TEXAS A&M UNIVERSITY

IFRB 2014

Interdisciplinary Faculty of Reproductive Biology

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

2014, ISSUE 1 SPRING, 2014

POINTS OF INTEREST:

- The IFRB was organized in 1990 and is one of the largest Reproductive Biology Programs in the US
- Membership includes 44 faculty from 5 departments, 5 colleges, 4 TAMUS components and 2 state agencies
- IFRB sponsored activities: IFRB Repro Forum Seminar Series (24 years) Annual R.O. Berry Lecture (20 years), Texas Forum on Reproductive Sciences (20 years), Annual IFRB Retreat (7 years)

INSIDE THIS ISSUE:

New IFRB Faculty Spotlight

Brandie Taylor, PhD, is one of two new members of the Interdisciplinary Faculty of Reproductive Biology. Dr. Taylor joined the Department of Epidemiology and Biostatistics at the School of Public Health as an Assistant Professor in January 2014. Dr. Taylor's research encompasses the examination of host genetic and immunological markers in pelvic inflammatory disease, preeclampsia, and preterm birth. As the immune system is vital to reproductive and pregnancy health, it is possible that genetic variations in or an imbalance immune response may lead to serious adverse reproductive and pregnancy outcomes. The goal of Dr. Taylor's research is to identify genetic and biological markers that may be used to build prediction models for common reproductive and pregnancy complications.

Dr. Taylor received both her M.P.H. (2007) and Ph.D. (2011) from the University of Pittsburgh. Her graduate training was in epidemiology with particular emphasis on the application of methods specific to women's reproductive and perinatal complications. During her doctoral training, she received a NIH T32 predoctoral fellowship in reproductive, perinatal, and pediatric epidemiology, and worked under Drs. Catherine Haggerty and Toni Darville. She completed various projects during this time focusing primarily on the identification of markers that increase the risk of long-term sequelae following pelvic inflammatory disease (PID). After her predoctoral training, Dr. Taylor received a T32 postdoctoral fellowship in perinatal epidemiology at Michigan State University. She worked with Dr. Claudia Holzman to identify inflammatory biomarkers that can predict the risk of preterm birth subtypes. Dr. Taylor also completed a postdoctoral position at the University of Pittsburgh. During this time, her work focused on the association between mid-trimester serum inflammatory markers and leptin in preeclampsia risk. This work is currently being prepared for publication.

Much of Dr. Taylor's graduate and post-graduate work has focused on identifying host genetic variants in immune related genes that are associated with pathology following

(Continued on page 2)

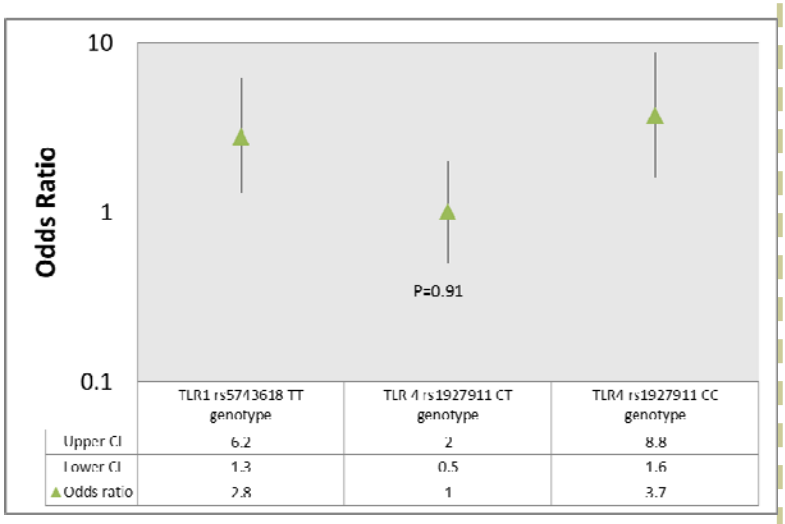
Reproductive Biology and One Health: Interferon Tau

What is the connection between the protein that regulates the development of a conceptus (embryo and its extra-embryonic membranes) in sheep and the prevention of chronic inflammatory diseases in humans? The connection represents a classic example of a long standing One Health initiative. It has involved collaborative efforts of multiple disciplines working locally, nationally, and globally to attain optimal health for people, animals and the environment.

