New IFRB Faculty Spotlight

Dr. Brett Mitchell, an Associate Professor in the Department of Medical Physiology in the College of Medicine, recently became a new member of the IFRB. One area of his research program is preeclampsia and specifically, how the innate immune system affects blood pressure regulation during pregnancy and how this becomes aberrant in preeclampsia. The objective is to develop therapeutics that reduce the severity of preeclampsia and safely prolong pregnancies.

Dr. Mitchell obtained his PhD from the Medical College of Georgia and after a brief stint with Universities Space Research Association located at NASA’s Johnson Space Center, he then joined the faculty at Baylor College of Medicine in the Department of Molecular Physiology and Biophysics. In July of 2007, he joined the faculty at Texas A&M Health Science Center in Temple, TX and then relocated his laboratory to the 3rd floor of the Reynolds Medical Building in College Station in 2015.

Preeclampsia, which affects 6-8% of all pregnancies, is the leading cause of maternal and fetal morbidity and mortality as well as premature births. He postulated that some women’s innate immune system becomes abnormally over-activated during pregnancy due to a variety of reasons (i.e., viral infections, autoimmune disease, abnormal placental development) which manifests clinically as hypertension, proteinuria, and/or end-organ damage-the clinical diagnosis of preeclampsia. To test this, his group performed experiments in which they injected viral mimetics (RNA) into rodents and discovered that this induced preeclampsia-like features, but only if the animals were pregnant. They have since used these animal models of preeclampsia to not only examine the innate immune system during pregnancy but also test various therapeutics.

(continued on page 2)

Dr. Dr. Rodolfo Cardoso is an Assistant Professor and a member of the graduate faculty in the Physiology of Reproduction section of the Department of Animal Science and a new faculty member of the Interdisciplinary Faculty of Reproductive Biology.

Dr. Cardoso’s research program focuses on better understanding the impact of the prenatal and early postnatal environments on reproductive neuroendocrine function in females using cattle and sheep as animal models to benefit both the livestock industry as well as human reproductive health.

He received a D.V.M. in 2005 and completed a residency program in Veterinary Theriogenology in 2007 at the Sao Paulo State University (Brazil). In 2009, he received a Master’s degree in Animal Reproduction from the same institution. Subsequently, Dr. Cardoso obtained his Doctoral degree in Physiology of Reproduction in 2014 from Texas A&M University under the mentorship of Drs. Gary Williams and Marcel Amstalden. He then and completed a postdoctoral fellowship in Reproductive Endocrinology in 2016 at the University of Michigan under the mentorship of Dr. Vasantha Padmanabhan. An important line of research in the Cardoso laboratory at Texas A&M investigates the effects of nutrition during perinatal development on reproductive maturation in females. Timing of puberty in females has an important impact on reproductive efficiency and profitability of livestock production. Additionally, from a human health perspective, obesity during early childhood is associated with increased risk of precocious puberty in girls, which is a risk factor for reproductive cancers and fertility issues during adulthood. Using ruminant females and in collaboration with the Williams/Amstalden group, (continued on page 4)
The group reported that two viral mimetics that activate two different innate immune system receptors, Toll-like receptors (TLRs) 3 and 7, were able to produce preeclampsia in mice and that placentas from women with preeclampsia had markedly higher expression of TLR3 and TLR7 compared to placentas from pregnant women with normal blood pressures. They found that these models of preeclampsia were exacerbated by deficiencies in the anti-inflammatory cytokines IL-4 and IL-10, of which low levels are also evident in women with preeclampsia. Supplementation with either IL-4 or IL-10 alone was able to prevent the hypertension and endothelial dysfunction in mice, however the combination of both IL-4 and IL-10 had even more beneficial effects on the kidney, placentas, and fetuses.

These mouse models of preeclampsia were also used to determine whether targeted depletion of activated innate immune cells with a peptide could affect the preeclampsia. Working with Dr. Karen Newell-Rogers from the Dept. of Surgery, together they demonstrated that an engineered peptide (VG1177) that depletes certain TLR-activated, MHC class II innate immune cells was not only able to prevent the development of preeclampsia in mice but also treat it after it had been established. VG1177 was successfully granted a patent for the treatment of preeclampsia and is moving along the pipeline as it temporarily depletes certain TLR-activated, MHC class II innate immune cells while leaving beneficial ones alone.

Dr. Mitchell’s group also worked with Pluristem Therapeutics (Haifa, Israel) who developed PLX cells which are derived from human placenta. These mesenchymal-like stromal cells, when placed into certain environments, sense the conditions and secrete various factors that reduce inflammation and promote growth. Together, the groups reported that one injection of PLX cells was able to fully treat preeclampsia in mice in a dose-dependent manner. The cells secreted various human factors that were able to not only decrease blood pressure, restore vascular endothelial function, and reduce urinary protein excretion, but also improve placental function and fetal development. Based on these data, Pluristem recently received FDA orphan drug approval for the use of PLX cells to treat severe preeclampsia.

The current research focus is on the role that gamma-delta T cells play in the development of preeclampsia. Preliminary studies indicate that gamma-delta T cells are increased in these models of preeclampsia (Figure 1) and that depletion of gamma-delta T cells after preeclampsia is established can normalize blood pressure and other measures. Additionally, gamma-delta KO mice are resistant to the development of TLR-induced preeclampsia and placentas from women with preeclampsia have elevated levels of gamma-delta T cells.

They are also examining how renal and placental lymphatics are altered during normal pregnancy and preeclampsia. In several TLR-induced preeclampsia mouse models (TLR3, TLR4, TLR7 agonists) they see lymphatic vessel dilation in the kidney and lymphangiogenesis in the placenta.

(continued on page 11)
Dr. Gary Williams, a founding member of the Interdisciplinary Faculty of Reproductive Biology, is Regents Fellow, AgriLife Research Faculty Fellow, and Professor in the Animal Reproduction Laboratory, Texas A&M AgriLife Research Station-Beeville and Department of Animal Science, Texas A&M University-College Station. He has been recognized nationally and internationally for his research in reproductive neuroendocrinology, reproductive physiology, and reproductive management of beef cattle and horses. Along with his duties as a full-time research scientist and graduate mentor, Williams also serves as Editor-in-Chief of Domestic Animal Endocrinology.

