraemer, who worked with Dr. Berry during his early years as a graduate student, led off the Lecture by providing an entertaining presentation that included memories of Dr. Berry.

Dr. Kwak-Kim's keen interest lies in Reproductive Immunology; particularly, recurrent pregnancy loss, which has been the focus of her research. Her work with natural killer cell and Th1/Th2 immune responses in women with recurrent pregnancy losses and multiple implantation failures is distinguished. The research work that she has done, which applies basic science techniques to clinical problems is cutting edge. She has over 100 publications in peer-reviewed articles and books. She has mentored and continues to mentor medical students, residents, and postdoctoral fellows. Dr. Kwak-Kim is a sought after lecturer both nationally and internationally. She is the editor-in-chief, *Journal of Reproductive Immunology*, an associate editor, *American Journal of Reproductive Immunology* and an editorial board member of many journals.

She has been a dedicated member of the American Society for Reproductive Immunology (ASRI) since 1994. Dr. Kwak-Kim has received numerous awards including the prestigious J. Christian Herr Award for outstanding achievement in basic or applied re-



For her outstanding contributions, Texas A&M University recognizes the work of Dr. Kwak-Kim through the Raymond O. Berry Memorial Lecture which was established in 1994 by **Dr. Fuller W. Bazer**. This Lecture Series ensures that her 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. Berry's pioneering studies contributed basic knowledge about maternal immune recognition of the fetal - placental unit."

-Fuller W. Bazer

She is planning to pursue an MD degree specializing in cardiology or hematology/oncology.

***Winter Tate** is another undergraduate participating in the CIMPIR program with Dr. Mitchell. She is a class of 2019 Nutritional Sciences major and Public Health minor at TAMU. She is planning to pursue an MD degree specializing in pediatrics.



GRADUATE STUDENT AWARDS

***Amanda Bradbery**, graduate student in Dr. Carey Satterfield's lab, received a \$19,850 American Quarterhorse Association Young Investigator Award for her proposal entitled "Effect of maternal overnutrition of foal skeletal muscle fiber type and development."



***Camille Goblet**, trainee in Dr. Annie Newell-Fugate's laboratory, received a L.T. Jordan Fellowship from the MSC Jordan Institute at TAMU, an OGAPS Research Travel Award, and CVM Independent Study Abroad stipend to assist her in field research studying the endangered Chacoan peccary in Paraguay. Camille also received the Peter Farin Trainee Scholarship Award from IETS to present the data from the Paraguay trip at the 2018 IETS Conference in Bangkok, Thailand."



***Brie Myre**, trainee in Dr. Duncan MacKenzie's laboratory received her second LT Jordan Fellowship from the MSC Jordan Institute at TAMU to assist her in her field research in Costa Rica. She received an honorable mention for a Ford Fellowship. Brie also completed a year of breeding season field sampling of Olive Ridley sea turtles in Costa Rica.

Twenty two trainees were awarded IFRB Trainee Travel Awards in 2017 to attend international and national meetings. Awards to attend the 50th Annual Meeting of the Society for the Study of Reproduction, Aug. 13-16, in Washington, D.C. included **Xin Fang, Kitty Halloran, Cassie Herring, Emily Hoskins, Shengdi Hu, Dhafer Ibrahim, Avery Kraemer, Colleen Lambo, John Long, Bryan McLendon, Nan Ni, Camila Sandoval, and Youwen Zhang**. Awards to attend the 2017 American Association for Animal Science Meeting, Aug. 8-12 in Baltimore, MD included **Christian Cook, Rui d'Orey Branco, Kyler Gilbreath, Jose Scarpa, and Brittini Littlejohn**. Trainees receiving awards to attend the 2017 Equine Science Society Symposium, May 30-June 2 included **Amanda Bradbery and Meghan O'Neil**. **Camille Goblet** presented her work at the 6th International Society of Wildlife Endocrinology, Aug. 14-16 in Orlando, FL. **Brianna Myre** presented her work at the 18th International Congress of Comparative Endocrinology, June 4-9, at Banff National Park, Alberta, Canada. The IFRB gratefully acknowledges funding provided by the TAMU Division of Research, Deans and Department Heads of the Colleges of Agriculture and Life Sciences, Medicine and Veterinary Medicine & Biomedical Sciences.

***Meaghan O'Neil**, M.S. student in Physiology of Reproduction with Dr. Gary Williams, received second place in the graduate student research competition at the annual meeting of the Equine Science Society in Minneapolis, May 2017.

***Dhafer Ibrahim**, student in Physiology of Reproduction working with Dr. Carey Satterfield received a \$9,500 Department of Animal Science Student Mini-Grant for a proposal entitled, "Expression of apoptotic factors in IUGR fetuses and maternal placentae in the ovine model."