The launch of this One Health initiative began in the early 1980s, when Drs. Fuller Bazer, Michael Roberts and William Thatcher at the University of Florida were working to identify a factor produced by sheep and cattle conceptuses that was critical for successful pregnancy in these farm species by preventing the regression of the corpus luteum. With postdoctoral fellow, Dr. Jim Godkin, they were able to identify an active protein factor that was produced transiently and in large amounts by trophectoderm of elongating sheep conceptuses. A similar factor was identified as a secretory protein from cattle conceptuses. Initially identified as ovine- and bovine-trophoblast protein-1, they were subsequently recognized to resemble a type-1 interferon with a unique structure and properties and produced only by ruminant species. (Continued on page 9)

New IFRB Faculty (cont'd from page 1)

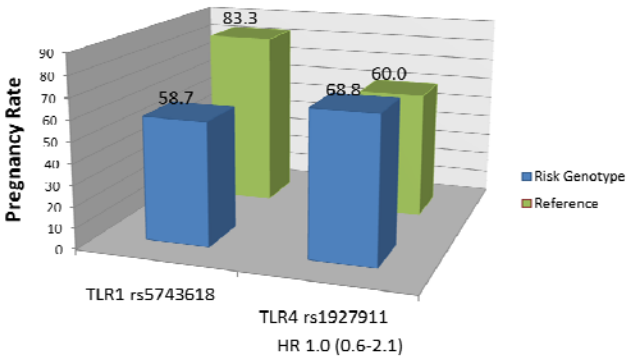
infection with Chlamydia trachomatis. C. trachomatis is the most common bacterial sexually transmitted infection in the United States. Even after treatment, C. trachomatis can ascend to the upper genital tract and cause PID and its subsequent sequelae including ectopic pregnancy, infertility, and chronic pelvic pain. However, there is great variability in clinical outcomes and some women may develop pathology following chlamydial-PID and others may not. As the mechanisms underlying the pathogenesis of C. trachomatis have yet to be completely elucidated, the reasons for this variability in outcome are unknown. It is known that the host inflammatory response may be responsible for disease progression. In addition, it is estimated that host genetics may account for up to 40% of the variability in clinical outcomes. Thus, it is possible that variations in host immune related genes may contribute to the pathogenesis of C. trachomatis. The Toll-like receptor (TLR) family is part of the innate immune system. TLRs 1-10 are expressed throughout the reproductive tract and function to recognize and eliminate pathogens through inflammatory responses. Dr. Taylor and colleagues tested 15 variants in TLR genes and found that polymorphisms in TLR1 and 4 genes were associated with increased odds of C. trachomatis infection and confirmed upper genital tract infection among African American women with clinically suspected PID. In addition, TLR1 but not TLR4 variants were associated with reduced pregnancy rates among a subset of women with chlamydial PID only. This suggests that TLR1 polymorphisms, shown to increase signaling, may be genetic risk markers for enhanced pathology following chlamydial-PID. However, these common variants only explain a small proportion of individual variation in chlamydial-disease risk. A long term goal of Dr. Taylor's research is to contribute to a better understanding of C. trachomatis pathogenesis by further examining host genetic susceptibility to long-term reproductive complications following infection. The identification of genetic markers in combination with bacterial factors, epidemiologic and clinical markers may be used to identify women at the highest risk of sequelae whom may benefit most from frequent screening. In addition, this work could direct future studies focused on the development of novel treatments and interventions for C. trachomatis.



	TLR1 rs5743618 TT genotype	TLR 4 rs1927911 CT genotype	TLR4 rs1927911 CC genotype
Upper CI	6.2	2	8.8
Lower CI	1.3	0.5	1.6
Odds ratio	2.8	1	3.7

Upper Right: Odds ratios (OR) and 95% confidence intervals (CI) to determine associations between TLR1 and TLR4 genotypes and Chlamydia trachomatis among African American women with pelvic inflammatory disease (n=205). OR and 95% CI were calculated using logistic regression. All models were adjusted for age and permutations were used to correct for multiple comparisons. All women in this study had clinically suspected PID at enrollment. Chlamydia was confirmed by PCR at enrollment. TLR variants were measured by florescent polarization. TLR1 and TLR4 genotypes were associated with increased odds of chlamydial-PID. Adapted from: Taylor, BD. Journal of Infectious Diseases. 2012;205(4):603-609.

Dr. Taylor is working to utilize high-throughput technologies to identify rare and novel genetic variants associated with chlamydial disease. Since joining A&M, Dr. Taylor has been completing ongoing projects from her postdoctoral studies including examining associations between interferon-epsilon gene variants and PID-associated microorganisms. She continues to be focused on perinatal outcomes in addition to reproductive complications. She is very interested in developing an epidemiologic study that will examine placental microparticles and immunological markers in the development of preeclampsia. In addition to research, Dr. Taylor is committed to teaching and mentoring. She is the Director of the Program in Reproductive and Child Health at the School of Public Health. This program focuses on research in human reproduction and child health but also training for future reproductive and perinatal epidemiologists. Dr. Taylor plans to build this program to provide a strong foundation for students interested in reproductive and perinatal epidemiology.