Williams received B.S. and M.S. degrees in Animal Science at New Mexico State University, Las Cruces and the Ph.D. in the Interdisciplinary Training Program in Animal Physiology at the University of Arizona. After completion of the Ph.D., he began his professional career in a research and teaching position in the Department of Animal Science, North Dakota State University (NDSU), Fargo where he spent 6 years and rose to the rank of associate professor. Williams joined the Texas Agricultural Experiment Station in 1984 as a full-time research scientist with a concurrent appointment in the Department of Animal Science and membership on the Graduate Faculty at TAMU. Under his direction, the Animal Reproduction Laboratory at the 1322-acre Beeville Station was designed and completed in 1986.

Early in his career, Williams made major contributions to science and the livestock industry by increasing our understanding of the neuroendocrinology and physiology of postpartum reproduction in the suckled beef cow, and the role of dietary fat metabolism in regulating ovarian physiology during the puerperium. Recognition of this work has included receipt of the Monsanto Animal Physiology and Endocrinology award in 2004 from the American Society of Animal Science and the Regents Fellow and Faculty Fellow awards from TAMUS.

Using a variety of novel physiological approaches, Williams’ research determined the mechanisms involved in suckling-mediated anovulation in cattle. This work contributed to a reversal of a 100-year-old dogma in reproduction regarding the mechanism through which the suckling stimulus impedes female reproduction and revealed that the somatosensory nerves of the udder are not required for the suckling calf to inhibit gonadotropin secretion during lactation. Instead, it was learned that the maternal bond was the essential component of the calf’s inhibitory influence during suckling. These series of experiments were made possible through the use of several unique surgical techniques developed by Williams in Beeville, including total surgical denervation of the mammary gland, mechanical blockade of olfaction, and a procedure for cannulation of the third cerebroventricle (IIIv). The latter allowed, for the first time, the measurement of hypothalamic gonadotropin-releasing hormone (GnRH) and intracerebral oxytocin release in the adult bovine. This has led to improved understanding of the physiological regulation of both maternal behavior and the central control of reproduction in cattle, results of which have been incorporated into practical protocols for managing postpartum reproduction under a variety of management scenarios.

Research relating dietary fat metabolism to ovarian physiology and use of this knowledge to enhance reproductive efficiency of cattle in marginal environments was pioneered by Williams. Fundamental studies contributed to a greatly increased understanding of dietary fat effects on ovarian cell biology and endocrinology, including novel effects mediated by changes in lipoprotein-cholesterol metabolism and metabolic endocrinology. Williams’ laboratory demonstrated that the consumption of fat by cattle, particularly polyunsaturated plant oils, can positively modulate ovarian follicular growth, luteal function, and postpartum reproductive performance, independent of caloric intake. Published work has contributed to expanded use of oilseeds for beef cattle supplementation programs and development of commercial high fat supplements by most major U.S. feed manufacturers.

During the past 16 years, the Williams-Amstalden (Marcel Amstalden; colleague and former Williams trainee) team, along with other former and current trainees (e.g., Garcia, Allen, Cardoso, Alves, Zhen), have produced the majority of published work on the role of hypothalamic neuropeptides in regulating postpartum reproduction, including fundamental roles of leptin, neuropeptide Y (NPY), proopiomelanocortin (POMC), and kisspeptin signaling pathways. Research in this area of investigation has been funded continuously since 2000 by the USDA-NRI/USDA-AFRI Competitive Research Grants program. Work has shown that increased rates of BW gain during the juvenile period promote functional alterations in the NPY-GnRH-POMC circuitry that are conducive for alleviating NPY inhibition of GnRH release. These include lower NPY concentrations in the hypothalamus as measured in the IIIv CSF, reduced NPY gene expression, and decreased NPY innervation of GnRH neurons (Figure 1) in the arcuate nucleus. The foregoing occur concomitantly with increased concentrations of circulating leptin, increased expression of POMC, and a greater number of POMC-derived α-MSH fibers in contact with kisspeptin neurons (see Figure 2 page 8).

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their team has demonstrated that increased nutritional input during the perinatal development promotes functional alterations in hypothalamic neurocircuits that are associated with an advancement in reproductive maturation. Focusing primarily on two leptin-responsive neuronal populations, the POMC/CART and the AgRP/NPY neurons, they have demonstrated that nutritional conditions that promote increased circulating concentrations of leptin result in transcriptional and morphological changes in the hypothalamus that facilitate the achievement of puberty in prepubertal bovine females (Figure 1). In collaboration with the Williams laboratory, his research team is currently investigating the potential interactions between maternal nutrition during gestation and early postnatal adiposity on pubertal development in female ruminants. The Cardoso laboratory is also interested in exploring the long-term effects of perinatal nutrition on reproductive neuroendocrine function in sexually-mature females. Based on epidemiological data and findings from different animal models, it is likely that nutritional imbalances during late gestation and/or early postnatal development will result in reproductive neuroendocrine perturbations during adulthood in female ruminants.

Another important line of research in his laboratory focuses on elucidating the mechanisms underlying reproductive neuroendocrine perturbations in females prenatally exposed to androgen excess. In conjunction with a team of outstanding researchers from the University of Michigan, Dr. Cardoso was able to demonstrate that postnatal endocrine imbalances, namely functional hyperandrogenism and hyperinsulinemia, play a critical role in promoting LH hypersecretion in prenatal testosterone-treated sheep, an animal model of polycystic ovary syndrome (PCOS). They have demonstrated that pituitary LH hypersecretion is likely a function of compensatory hyperinsulinemia in prenatal testosterone-treated sheep (Figure 2). Moreover, they observed that postnatal treatment with an insulin sensitizer (rosiglitazone) normalizes the GnRH-stimulated LH secretion in this sheep model, a finding that is likely to have important translational relevance to reproductive health in women with PCOS. Their research group is currently using this knowledge to elucidate the epigenetic and transcriptional changes that occur during fetal development that may contribute to the development of LH hypersecretion in female ruminants.