***John Long**, student in Physiology of Reproduction working with Dr. Carey Satterfield received a \$19,952 Department of Animal Science Student Mini-Grant for a proposal entitled, "Programming fetal development of lifelong metabolic function through the supplementation of arginine to nutrient restricted sheep."

***Camila Sandoval**, student in Physiology of Reproduction working with Dr. Carey Satterfield received a \$19,663 Department of Animal Science Student Mini-Grant for a proposal entitled, "Maternal nutrient restriction effect on metabolic programming of fetal skeletal muscle in beef cattle."

POSTDOCTORAL AWARDS AND INVITED LECTURES

***Colleen Lambo**, DVM received a \$20,000 Department of Animal Science Mini-Grant for her proposal, "Fluctuations and correlations for anti-Müllerian hormone levels in sheep serum."

***Renato Salgado**, Research Associate, Equine Embryo Laboratory presented the following invited lectures: "Sperm processing after conventional vs. Piezo-driven ICSI in equine assisted reproduction." 9th Annual Assisted Reproductive Technology World Congress, New York, Oct. 25-26, 2017.

"Comparison of conventional vs Piezo-driven ICSI for the in vitro production of equine blastocysts," 23rd Annual Texas Forum for Reproductive Sciences, Houston, TX, USA. April 27-28, 2017.



"Effects of different temperatures of oocyte transport and transport media on equine embryo quality." Oral Presentation, Four-Minute Blasts session, Legends Equine Reproduction Short Course, TAMU, College Station, Texas, Oct. 21, 2017.

"Sperm processing after conventional vs. Piezo-driven ICSI in equine assisted reproduction," 11th Interdisciplinary Faculty of Reproductive Biology Retreat, Navasota, TX, Nov. 17, 2017.

***Heloisa Canesin**, Research Assistant, Equine Embryo Laboratory, presented the following invited lectures: "The horse oocyte as a model for ICSI in rhinoceros." Oral Presentation in "4-Minute Blasts" session, Legends Equine Reproduction Short Course, Texas A&M University, Oct. 21, 2017.

"Transvaginal ultrasound-guided follicle aspiration demonstration). Legends Equine Reproduction. Short Course, TAMU, Oct. 22, 2017



***Joao Brom-de-Luna**, Research Assistant, Equine Embryo Laboratory, presented the following invited lectures: "Intracytoplasmic sperm injection." Oral presentation, Legends Equine Reproduction Short Course, TAMU, Oct. 21, 2017. "Maturation, ICSI and Embryo Development as a Tool for the Equine Industry." First South American Symposium of Equine Assisted Reproduction, Bogota, Colombia, Nov. 14, 2017.



***Helene Resende**, Research Assistant, Equine Embryo Laboratory presented the following invited lecture: "Evaluation of the effect of method of calcium ionophore addition on sperm capacitation measures." Oral Presentation in "4-Minute Blasts" session, Legends Equine Reproduction Short Course, Texas A&M University, College Station, Texas, October 21, 2017.



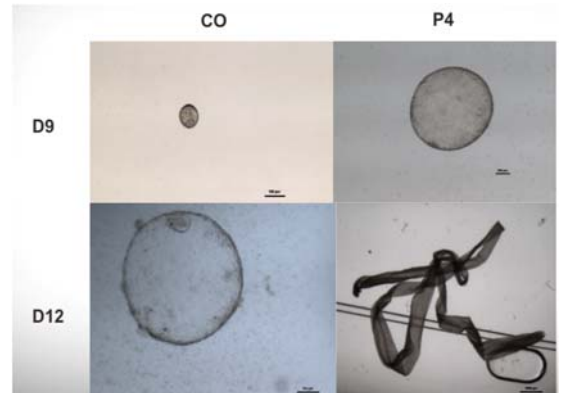


***Emily Hoskins** is pursuing a M.S. degree in Physiology of Reproduction in the department of Animal Science under the mentorship of **Dr. Fuller Bazer**. She received both a B.S. in Animal Science and a B.A. in Music in Voice and graduated cum laude from Texas A&M University. Before joining Dr. Fuller Bazer's lab in May of 2016, Emily completed an internship as an equine Reproductive Technician at Granada Farms in Wheelock, TX. Her thesis is part of a joint project examining the effects of administering exogenous progesterone to pregnant ewes on conceptus growth and development. Previous research by Dr. Carey Satterfield demonstrated that progesterone-treated ovine conceptuses had accelerated growth and development (see **Figure**) Emily's work reaffirms and continues investigating the molecular mechanisms of this phenomenon during early pregnancy including novel pathways of arginine conversion to polyamines via arginine decarboxylase and agmatine. At this time, she has submitted abstracts and presented posters at Texas Forum of Reproductive Sciences, Society for the Study of Reproduction, and the Interdisciplinary Faculty of Reproductive Biology Retreat. In addition to her research, Emily has greatly enjoyed serving as a TA