Lower Right: Pregnancy rates among African American women with chlamydial-PID (n=94) who carry TLR1 and TLR4 risk genotypes. Hazard ratio's (HR) and 95% confidence intervals for time-to-pregnancy are shown and were adjusted for age and history of infertility. Pregnancy was assessed at follow-up (mean of 84 months after PID was confirmed) and determined by a positive urine or blood pregnancy test. Women with chlamydial-PID who carried the risk genotype for TLR1 had significantly reduced pregnancy rates. Adapted from: Taylor, BD. Journal of Infectious Diseases. 2012;205(4):603-609.

New Faculty Spotlight: Dr. William Foxworth

William Bush Foxworth, PhD is another new member of the Interdisciplinary Faculty of Reproductive Biology. He is a research scientist at Prairie View A&M University's International Goat Research Center. Dr. Foxworth earned a bachelor's degree in Animal Science from the University of Wyoming in 1986, a certificate in Japanese Studies from Sophia University, Tokyo, Japan, 1986, a doctorate in Veterinary Physiology from Texas A&M University in 1993 and a certificate in Advanced International Affairs from the George Bush School of Government and Public Service, Texas A&M University in 2005. He was also a member of Texas AgriLife's Texas Agricultural Lifetime Leadership (TALL) Program, Class VII, from 2000 – 2002.

The career path for Dr. Foxworth has taken him from academia to the private sector and back, along a road that has circumnavigated the globe. Dr. Foxworth received his Ph.D. in the laboratory of **Dr. Duane C. Kraemer** where he investigated the usefulness of diploid/tetraploid embryo aggregation for facilitating xenogeneic transfer between *Mus musculus* and *Meriones unguiculatus*. As a graduate student, he worked with USAID in Kenya transferring embryos in goats that were being studied for their genetic resistance to Haemonchus contortus. Following post-doctoral work, he joined the faculty in Veterinary Pathobiology at the Texas A&M College of Veterinary Medicine, where he developed a laboratory animal transgenic core. He left academia and established two international advanced biotechnology ruminant genetic collection and export centers at which he managed operations, strategic direction and biotechnology transfer. His work involved technology transfer and import/export negotiations with both government officials and private business personnel from Asia (China, Vietnam and Thailand), Australia, Latin America (Cuba, Mexico, Guatemala, Nicaragua, Costa Rica, Panama, Colombia, Venezuela, Argentina, Chile and Brazil), Africa (Kenya and South Africa), Europe (Russia, Poland, Germany and Great Britain) and Canada.

Dr. Foxworth's research interests have focused on gamete physiology and cryopreservation, ruminant embryo transfer and in vitro fertilization, transgenic animal production, gene targeting, agroterrorism and the international transfer of biotechnologies to improve animal production and research systems. His past research has involved areas as diverse as the production of the first giraffe by artificial insemination, production of transgenic laboratory animals, the development of novel procedures for the identification and analysis of transgenic mice and the development of artificial reproductive technologies for small ruminants.

A major limiting factor in utilizing advanced reproductive technologies, such as artificial insemination and embryo transfer in the goat, is the early/premature regression of the corpus luteum (CL), which is needed to establish and support pregnancy to term. Dr. Foxworth is currently developing an interdisciplinary research program which involves defining the mechanism that triggers early regression of the goat CL. His efforts are focused on identifying and illustrating the morphologic, histologic, endocrine and genomic characteristics of the early regressing, normal regressing and non-regressing CL of the goat.

Right: Dr. Foxworth is shown here performing artificial insemination on a giraffe.

20th Annual Raymond O. Berry Memorial Lecturer Selected

Professor Sarah Robertson, NHMRC Principal Research Fellow and Director of the Research Centre for Reproductive Health, Robinson Institute, University of Adelaide Australia was selected by a vote of IFRB faculty in December 2013, to present the 20th Annual Dr. Raymond O. Berry Memorial Lecture which will be held in conjunction with the 8th Annual IFRB Retreat on Friday, October 11, 2014 at the Navasota Center, Navasota, TX.