Through the integration of whole animal physiology with cellular and molecular biology, Dr. Cardoso’s long-term research goals are to contribute to better understand the mechanisms by which the perinatal environment can modulate several reproductive processes in the offspring. He is honored and excited to be back to Texas A&M University, and is looking forward to interacting and collaborating with other IFRB investigators.
The IFRB Seminar Series, Reproductive Biology Forum, has been held weekly during the Fall and Spring Semesters since 1990. The Spring 2016 IFRB Seminar Series was coordinated by Dr. Michael Golding and the Fall Series by Dr. Sakhila Banu. Fall Semester Speakers Included:

September 2, Dr. Dolores J. Lamb, Scott Dept. of Urology, Baylor College of Medicine, “Genetic and genomic causes of male reproductive failure”

September 9, Mr. Kirthiram K. Sivakumar, Veterinary Integrative Biosciences, “Molecular mechanism of hexavalent chromium-induced premature ovarian failure.”

Dr. Jone Stanley Arulrajadurai, “Reveratrol protects the ovary against chromium-induced toxicity.”

September 16, Ms. Brianna Myre, Department of Biology, “Fasting physiology and resource allocation during reproduction in Costa Rican Olive Ridley sea turtles.”

September 23, Dr. Fuller Bazer, Physiology of Reproduction, Department of Animal Science, “Potential roles of fructose: The major hexose sugar in conceptuses of ungulates and cetaceans.”

September 30, Dr. William H. Griffith, Neuroscience and Experimental Therapeutics, TAMUHSC, “Estrogen signaling in basal forebrain neurons from both male and female F344 rats across aging and reproductive senescence.”

October 2, Dr. Pushkar Lele, Department of Chemical Engineering, “Dynamics of self-assembly and adaptation of biological molecular motors.”

October 4, Dr. Rodolfo Cardoso, Animal Science, “Developmental programming of the reproductive neuroendocrine system.”

October 7, Dr. Andreeta Trache, Medical Physiology and Biomedical Engineering, “Mechanotransduction in vascular smooth muscle cells studied by atomic force microscopy.”

October 14, Dr. Jay Ramadoss, VTPP, “Maternal perspectives in fetal alcohol spectrum disorders: Mechanisms and diagnosis.”

October 21, Tenth Annual IFRB Retreat and Twenty-Second Annual Dr. Raymond O. Berry Memorial Lecture.

October 28, Dr. David K. Fulliker, Department of Surgery, “Androgens, pregnancy and long term fetal health.”

December 2, Dr. Michael J. Soares, Ph.D, Director, Institute for Reproductive Health & Regenerative Medicine & Department of Pathology & Laboratory Medicine. “Plasticity and Placental Health.”

December 9, Dr. Yasser Lenis Sanin, Animal Science, “Effects of agmatine on secretion of interferon tau and catecholamines and expression of genes related to production of polyamines by ovine trophectoderm cells.”

December 16, Yang Gao, Veterinary Integrative Biosciences, “Abrogation of Transforming Growth Factor-β receptor 1 in PTEN-inactivated endometrium reveals a metastatic switch that promotes endometrial cancer progression.”

Dr. Shameena Bake, Assistant Professor, Neuroscience and Experimental Therapeutics, TAMUHSC “IGF-1 therapy and stroke outcome in middle-aged female rats: Role of blood brain barrier.”

International Scholars

*Dr. Renato Salgado did his PhD and postdoctoral studies in Reproductive Biology at the University of Sao Paulo, Brazil, studying the remodeling of the uterine extracellular matrix orchestrated by estradiol and progesterone in a mouse model. Following completion of his studies, Renato worked as a human embryologist for four years. He joined Dr. Katrin Hinrichs’ Equine Embryo Laboratory at Texas A&M University in February 2017, and is currently working in equine embryology, performing studies on intracytoplasmic sperm injection and embryo vitrification.

*Dr. Mohammed Ahmed Elmetwally is an Assistant Prof. of Theriogenology, Fac.Vet.Med, Mansoura University, Egypt who recently joined the laboratory of Dr. Fuller Bazer. He is interested in uterine biology and intrauterine fetal development and is evaluating the use of color Doppler as a noninvasive tool to study the effect of maternal anxiety on uterine and umbilical blood flow changes during pregnancy in sheep and goats. He is also studying the effect of catecholamine on ovine trophectoderm cells. Previously, he completed a doctoral thesis in Germany at the Institute for Reproductive Biology, University for Veterinary Medicine with Prof. Sabine Meinecke-Tillmann. His thesis was related to clinical applicability of color Doppler sonography during pregnancy in sheep and goats. He also worked in the cattle clinic in Hannover for one and half year on the effects of biological and nonbiological substance on uterine and vaginal blood flow, with Prof. Dr. Heiner Bollwein.
NEW GRADUATE STUDENT TRAINEES

*Jonathan C. Behlen graduated from Texas A&M University in 2011 with a BS in Molecular and Cell Biology. Following graduation, he went into industry for four years working in the biochemical and oil and gas fields. After realizing he wanted to pursue an even higher education, he matriculated into a master’s program and subsequently transferred into a PhD program in Dr. Sakhila Banu’s laboratory in August 2016. He is currently interested and studying how hexavalent chromium affects placentaion, in particular, trophoblast cell differentiation, migration and spiral artery remodeling.

*Xin Fang received her B.S. degree in Nanjing Agricultural University, China. She began her graduate research assistantship in Dr. Qinglei Li’s lab at Texas A&M University in May 2016. Her research focus is on understanding the role of TGF-beta signaling in reproductive development and cancer.

*Kitty Halloran is from California. She earned a B.S. in Animal Science from California Polytechnic State University and began graduate studies at TAMU this summer under the guidance of Dr. Bazer and Dr. Wu. She is currently working on a joint project to elucidate the effects of exogenous progesterone on ovine conceptus growth and development.

*Emily Hoskins (Townsend) is from Friendswood, TX and received a B.S. in Animal Science and M.A. in music at TAMU. She is pursuing her M.S. in Physiology of Reproduction under the mentorship of Drs. Fuller Bazer and Guoyao Wu. She is working on a joint project that focuses on the effects of exogenous progesterone on the growth and viability of sheep conceptuses.