IFRB Graduate Student Spotlights

for the lab portion of the undergraduate class Reproduction in Farm Animals for the past three semesters. After defending her thesis, she is hoping to pursue a DVM and apply her knowledge of the research process with that of clinical methodologies. Additionally, she would like to continue exploring her passion for teaching as well as continue to sing in the community. Emily is extremely grateful for the guidance of her committee members Drs. Fuller Bazer, Guoyao Wu, Greg Johnson, and Kathrin Dunlap as well as her project partner Kitty Halloran.



Above: Exogenous progesterone treatment during the peri-implantation period resulted in elongated, filamentous conceptuses while control conceptuses remained spherical at the same time point.



***Brie Myre** is a PhD Biology candidate mentored by **Dr. Duncan MacKenzie**. She has been an active IFRB member since Fall 2015. Brie received her BSc in Fisheries and Wildlife with Zoo Care and Conservation Biology Options and a Spanish minor from the University of Nebraska in 2012. Following her undergraduate degree, she pursued her MSc in Biology at Southeastern Louisiana University and graduated in August 2015. In Brie's first year at TAMU, the IFRB sponsored her travel to the International Sea Turtle Symposium in Peru where she presented her MSc research on sea turtle reproductive endocrinology and received the Archie Carr Best Student Paper in Biology Award (runner-up). Her master's research applied the use of the first ELISA specific to sea turtle vitellogenin to show its utility to determine reproductive status in females which is a useful tool for both physiological research and conservation.



Brie's research left her with questions about the nutritional regulation of reproduction in sea turtles stemming from the fact that sea turtles incur high energetic costs with reproduction associated with a long reproductive migration and the production of hundreds of eggs. The question of when and where sea turtles garner energy for reproduction is important to conservation because habitat management plans change based on whether or not an organism feeds there. Sea turtles have long been thought to abstain from feeding during breeding, but recent studies have called this into question. The nomadic behavior of sea turtles makes them difficult to observe, so Brie is proposing that the measurement of leptin and ghrelin, the hormones which regulate feeding behavior, could answer this question. This is particularly useful in olive ridley sea turtles which are the only species to exhibit both mass-nesting (in which thousands of turtles haul out onto the beach in synchrony to nest) and solitary nesting. No genetic difference has been detected between these groups, and females have been shown to use both behaviors. Physiological differences have been documented between mass-

and solitary nesting females, so Brie is investigating whether a female may choose one behavior over another based on the amount of nutritional resources gained prior to reproduction. To do this, she will compare reproductive hormones, vitellogenin, reproductive output, nutritional hormone profiles and gonadal ultrasounds (**Figure 1**) from both groups at nesting.

As an avid grant writer, Brie has accumulated more than \$12,000 to fund her field experiments and lab supplies. She has completed two seasons of fieldwork at various beaches in Costa Rica and is currently preparing for her final season in summer of 2018. During this fieldwork, Brie's team makes it a priority to enrich local communities by renting boats from local fishermen and staying with host families. One main set of sampling involves catching females immediately post-mating for an initial sample and using radiotransmitters to track individual females in order to measure hormone dynamics during the next two nesting events. The serial sampling will allow Brie to see if the patterns

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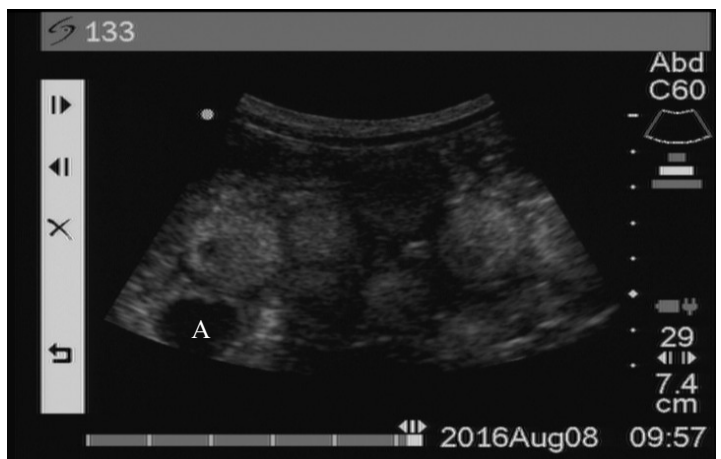


Figure 1. Gonadal ultrasound of a female olive ridley sea turtle post-mating showing vitellogenic follicles and an atretic follicle (A).