*Camille Goblet completed her undergraduate degree at Oregon State University where she received her B.S. in Zoology. Camille joined Dr. Annie Newell-Fugate’s lab at Texas A&M where her current project focuses on wildlife reproductive endocrinology and the effects of the introduction of novel pheromones in breeding pairs of Red River Hogs in North American zoos.

*Cassandra Skenandore (Cassie) is a first-generation college-student from Springfield, IL with a background in Dairy Science. She received her B.S. and M.S. in Animal Sciences from the University of Illinois at Urbana-Champaign. Cassie brought her husband and two dogs to Texas A&M University in August 2015 to start her Ph.D. under Dr. Newell-Fugate. Cassie’s research uses porcine models to assess the effects of fat source in lean and high fat diets on growth, metabolism, steroidogenesis, and adipose tissue function in lean and obese females.

*Ashley Padgett completed her undergraduate education at Texas A&M, where she received her Bachelor’s degree in Biomedical Sciences in May 2016. She began working in Dr. Shannon Washburn’s lab as an undergraduate student and gained experience using the pregnant sheep model, including collaborative work with Dr. John Brosnan examining the role of folate during pregnancy. She chose to pursue her interest in research and started her Masters in Dr. Washburn’s lab this past fall. Her thesis work will focus on the maternal-fetal implications and effects of anesthesia and analgesia during pregnancy, as well as determining concentrations of oxytetracycline in the fetal compartment after maternal administration.

*Josue Ramirez graduated with a B.S. in Biomedical Science in 2016. He is a veteran of the United States military who served in Afghanistan as an infantryman in 2011. He starts graduate school in January 2017 and will join the laboratory of Dr. Jay Ramadoss as a graduate research assistant. His work will be centered on the Collaborative Initiative in Maternal and Infant Health Research (CIMPIR) Tier One Grant that will provide students the opportunity to acquire laboratory research experience.

(continued on page 10)
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 2016:


Faculty Spotlight, Dr. Williams (cont’d from page 3)

Such changes appear to mediate the nutritional programming of the reproductive neuroendocrine axis and facilitate an early onset of puberty in heifers. Importantly, applied studies have demonstrated that the age at onset of puberty can be nutritionally programmed by exposing heifers to a stepwise nutritional regimen (Figure 3) during juvenile development and can be used to time reproductive maturation consistently so that the majority of replacement beef heifers have reached puberty at 11 to 14 mo of age, while avoiding a high incidence of precocious puberty. Most recently, these interrelationships have been examined in relation to epigenetic changes created by perinatal nutrition. In this context, the neuroendocrine axis is responsible for integrating the operational control of a variety of nutritional and reproductive processes. In recent years, mounting evidence has shown that nutritional imbalances during perinatal development can permanently alter the organization of this system, resulting in lifelong alterations of reproductive function in female offspring. To this end, Williams’ interdisciplinary research team has specifically focused on temporal changes in neuroendocrine networks that respond to nutritional programming during the perinatal period. They have now demonstrated that changes in hypothalamic gene expression and neuronal morphology are accompanied by alterations in DNA methylation of key genes associated with the pubertal process (Cardoso et al. 2015; J. Neuroendocrinol. 27: 647-657).

A currently-funded USDA-AFRI project is evaluating these processes further by examining the interaction of pre- and postnatal nutrition on hypothalamic networks controlling pubertal development and mature reproductive phenotype.

Neuroendocrine control of reproductive seasonality in the mare have also been a significant recent focus of the Williams lab. These investigations, funded by the Link Equine Research Fund, Texas A&M AgriLife Research and regional horse breeders, have exploited the unique functional character of the equine gonadotrope to develop strategies for using native GnRH as a continuous modulator of pituitary-ovarian function, and sought to understand the role of a novel hypothalamic neuropeptide, RF-amide-related peptide 3 (gonadotropin inhibitory hormone; GnIH) in equine seasonality. Translational studies have demonstrated the ability of continuous, subcutaneous infusion of native GnRH treatment to accelerate the timing of pregnancy in mares by up to 2 months within a normal management setting. In addition, during the last 15 yrs., an entirely new neuroendocrine signaling pathway involving the RF-amide related peptides (RFRP), particularly RFRP3 or gonadotropin-inhibitory hormone (continued on page 14).
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 October 21, 2016. Gil Mor, M.D., Ph.D., Professor of Obstetrics and Gynecology and Reproductive Science at Yale University School of Medicine, was selected by a vote of IFRB faculty to present the Lecture entitled, “Polymicrobial Infections During Pregnancy: Maternal and Fetal Risks.”

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. Mor received his training in Israel with the M.D. and M.S. degrees from the Hebrew University Medical School and Hebrew University, respectively, and the Ph.D. in Immunoenocrinology from the Weizmann Institute of Science. He was also a postdoctoral fellow in the Max-Planck Institut fur Experimental Endocrinologie in Hanover, Germany and in the Laboratory of Immunobiology at the National Institutes of Health. Dr. Mor is Division Director of the Reproductive Science Division in the Department of Obstetrics and Gynecology and he directs the Reproductive Immunology Unit and the Translational Research Program “Discovery To Cure” at Yale University.

A major objective of Dr. Mor’s research is to understand communication between the maternal and fetal components of pregnancy and how pathogens contribute to disruption of this crosstalk leading to preterm labor. He also examines topics related to the immunology of pregnancy and the role of inflammation in cancer formation and progression. Dr. Mor has been the Editor in Chief of the American Journal of Reproductive Immunology since September, 2009.

Dr. Mor’s research is funded by grants from National Institute of Child Health Development, National Cancer Institute, National Institute of Allergies and Infectious Diseases and pharmaceutical companies. He is widely published in the areas of immunology, cancer biology and reproductive biology with more than 250 publications and he has edited three books on “Immunology of pregnancy” and “Apoptosis and Cancer.”

He is recipient of several national and international prizes, including the J. Christian Herr Award from the Society for Reproductive Immunology and the Harold Behrman Award from Yale University. He is also Honorary member of several scientific societies in Asia, South America and Europe, and he is an active member of the American Association for Cancer Research, the Society for Gynecologic Investigation, American Association of Immunologist and the American Society of Reproductive Immunology.

Dr. Mor teaches graduate courses in both immunology and developmental biology, as well as an undergraduate level course in reproductive immunology. He has a strong program in graduate education through which he has mentored 46 undergraduate students, 8 graduate students, 33 postdoctoral fellows and 17 medical students and fellows. He shares his knowledge nationally and internationally through his publications and presentations at scientific meetings, as well as many invited seminars and lectures.

For his outstanding contributions, Texas A&M University recognizes the work of Dr. Mor 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. Over the past 22 years, Dr. Berry’s daughters, Dorothy McLemore and Margaret Thompson and family members have attended the Lecture as guests. This year, Dr. Joe McLemore, son-in-law of Dr. Berry and husband of his daughter, Dorothy McLemore joined the IFRB for the Lecture. For the first time in 22 years, Dr. Bazer was unable to host the Lecture as he was in Israel carrying out a study with colleagues there.

Left: Dr. Duane Kraemer, Dr. Joe McLemore, Dorothy McLemore, Dr. Gil Mor, Dr. Gary Newton, Dr. Greg Johnson and Dr. Chuck Long

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

- Fuller W. Bazer
IFRB Trainee News, cont’d from page 6

*Nan Ni received her Bachelor of Medicine degree in Jilin University, China. She began her graduate research assistantship in Dr. Qinglei Li’s lab at Texas A&M University in September 2016. Her research focuses on understanding the role of TGF-beta signaling in endometrial biology and pathology.

*Bryan McLendon also joined Dr. Greg Johnson’s Laboratory after completing his B.S. in Animal Science from Texas A&M University. He will be studying reproductive biology with a focus on the effects of interferon gamma during early pregnancy in the pig.

*Avery Kramer recently joined the laboratory of Dr. Greg Johnson following the completion of her M.S. degree in Animal Science from the University of Wyoming. Her project is focused on the molecular signaling of interferon gamma and its role within the uterine environment of pigs during early pregnancy.

*Amanda N Bradbery is a PhD student in the Department of Animal Science. She received her B.S. in Animal Science from Virginia Tech. After completing her B.S., she remained at Virginia Tech as the Campbell Arena Supervisor/Riding Instructor and served as assistant coach for the Hunt Seat IHSA Team. In January of 2013, she began her graduate career, completing her M.S. in Animal Science in December 2014 with a focus in equine nutrition and joint inflammation under Dr. Josie Coverdale. She continued directly into a doctoral program under Dr. Josie Coverdale, and now works under Drs. Carey Satterfield, Tryon Wickersham, and Kathryn Dunlap investigating the effects of maternal overnutrition on foal development.

*Lacey Quail, Christian Cook and Marianna Mund are three new students working with Drs. Ron Randal and Tom Welsh. Lacey earned a B.S. in Animal Science from South Dakota State University. Her undergraduate research project focused on implementation of an artificial insemination program and assessment of its impact on herd calving date and calf weaning weight. Her thesis project focuses on the relationships between antral follicle counts, postpartum interval, and conception and pregnancy rates in Brahman females. *Christian Cook earned a B.S. in Animal Science from Oklahoma State University in May 2015, entered the Physiology of Reproduction graduate program in Summer 2016 at TAMU. Her M.S. project focuses on development of an immune response selection tool to improve the health of Brahman cows and calves. *Marianna Mund earned a B.S. in Animal Science from TAMU in 2015. After working with the V8 Ranch’s purebred Brahman herd, she joined the Physiology of Reproduction M.S. program. She will conduct thesis research for the next 8 months at the AgriLife Research Center in Overton. She will return to College Station to finish course and lab work. Mari’s project is focused on the cow-calf immune system inter-relationships and postnatal growth performance of Brahman calves.

*Dr. Bruna Alves, who completed her Ph.D. in Physiology of Reproduction under the mentorship of Drs. Marcel Amstalden and Gary Williams in 2014, will begin a position as Assistant Professor in the Department of Agriculture, Nutrition and Veterinary Science at the University of Nevada-Reno in July 2017.

GRADUATE STUDENT AWARDS

*Brin Myre, trainee in Dr. Duncan MacKenzie’s laboratory received a LT Jordan Fellowship from the MSC Jordan Institute at TAMU to assist her in her field research in Costa Rica. Brin also completed a year of breeding season field sampling of Olive Ridley sea turtles in Costa Rica.

NEW POSTDOCTORAL SCIENTISTS

*Dr. Matthew Nemec attended Miami University in Oxford, OH where he received his B.A in Zoology and Philosophy in 2008. He then received his M.S. in Toxicology at San Diego State University and industrial training at Johnson & Johnson. In 2012 Matt joined the Toxicology program at TAMU. He completed his PhD in Summer of 2016, and joined Dr. Jay Ramadoss’ lab to continue his training as a Postdoctoral Research Associate. His research focuses on establishing a translational model to study effects of electronic cigarette vapor on fetal development.

*Dr. Aileen Rowland attended the University of Nevada-Reno in July 2014, will begin a position as Assistant Professor in the Department of Agriculture, Nutrition and Veterinary Science at the University of Nevada-Reno in July 2017.

(continued on page 16)
The 10th Annual IFRB Retreat was held on October 21, 2016 in conjunction with the 22nd Annual Dr. Raymond O. Berry Memorial Lecture. Over 100 IRFB faculty and trainees from the Colleges of Veterinary Medicine & Biomedical Sciences and Agriculture and Life Sciences, College of Medicine, and Prairie View A&M plus guests participated in the Retreat which was held at the Navasota Civic Center, Navasota, TX. Dr. Chuck Long, Chair of the IFRB, presided over the meeting.

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

Minisymposia were presented by IFRB Faculty: Dr. Nancy Ing, “RNAs in stallion sperm: Towards development of a novel assay for male fertility.”

Dr. Sakhila Banu, “Early exposure to the Erin Brockovich chemical (CrVI) lead to placental perturbation.”

Presenters at the “Data Blitz” section of the Retreat program included: Christine Figgener, “The basis and consequences of female alternative reproductive tactics in sea turtles.”

Richard Chang, “Paternal alcohol consumption restricts growth and alters developmental programming in offspring.”

Meaghan O’Neil, “The role of estradiol-17β in modulating pituitary-ovarian responsiveness to GnRH in winter anovulatory mares.”