IRFB Faculty Activities, Awards, etc.

NEW GRANTS:



***Dr. Qinglei Li**, “TGF-beta signaling in endometrial cell function and dysfunction,” National Institutes of Health, NICHD R01 HD087236-01A1, 03/01/2017-

02/28/2022, Co-investigators: **Drs. Robert Burghardt** (CVM), **Kayla Bayless** (HSC), **Monique Rijnkels** (CVM), and **Ivan Ivanov** (CVM).

***Dr. Fuller Bazer**, “Roles of fructose and glucose in growth and development of ovine and porcine conceptuses.”

USDA/AFRI Proposal NIFA: 2017-05446; \$500,000; 12/01/2018 - 11/30/2022; Co-PDs are

Drs. Greg Johnson and **Guoyao Wu**.



***Drs. Rodolfo Cardoso and Gary Williams** (Co-PI's) received notification of award of the grant proposal entitled, 'Impact of perinatal



nutrition on reproductive neuroendocrine phenotype in sexually mature heifers', USDA-AFRI, \$500,000



12/01/2018 - 11/30/2022.

AWARDS & HONORS:

***Dr. Qinglei Li** received an Outstanding Research Achievement Award, TAMU CVM.

Dr. Li served as an ad hoc reviewer for NIH Study Section-Pregnancy and Neonatology (PN), and as an ad hoc reviewer for Department of Defense Ovarian Cancer Research Program (OCR).

Dr. Li also served as a member of SSR 2017 Awards Committee.

***Dr. Fuller W. Bazer** was named a 2017 TAMU Presidential Impact Fellow.

***Dr. Sakhila Banu** served as ad hoc reviewer for the NIH, Systemic Injury and Environmental Exposure study section, March 1-2, 2017.



***Dr. David Forrest** received the 2017 College of Agriculture and Life Sciences (COALS) Dean's Outstanding Achievement Award for Service. He also received a Neuhaus-Shepardson Faculty Development Grant from COALS to attend the Teaching Professor Conference: Cutting Edge Learning for Exceptional Educators in Atlanta, GA.

***Dr. Kathrin Dunlap** was recognized with the Honor Professor Award presented by the TAMU College of Agriculture and Life Sciences.



***Dr. Greg Johnson** was appointed as a member of



the editorial board of the journal *Placenta* in 2017. He also served on the Board of Reviewing Editors for *Biology of Reproduction* and on

Editorial Boards of *Reproduction* and *Domestic Animal Endocrinology*.

***Dr. Gary Williams** received the American Society of Animal Science Research Fellow Award at the annual meeting in Baltimore, June 2017.

INVITED LECTURES

***Dr. Fuller Bazer** was invited to give two lectures, one to undergraduates and another to faculty and graduate students, “Contributions of an

Animal Scientist to Reproductive Biology,” and “The Many Faces of Interferon Tau” at Virginia Technological Institute, Blacksburg, VA, Nov. 8-10, 2017.

***Dr. Katrin Hinrichs** was invited to present the following lectures:

“The Amazing Oocyte,” meeting of the Student Chapter for the Society for Theriogenology, School of Veterinary Medicine, University of California, Davis, California, Jan. 31, 2017.



“Assisted reproductive techniques in the horse” Joint meeting of the Student Chapter for the Society for Theriogenology and the Student Chapter of the American Association of Equine Practitioners, School of Veterinary Medicine, University of California, Davis, California, Jan. 31, 2017.

“Integration of ICSI into Clinical Equine Reproductive Practice” Student American Veterinary Medical Association Annual Symposium, College Station, Texas, March 17, 2017.

“Transvaginal ultrasound-guided follicle aspiration and oocyte identification,” Demonstration and discussion, Legends Equine Reproduction Short Course, Texas A&M University, College Station, Texas, Oct. 22, 2017.

“Clinical ICSI in the horse: differences and similarities to human in an in vitro maturation-based system,” 9th Annual ART World Congress, New York, New York, Oct. 26, 2017.

“Evaluation of procedural factors affecting blastocyst rates after ICSI in the horse” Interdepartmental Faculty of Reproductive Biology Seminar Series, TAMU, Nov. 3, 2017.

***Dr. Greg Johnson** was invited to serve as a faculty member in the 2017, Frontiers in Reproduction course at the Marine Biological Laboratories, Woods Hole, MA, 29 April - 11 June, 2017. He presented lectures on placental development in domestic animals. This is the eighth consecutive year he has contributed to this course.

Dr. Johnson was also invited to give a seminar “Concepts in Porcine and Ovine Placentation,” for the Department of Animal Science seminar series. (cont'd on page 16)

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lions effectively. He has published clinical studies and clinical reports on these methods, including methods he developed for both centrifugal fractionation of semen and for non-hysteroscopic low-dose deep-horn insemination.



Top picture: ICSI-in vitro produced equine blastocyst stained for three different cell types. Bottom picture: Foal born as a result of ICSI using lyophilized sperm. (Image and photograph courtesy of Dr. Katrin Hinrichs)

Procedures and approaches that Dr. Varner has pioneered are used worldwide in the equine industry on a daily basis. In the words of one breeder: "It may seem like I am a bit over the top about Dickson. But in saving my stallion's fertility, he didn't just allow me to get more foals from [the stallion], he saved my entire ranch and livelihood".

According to Dr. Varner, any success that he has had is simply a product of the close professional and personal relationships that he has had with wonderful colleagues like Drs. Terry Blanchard, Charles Love, Katrin Hinrichs, Steven Brinsko, Terje Raudsepp, Larry Johnson, and Charles

Long within the CVM. He also considers collaborations with so many in other colleges, such as Nancy Ing, David Forrest, Thomas Welsh Jr., and David Russell, to be integral to his professional growth. His interactions with those at other institutions (such as Dr. Stuart Meyers, University of California-Davis, and Drs. R.J. Aitken and Zamira Gibb, University of Newcastle) are also deemed invaluable. Foremost, he is indebted to his late mentors, Drs. R.M. Kenney and John P. Hurtgen, at the University of Pennsylvania, for inviting him into their gravitational pull and providing the mechanism for him to experience growth in both wisdom and insight that is still being expanded upon today. He takes particular pride in further development of enthusiastic trainees that will become the next generation of theriogenologists and reproductive scientists. He often relays a statement told to him by his close cowboy friend, Donnie McKinney....People won't remember you by what you have done. People won't remember you by what you say....they will remember you by how you made them feel. Words well spoken!

Principles of Animal Nutrition, CRC Press

Dr. Guoyao Wu

Animals are biological transformers of dietary matter and energy into high-quality foods (e.g., meats, eggs and milk) for human consumption, as well as raw materials such as wool and leather for clothing and accessories for humans. Through biotechnological techniques, animals are also employed to produce enzymes and proteins to treat a wide array of human diseases. Mammals, birds, fish, and shrimp possess both common and divergent metabolic pathways for their maintenance and adaptations, but all of them need food to survive, grow, develop, and reproduce. As an interesting, dynamic, and challenging discipline in biological sciences, animal nutrition spans an immense range from chemistry, biochemistry, anatomy and physiology to reproduction, immunology, pathology, and cell biology.

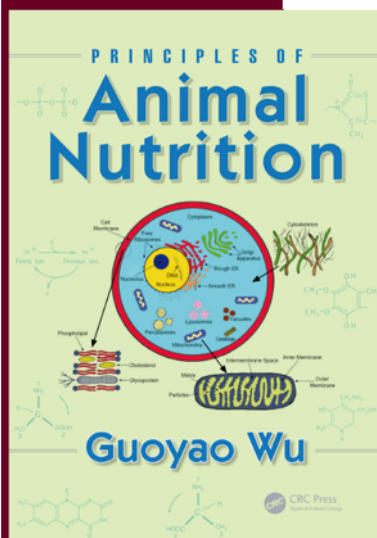
Dr. Guoyao Wu has recently published a 772-page book entitled *Principles of Animal Nutrition* (November 2017. CRC Press, Boca Raton, USA), with the cover being prepared by Dr. Gregory A. Johnson. Before the publication, the entire manuscript was reviewed by expert scientists at Texas A&M University and other institutions. They are Drs. Fuller W. Bazer, Werner G. Bergen, John T. Brosnan,

Margaret E. Brosnan, Jeffrey L. Firkins, Catherine J. Field, Nick E. Flynn, Wayne Greene, Chien-An Andy Hu, Shengfa F. Liao, Timothy A. McAllister, Cynthia J. Meininger, Steven Nizielski, James L. Sartin, Stephen B. Smith, Luis O. Tedeschi, James R. Thompson, Nancy D. Turner, Rosemary L. Walzem, and Hong-Cai Zhou.

This book consists of 13 well-written chapters. It

highlights recent advances in biochemistry, physiology and anatomy that provide the foundation to understand how nutrients are utilized by ruminants and non-ruminants. The text begins with an overview of the physiological and biochemical bases of animal nutrition, followed by a detailed description of chemical properties of carbohydrates, lipids, protein, and amino acids. It advances to the coverage of the digestion, absorption, transport, and metabolism of macronutrients, energy, vitamins, and minerals in animals. To integrate the basic knowledge of nutrition with practical animal feeding, the book continues with discussion on nutritional requirements of animals for maintenance and production, as well as the regulation of food intake by animals. Finally, the book closes with feed additives, including those used to enhance animal growth and survival, improve feed efficiency for protein production, and replace feed antibiotics.