Raine Lunde, “Chronic binge alcohol consumption during pregnancy alters rat maternal uterine artery pressure response.”

Katie Beason, “Metabolic and hormonal differences in nutrient restricted ewes having SGA and non-GA fetuses.”

Stephanie Walsbornn, “The effect of dual hemisphere breeding on stallion fertility.”

Support for the 9th 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. Alan Sams, College of Agriculture and Life Sciences, Dr. Alton Johnson, College of Agriculture, Prairie View A&M University, Dr. Evelyn Tiffany-Castiglioni, Department of Veterinary Integrative Biosciences, Dr. H. Russell Cross, Department of Animal Science, Dr. Larry Suva, Department of Veterinary Physiology and Pharmacology, Dr. William Griffith, Department of Neuroscience and Experimental Therapeutics, Dr. Geoffrey Kapler, Department of Molecular and Cellular Therapeutics, College of Medicine, and Dr. Fuller Bazer, through his Distinguished Professor account.

Placentas from women with preeclampsia also exhibit lymphangiogenesis (Figure 2).

In addition to working with groups from industry, the Mitchell lab is working with Dr. Newell-Rogers and Dr. Robert Alaniz (Dept. of Microbial Pathogenesis and Immunology) on the gamma-delta T cell studies and Drs. David Zawieja, Joe Rutkowski, Mari Muthuchamy, and others from the Department of Medical Physiology on the lymphatic studies. They are also working in conjunction with Drs. Brandie Taylor and Mahua Choudhury on translational preeclampsia studies and are open to further areas of preeclampsia-related research.

Figure 2. Placental lymphangiogenesis in women with PE. Methods: Paraffin-embedded placental slices were obtained from normotensive women and women with PE as described in our previous paper (Chatterjee et al., PLoS One, 2012). The slices were de-paraffinized and stained with anti-podoplanin followed by a 594 nm-conjugated secondary antibody and DAPI for blue nuclei staining. Images were taken at 20x magnification (scale bar = 100 μm). Similar results were found for LYVE-1 staining of serial sections. The white arrows point to lumen-containing, podoplanin positive, stained vessels ~30-40 μm in size. The arrowhead points to 2 lumen-containing vessels but are ~8-10 μm. The 2 images of the PE placenta are the same, with DAPI in the left image and the right image has the red channel darkened for visual purposes.
IRFB Faculty Activities, Awards, etc.

NEW GRANTS:
*Dr. Jay Ramadoss, coordinator and Fuller Bazer, Katrin Hinrichs, Larry Suva, and Jim Herman, received a Tier One Program Grant on “Collaborative Learning Initiatives in Maternal, Perinatal, and Infant Health Research,” 09/01/2016-08/31/2019, $288,000.

*SA Meyers and Dickson Varner, American Quarter Horse Foundation “Mitochondrial oxidative function of stallion sperm is a novel indicator of aging and cryopreservation success in stallions.” 2016-2017, $58,913.


AWARDS & HONORS:
*Dr. Kayla Bayless served participated in the Atherosclerosis, Inflammation, and Cardiovascular Sciences Study sections February 4-5th in Bethesda, MD, and September 29-30th in Pocomac, MD. Dr. Bayless also participated in an American Heart Association Peer Review Group, Vascular Wall Biology Basic Science 3 Committee on October, 2016.

*Dr. Fuller Bazer received the following awards: Centenary College of Louisiana Alumni Hall of Fame Inductee, Shreveport, LA (2016). Colegio Brasileiro de Reproducao Animal Award for Outstanding Contributions to Reproductive Biology, Campos do Jordao, Brazil, November, 2016.

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

*Dr. Greg Johnson was elected to the Board of Directors for the Society for the Study of Reproduction, 2016. He also received an “Excellence in Reviewing,” outstanding contribution to the quality of the Journal Placenta.

Dr. Johnson was a Co-Organizer for the Twenty Second Annual Dr. Raymond O. Berry Memorial Lecture and Tenth Annual Interdisciplinary Faculty of Reproductive Biology (IFRB) Retreat, 2016.

*Dr. Qinglei Li served as an ad hoc reviewer for two agencies including:
- The Department of Defense Ovarian Cancer Research Program (OCRP) Integration Panel and
- The Israel Science Foundation (ISF), 2016.

*Dr. Jay Ramadoss, received the 2016 Juan Carlos Robles Emanueli Teaching Award from the TAMU College of Veterinary Medicine & Biomedical Sciences (CVM). He also received the 2016 Outstanding Young Faculty Research Award from the CVM, TAMU.

*Dr. Ramadoss served on the following NIH Review Panels:
- Ad hoc Reviewer, NIH PN Pregnancy and Neonatology Study Section (February, 2016)
- Reviewer, NIH ZRG1 EMNR-A (55) R, Translational Research in Pediatric and Obstetric Pharmacology and Therapy (April 2016)
- Reviewer, NIH NIGMS Centers of Biomedical Research Excellence (COBRE) Award Program for COBRE-Phase I (P20) special emphasis panel (July, 2016)
- Reviewer, NIH 2016/10 ZAA1 JJ Special Emphasis Panel (July, 2016)

*Dr. Dickson Varner received the 2016 Bartlett Award for Lifetime Achievement in Theriogenology, awarded by the Society for Theriogenology and American College of Theriogenologists.

*Dr. Carey Satterfield received the 2016 American Society of Animal Sciences Early Career Achievement Award.

*Dr. Tom Welsh, Jr., was recipient of 2016 ASAS Physiology & Endocrinology Award (presented at 2016 ASAS-ADSA meeting in Salt Lake City, Utah).

http://takingstock.asas.org/?p=20220

INTERNATIONAL ACTIVITIES:
*Dr. Sakhiha Banu gave a talk at the University of Madras, India entitled, Chromium Toxicity and Premature Ovarian Failure” on June 8, 2016.