While the classical and modern concepts of animal nutrition are emphasized throughout the book, every effort has been made to include the most recent progress in this ever-expanding field, so that readers in various biological disciplines can integrate biochemistry and physiology with nutrition, health, and disease in mammals, birds, and other animal species (e.g., fish and shrimp). All chapters clearly provide the essential literature related to the principles of animal nutrition, which should be useful for academic researchers, practitioners, beginners, and government policy makers. This book is an excellent reference for professionals and a comprehensive textbook for senior undergraduate and graduate students in animal science, biochemistry, biomedicine, biology, food science, nutrition, veterinary medicine, and related fields.



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Faculty Activities, cont'd from page 12

***Dr. Annie Newell-Fugate** presented an invited seminar, "The role of sex and nutrition in white adipose tissue function, metabolic homeostasis, and reproduction," Department of Medical Physiology, Texas A&M Health Science Center, Oct 4 2017.

***Dr. Gary Williams** invited to present "Nutritional Programming of Puberty in Heifers: Developmental, Genomic and Functional Implications" at the American Society of Animal Science, Southern Section meetings, Ft. Worth, TX, Feb. 2018.

INTERNATIONAL LECTURES

***Dr. Fuller Bazer** presented the following invited lectures: "Pregnancy Recognition Signaling in Sheep and Pigs," Chinese Academy of Sciences, Beijing, China, May 15, 2017.

"The Role of Fructose in the Conceptus, China Agricultural University, Beijing, China, May 15, 2017.

"Pig Reproduction Through the Ages and into the Future," Keynote lecture, International Congress on Pig Reproduction, University of Missouri, Columbia, MO, June 14, 2017

"Roles of Cytokines During the Peri-Implantation Period of Pregnancy in Ruminants," Youth Program, Tohoku University, Sendai Japan, and

"The Many Faces of Interferon Tau and Its Potential Therapeutic Value," Keynote speaker for Tohoku Forum for Creativity Thematic Program 2017 – New Horizons in Food Science via Agricultural Immunology, July 2017.

***Dr. Rodolfo Cardoso** was invited to present, "Neuroendocrine signaling pathways and the nutritional control of puberty in heifers" at the Tenth International Symposium on Ruminant Reproduction, Foz do Iguaçu – Brazil, September 16-20, 2018.

***Dr. Greg Johnson** was invited to present, "Molecular events during ovine implantation and impact for gestation" at the Tenth International Symposium on Ruminant Reproduction, Foz do Iguaçu – Brazil, September 16-20, 2018.

***Dr. Katrin Hinrichs** presented the following lectures at the 2nd International Workshop on Equine Reproductive Biotechnology, Sociedad Argentina de Tecnologías Embrionarias (Argentine Society of Embryo Technologies), Pilar, Argentina, September 15-16, 2017:

"Cloning: how does it work and how it affects the foal and the foal's offspring,"

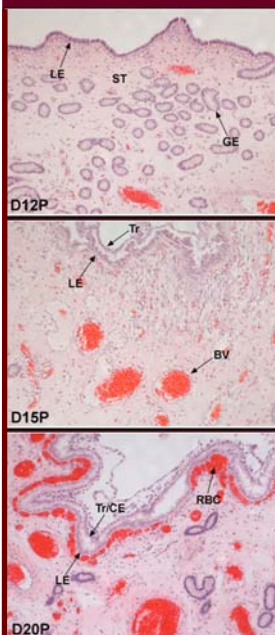
"Introduction to assisted reproductive technologies in the horse: embryo biopsy, embryo collapse for vitrification, and oocyte transfer" and

"Clinical application of ICSI in equine practice,"

BOOK CHAPTERS

Gary R. Williams, Bruna R.C. Alves, Rodolfo C. Cardoso. Female Puberty: Nutrition and Endocrinology, in Encyclopedia of Reproduction, 2nd Edition, 2018, Elsevier, Amsterdam, Netherlands (in Press).

Vasanth Padmanabhan, Murali Puttabyatappa, Rodolfo Cardoso. Hypothalamus, Pituitary, Ovary Axis, in Encyclopedia of Reproduction, 2nd Edition, 2018, Elsevier, Amsterdam, Netherlands (in Press).



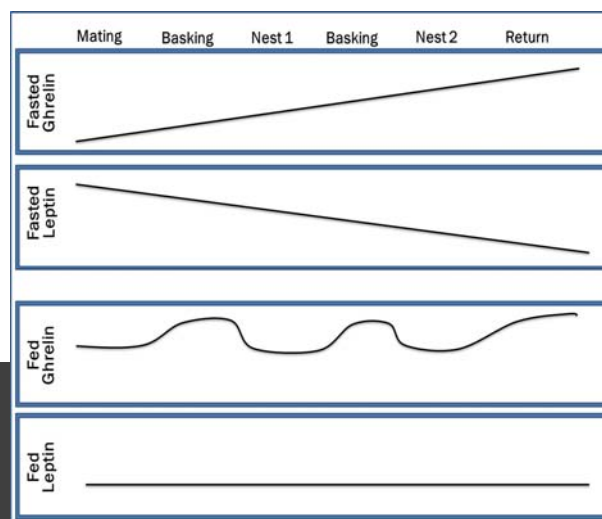
Changes in the vasculature (note accumulation of red blood cells) within the stratum compactum stroma of the uterine endometrium between Days 12 and 20 of pregnancy suggests a high demand for oxygen and nutrient exchange at the implantation sites in pigs. (Images courtesy of Dr. Heewon Seo)

Graduate Student Spotlight, cont'd from page 11

of leptin and ghrelin exhibit a fasted or fed pattern.

Brie hypothesizes that the fasted pattern would show an increase in ghrelin between post-mating and nesting and low or decreasing leptin (**Figure 2**). She expects that the fed pattern would show high variability in concentration due to uncertainty of the timing of when a turtle had last fed prior to recapture and high leptin concentrations. In order to test this hypothesis, Brie will also conduct a 2 week fasting/feeding experiment in juvenile loggerheads so that these hormone measurements can be applied) to answer an ecological question in wild populations.

Figure 2. Hypothetical trends of fasted and fed circulating leptin and ghrelin levels associated with sea turtle reproductive behaviors: mating, basking (internesting), nesting and return migration to foraging grounds.



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11th Annual IFRB Retreat, 2017

The 11th Annual IFRB Retreat was held on November 17, 2017 in conjunction with the 23rd Annual Dr. Raymond O. Berry Memorial Lecture. Over 100 IFRB faculty and trainees from the Colleges of Veterinary Medicine & Biomedical Sciences and Agriculture and Life Sciences, Science and Medicine, along with Prairie View A&M participated in the Retreat which was held at the Navasota Civic Center, Navasota, TX. **Dr. Rodolfo Cardoso, Assistant Professor, Department of Animal Science**, presided over the meeting.

Organizers of the retreat were Drs. Gary Newton from Prairie View A&M and **Greg Johnson**, Veterinary Integrative Biosciences.

An IFRB Faculty presentation was given by **Dr. Chuck Long**, "Gene editing livestock for biomedical and agricultural applications."

A Special Guest presentation was given by former IFRB trainee, **Dr. Hakhyun Ka**, who is a Professor at Yonsei University, South Korea. His presentation was entitled, "Endo-metrial changes in response to conceptus-derived factors during early pregnancy in pigs."

Trainee platform presenters included: **John Long**, "Nutritional programming of prenatal beef heifer development and subsequent postnatal performance,"

Min Jung, "Estrogen deficiency induces microbiota dysbiosis impacting stroke outcome in female rats,"

Camille Goblet, "Effect of urine pheromones on estrous cyclicity in pairs of red river hogs in North American zoos,"

Camilo Hernandez, "Effects of extender antibiotics and storage conditions on stallion semen quality and bacterial growth,"

Dr. Jone Stanley, "Sexual dimorphism in

chromium VI-induced oxidative stress and apoptosis in human placenta,"

Chris Holland, "Pheromonal mechanisms of reproductive isolation in two hybridizing species of *Xiphophorus*,"

Shengdi Hu, "The endogenous synthesis and physiological functions of glycine in neonatal piglets."

Retreat participants also attended a trainee poster session that included 25 posters from TAMU and PVAMU.

Support for the 11th Annual IFRB Retreat and Dr. Raymond O. Berry Memorial Lecture was provided by **Dr. Eleanor E. Green**, College of Veterinary Medicine & Biomedical Sciences, **Dr. Alan Sams**, College of Agriculture and Life Sciences, **Dr. Alton Johnson**, College of Agriculture, Prairie View A&M University, **Dr. Jane Welsh**, Dept. of Veterinary Integrative Biosciences, **Dr. Cliff Lamb**, Dept. of Animal Science, **Dr.**

Larry Suva, Dept. of Veterinary Physiology and Pharmacology, **Dr. William Griffith**, Dept. of Neuroscience and Experimental Therapeutics, **Dr. Geoffrey Kapler**, Dept. of Molecular and Cellular Therapeutics, College of Medicine, and **Dr. Fuller Bazer**, through his Distinguished Professor account..