*Dr. Fuller Bazer presented the following invited lectures: “Pregnancy in ruminants: Viral and antiviral aspects during pregnancy” at Queen’s University for the Anne Croy Retirement Symposium, the July 28-29, 2016, Kingston, Ontario, “Effects of agmatine on secretion of interferon tau and catecholamines and expression of genes related to production of polyamines by ovine trophoblast cells” at the Fourth International Symposium on Polymines, Biochemical, Physiological and Clinical Perspectives, September 4-9, 2016, Rome, Italy; “Pregnancy recognition signals in mammals: The roles of interferons and estrogens at the VI International Symposium on Animal Biology of Reproduction, November 5-9, 2016, Campos do Jordao, Brazil.

(continued on page 16)
Research Snapshot, cont’d from page 7


The International Congress on Animal Reproduction (ICAR) announced that Dr. Katrin Hinrichs was the recipient of the 2016 Simmet Prize for Assisted Reproduction. The prize, which is the most prestigious award in animal reproduction and one of the largest of its kind, was awarded based on the pioneering efforts of Dr. Hinrichs to elucidate the fundamental biology of gametes and embryos in the horse and to develop laboratory techniques that have made assisted reproduction technologies in the horse a practical reality. The clinical program in equine assisted reproduction she founded in 2009 in collaboration with the Section of Theriogenology at Texas A&M is now one of the largest in the world and has performed over 450 embryo production procedures in 2015 alone.

She and her colleagues have been instrumental in the development of assisted reproductive techniques in the horse. Areas in which Dr. Hinrichs and colleagues have made instrumental advances include in vitro maturation of eggs, fertilization by intra-cytoplasmic sperm injection, embryo culture, cloning, cryopreservation of embryos and the use of embryonic biopsy to enable pre-implantation genetic screening.

The prize, established as a memorial to the accomplishments of Dr. Ludwig Simmet, a pioneer in development of artificial insemination in farm animals and founder of Minitube, recognizes an active research scientist for basic and applied research published during the previous six years in the area of assisted reproduction of animals. The prize is presented each 4 years and includes an award of 50,000 euros.


(continued on page 17)
**Faculty Activities, cont’d from page 12**

*Dr. Katrin Hinrichs* presented an invited lecture, “A journey through people, places, and projects in equine assisted reproduction” Simmet Prize Lecture, International Congress on Animal Reproduction, Tours, France, June 27, 2016.

*Dr. Greg Johnson* was Keynote Speaker at the 1st International Symposium, Creation and Future Trends in Food and Agricultural Immunology, Sendai, Japan. The title was “Inflammatory cytokines osteopontin and interferon gamma physically and functionally modify the uterus and placenta to support pregnancy.” He was also Keynote Speaker at Erdos, Inner Mongolia, China, “Molecular, cellular and physiological interactions between the placenta and uterus during sheep pregnancy.”

**INVITED LECTURES**

*Dr. Kayla Bayless,* was an invited speaker to the 15th Biennial Meeting of the International Society of Applied Cardiovascular Biology held September 7-10th in Banff, Alberta, CA. The talk was entitled, “Ultrabxorax-based biomaterials enhance endothelial activation and neovascularization.”

*Dr. Sakhila Banu,* gave an invited lecture at the University of Texas Medical Branch, Galveston, on January 9, 2016 entitled, “Prenatal CrVI Exposure and Premature Ovarian Failure: A DoHAD Perspective.”

She also gave an invited lecture entitled, “Chromium VI-Induced Reproductive Toxicity: Mechanisms and Intervention” at the 6th Global Summit on Toxicology and Applied Pharmacology, Houston TX, on Oct. 17, 2016.

*Dr. Fuller Bazer,* presented an invited lecture “The Many Faces of Interferon Tau” to faculty and trainees at Iowa State University, Ames, Iowa, Feb.10-12, 2016.


*Dr. Gary Williams,* presented invited lectures entitled “Reproductive Seasonality in the Mare: Neuroendocrine Basis and Pharmacologic Control” for the Society for Theriogenology, College of Veterinary Medicine & Biomedical Sciences, TAMU, Feb. 5, 2016 and “Synchronization of Ovulation for Fixed-Time AI in Bos indicus-influenced cattle using Bee Synch” for the South Texas Hereford Association, February 2016, Beeville, TX.

*Dr. Greg Johnson* was again invited to serve as a faculty member in the 2016, Frontiers in Reproduction course at the Marine Biological Laboratories, Woods Hole, MA, 30 April–12 June 2016. He presented lectures on placentation in domestic animals.

*Dr. Dickson Varner* was invited speaker at the following symposia: - West Coast Equine Reproduction Symposium V, Buelton and Los Olivos, California. “Handling the Breeding Stallion” and “Processing Semen for Cooled Transport.” Nov. 3-5, 2016.


**IFRB Trainee News, cont’d from page 10**

Egypt and Belgium before joining the Equine Embryo Laboratory with Dr. Katrin Hinrichs in November, 2016 as a Research Assistant. Dr. Resende is working on the role of reactive oxygen species in stallion sperm capacitation, as well as on transvaginal follicle aspiration and oocyte manipulation in the mare.

*Dr. Rosanna Serafini* is a Postdoctoral Research Associate in the Stallion Reproductive Studies (SRS) Laboratory, Section of Theriogenology, at the CVM. She received her DVM in 2007 and PhD in 2015 from University of Naples, Italy. During her PhD she conducted a collaborative research on sperm quality and fertility, and developed a research project focused on the Comet assay in stallion, bull and water buffalo sperm. Part of this project was developed at the TAMU SRS Laboratory. She returned to Texas and has continued to expand her interest in stallion reproduction, including sperm DNA assays and sperm function. Her interest, during the first year of her Postdoc, focused on the effect of seminal plasma on sperm DNA, creating a model by using potentiators of DNA damage to better understand the response of the different DNA assays. She was also involved in a project on antioxidant enzymes in equine seminal plasma and her goal is to improve sperm function, particularly under storage conditions.

**AWARDS AND GRADUATES**

*Anita Snell* completed her M.S. Thesis in August, 2016 entitled “Effect of monensin supplementation on follicular development of Brahman cows and the effect of sex and temperament on response of beef calves to Salmonella Newport Extract vaccine”. Co-Chairs were **Drs. Jason Banta, Ron Randel,** and **Tom Welsh.** Anita was a Texas A&M AgriLife Extension Assistant and served as a graduate and teaching assistant in the Department of Animal Science. Anita is now a Beef and Livestock Specialist for the University of Missouri Extension Service in Milan, MO.