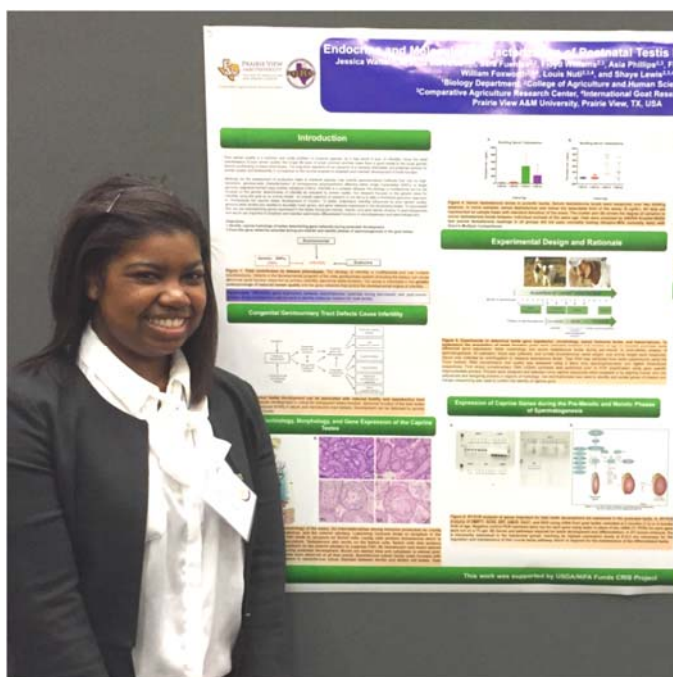


IFRB Undergraduate Student Spotlight



***Jessica R. Watts** is an undergraduate student majoring in Biology at Prairie View A&M University working in the laboratory of **Dr. Shaye Lewis** in the College of Agriculture and Human Sciences for the past two years. She will graduate in Spring 2018. The focus of her work was the identification of gene networks important to establish spermatogenesis during postnatal development in caprine testes. Analysis of postnatal testes and serum testosterone was used to establish the timing of pre-meiotic and meiotic phases of postnatal testes development. High-throughput RNA and miRNA sequencing and subsequent pathway analysis were used to identify gene networks important during pre-meiotic and meiotic phases of spermatogenesis in the goat testes as well as for maintenance of spermatogenesis in post-pubertal testes.

During the past year she presented at the 50th Annual Society for the Study of Reproduction (SSR), Washington, DC, in July and the 17th Annual Biomedical Research Conference for Minority Students (ABRCMS), Phoenix, AZ, in November. She also had an oral presentation at the 23rd Annual Texas Forum for Reproductive Sciences in Houston. She recently had a paper accepted for publication in the PURSUE undergraduate research journal for her work titled "Postnatal testis development in the male goat: characterization of endocrine and molecular changes before puberty." She is interested in conservation biology and the genetics/genomics of wild non-model species and has applied to Ph.D. programs in molecular biology and genetics.



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50th SSR Annual Meeting, Washington, DC 2017 American Society for Animal Science, Baltimore, MD



The 50th Annual Meeting of the Society for the Study of Reproduction was held 13 – 16 July 2017, Washington, DC. The theme of the Meeting was “50 Years of Research: Looking Back and Moving Forward.”

This year 21 presentations were given by IFRB faculty (16) and trainees (25). This included 11 trainees who submitted first-authored abstracts accepted for presentation at the Annual SSR meeting and received IFRB trainee travel funds to attend the meeting. Trainees receiving travel awards included Kitty Halloran, Emily Hoskins, John Long, Colleen Lambo, Dhafer Ibrahim, Camila Sandoval, Xin Fang, Nan Ni, Bryan McLendon, Avery Kraemer, and Youwen Zhang.

The IFRB gratefully acknowledges funding provided by the Texas A&M University Division of Research, Deans and Department Heads of the Colleges of Agriculture and Life Sciences, Medicine and Veterinary Medicine & Biomedical Sciences.



The 2017 American Society for Animal Science was held July 8-12 Baltimore, MD. The theme of the meeting was “Animal Science and Technology: Ensuring Food Security.”

More than 40 presentations were given by TAMU faculty including 13 IFRB members and 10 trainees. This included 7 trainees who submitted first-authored abstracts accepted for presentation at the ASAS meeting and received IFRB trainee travel funds to attend the meeting. Trainees receiving travel awards included, Jose Scarpa, Cassie Herring, Shengdi Hu, Kyler Gilbreath, Brittini Littlejohn, Christian Cook and Rui d'Orey Branco.

The IFRB gratefully acknowledges funding provided by the TAMU Division of Research, Deans and Department Heads of the Colleges of Agriculture and Life Sciences, Medicine and Veterinary Medicine & Biomedical Sciences.



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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.

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