*Dr. Katie Davis-Anderson,* postdoctoral fellow in **Dr. Ramadoss**’ lab received a Research Society on Alcoholism Junior Investigator Award.

*Heewon Seo,* postdoctoral fellow in the laboratory of **Dr. Greg A. Johnson,** received a USDA-NIFA-AFRI Merit award at the 49th Annual Meeting of the Society for the Study of Reproduction, San Diego, July 2016 where he was also a finalist in the Trainee Research Award Competition. The title of his platform presentation was “Synchrony Trophoblast Fusion and Breaching of Uterine Luminal Epithelium in Sheep.”

(continued on page 20, top-right column)
Trainee Spotlight: Rui A. d’Orey Branco

Rui A. d’Orey Branco is a doctoral student co-mentored by Drs. Ron Randel and Tom Welsh. He has been an interactive student member of the IFRB program while he served as a graduate research and teaching assistant since Fall 2014. Rui has specific interests in controlling ovarian follicle development as a means to increase reproductive efficiency and improve delivery of animal sourced protein to a growing human population.

Rui was born Halloween, October 31, 1985 in his hometown of Vila Nova de Famalicão in Portugal. Through the stimuli of physical and mental exercises provided by his supportive parents, 4 siblings, and friends, young Rui developed 2 overarching, intertwined career interests: sports and academics. Specifically, Rui has actively pursued interests in rugby, veterinary medicine, and animal reproduction. The adolescent Rui moved to Lisbon, Portugal to pursue rugby and a college education. He played international rugby as a member (U17 and U19 teams) and captain (U20 team) of the National Team of Portugal. Subsequently, Rui was a professional rugby player on several teams that won the Portugal Cup and the Iberian Cup. The international rugby activities afforded Rui the opportunity for travel and cultural experiences across Europe and Africa.

Animal biology attracted Rui’s academic interests. In 2013 he earned the D.V.M. degree from the Faculdade De Medicina Veterinaria de Lisboa, Universidade de Lisboa, Portugal. Also in 2013, Rui was awarded an M.S. degree from the University of Lisbon. A portion of his M.S. program was based on his Spring 2013 research internship at the Texas A&M AgriLife Research Center in Overton with Drs. Ron Randel and Tom Welsh. The Aggie Connection was instrumental in placing Rui with Dr. Randel’s Brahman cow herd. Specifically, on a trip to the University of Porto’s vet school, Rui met Dr. Antonio Rocha, a theriogenology professor. Dr. Rocha earned his M.S. and Ph.D. degrees at TAMU in Physiology of Reproduction with Drs. Randel and David Forrest. It was Dr. Rocha’s recommendation that brought Rui to Texas. After successful completion of his M.S. degree, Rui initiated pursuit of his doctoral program with Drs. Randel and Welsh in the Fall 2014.

Rui has been an enthusiastic and effective graduate teaching assistant in the lab components of the animal reproduction courses in the Department of Animal Science. Based on student and professor recommendations, He was selected as the recipient of the esteemed Dr. Ronnie L. Edwards Graduate Teaching Award in Animal Science in December 2015. With regard to his dissertation research, Rui was instrumental in preparation of a proposal to acquire a new 3D ultrasound to study follicular wave development in cattle (see Figure below). Rui has been involved in identification of early maturing female cattle and assessing the long range economic impact of early maturation and long term production of heifers that calve at an early age. Most recently Rui launched studies to determine the relationship of antral follicle number and reproductive maturation/productivity of tropically adapted cattle such as the Brahman breed. To date, Rui has presented 4 papers from his M.S. program and 5 papers from his Ph.D. program. He anticipates graduating in December 2017 and starting his independent careers as a rugby coach and theriogenologist.

Above: Rui with his Dr. Ronnie Edwards Graduate Teaching Award. Left: A threedimensional image of an ultrasound examination of a Brahman cow. A, B, and C represent the three planes in a bidimensional image. The 3-D image is colored with the colors representing the follicles present.


Wang, X, Johnson, GA, Burghardt, RC, Wu, G, Bazer, FW. Uterine histotroph and conceptus development. II. Arginine and secreted phosphate co-transporter member 1 (SLC2A1) at the uterine placental interface of a pig at Day 60 of pregnancy. Courtesy of Avery Kramer and Dr. Heewon Seo in the lab of Dr. Greg Johnson.

Wang, X, Johnson, GA, Burghardt, RC, Wu, G, Bazer, FW. Uterine histotroph and conceptus development. II. Arginine and secreted phosphate co-transporter member 1 (SLC2A1) at the uterine placental interface of a pig at Day 60 of pregnancy. Courtesy of Avery Kramer and Dr. Heewon Seo in the lab of Dr. Greg Johnson.
The 47th Annual Meeting of the Society for the Study of Reproduction was held 16 – 20 July 2016, San Diego, CA. The theme of the Meeting was “Systems Biology of Reproduction.”

This year 5 trainees who submitted first-authored abstracts accepted for presentation at the Annual SSR meeting received travel funds to attend the SSR meeting. Trainees included Yang Gao, Yasser Lenin, Dr. Colleen Lambo, Dhafer Ibrahim, and Katharine Beason. Two trainees, Rui d’Orey Blanco, and Brittini Littlejohn, presented their work at the Joint Meeting of the American Dairy Science Association/American Society of Animal Science, and one trainee Brianna Myre, attended International Sea Turtle Symposium in Lima, Peru.

Dr. Fuller Bazer was an invited speaker at the Conceptus-Uterine Interactions: Critical Players in Pregnancy Success Focus Session. The title of his talk was, “Interferon Tau: Roles in Establishing and Maintaining Pregnancy.” Twelve IFRB faculty members and 15 current or former trainees contributed to published abstracts at the meeting.

*Dr. Heewon Seo, postdoctoral fellow in the laboratory of Dr. Greg A. Johnson, was the recipient of a USDA-NIFA-AFRI Merit award and was also a finalist in the Trainee Research Award Competition. The title of his platform presentation was “Syncytial Trophoblast Fusion and Breaching of Uterine Luminal Epithelium in Sheep.”

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.

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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.