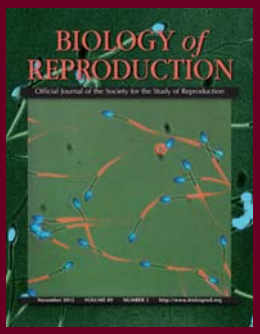
Dr. Robertson's research focus is to define how events at the time of conception impact pregnancy and fetal development, and the health of the child after birth. In particular she studies the role of cytokines and the immune response in regulating embryo development and implantation. She has a major interest in the immune adaptation required to support healthy fetal development and prevent pathologies of pregnancy such as miscarriage, preeclampsia and preterm delivery. She has collaborated with commercial partners to successfully develop her discovery of cytokine control of embryo development into new commercial products for human reproductive medicine. Her work is funded by Project grants from the National Health and Medical Research Council of Australia, the Australian Research Council, The Canadian Institutes of Health Research and the Gates Foundation. Professor Robertson has authored and co-authored over 125 peer-reviewed scientific journal papers and reviews. She holds patents in various countries around the world for reproductive technologies, and has collaborated with industry partners to successfully develop a new treatment for miscarriage, which is now on the international market.

She has won several awards, including the 2013 Senior Investigator Award of the European Society for Reproductive Immunology, serves on the Academy of the National Health and Medical Research Council (NHMRC), and was Editor-in-Chief of the Journal of Reproductive Immunology from 2008-2013.

The Annual Raymond O. Berry Memorial Lecture series is held in honor of Dr. Raymond O. Berry, a member of the faculty from 1931 to 1960 who contributed to the establishment of the discipline of Reproductive Immunology through his pioneering studies involving embryo transfer to evaluate genetic factors affecting reproduction. The Lecture was established in 1994 by Dr. Fuller Bazer.

IFRB Faculty Awards, etc.

Dr. Kanako Hayashi, Former IFRB postdoctoral trainee, now Assistant Professor at Southern Illinois University , is the recipient of the 2014 Society for the Study of Reproduction New Investigator Award



Loux SC, Crawford KR, Ing NH, González-Fernández L, Macías-García B, Love CC, Varner DD, Velez IC, Choi YH and Hinrichs K. CatSper and the relationship of hyperactivated motility to intracellular calcium and pH kinetics in equine sperm was the cover article of Biology of Reproduction (BOR) in November, 2013.
It was the most read paper in BOR in January and the secomd-most read paper in December, February and March.

NEW GRANTS:

*** Ashlee Watts,** "Developing a Technique for Stem Cell Tracking via 19F MRI and a Fluorocarbon Label," Co-I's Mark Lenox, Chad Marsh, Kevin Cummings, Alexis Mitchell (grad student). October 1, 2014 to September 30, 2015.

* **Tom Welsh, Ron Randel, Sara Lawhon and Rhonda Vann** are the recipients of a 2014-2016 USDA Formula Animal Health grant "Efficacy of Salmonella Newport Extract Vaccine in Cattle of Divergent Temperaments."

*** Marcel Amstalden, Ivan Ivanov Gary Williams** received a Texas A&M Genomics Seed Grant 2014 to study "Functional genomic mapping of the neuroendocrine hypothalamus."

AWARDS:

*** Fuller W. Bazer,** received the 2014 Morrison Award, American Society of Animal Science (ASAS). Dr. Bazer is the first member of Texas A&M University's Department of Animal Science to receive the award which is presented each year to a member of the ASAS who has made a meritorious scientific contribution or discovery in research in the field of animal science and done outstanding recent research of direct importance to livestock production.

* **Greg Johnson,** received a College of Veterinary Medicine & Biomedical Sciences Mentoring Award at the Spring Distinguished Achievement Awards ceremony. Dr. Johnson was also recently appointed to the Editorial Board of *Domestic Animal Endocrinology.*

*** Tom Welsh** was the recipient of the Distinguished Service Award at the annual meeting of the Southern Section of the American Society of Animal Science, February 2014.

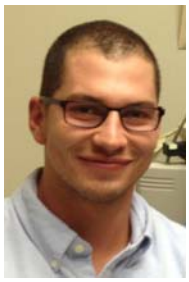
INVITED LECTURES:

*** Sakhila Banu** was invited to present a lecture at an international conference on recent trends in biomedical sciences, Society of Reproductive Biology and Comparative Endocrinology (SRBCE), 32nd Annual Meeting, Jan. 7-9, Holy Cross College, Bharathidasan University, Tamil Nadu, India. The title of her presentation was "Chromium exposure and premature ovarian failure." (Continued on page 12)

IFRB Trainee News

*** Bruna Alves** DVM was awarded her Physiology of Reproduction Ph.D. degree in May. Her dissertation was entitled "Nutritional Programming of Neuroendocrine Pathways Controlling the Onset of Puberty in Heifers." During her doctoral program she coauthored 5 peer-reviewed articles and is the author of 3 others in preparation. She was awarded the USDA National Institute of Food and Agriculture Merit Award during the 2011 Annual Meeting of the Society for the Study of Reproduction (SSR), the Animal Reproduction in Agricultural Research Fellowship during the 2012 SSR Annual Meeting and the 2012 Tom Slick Graduate Research Fellowship, College of Agriculture and Life Sciences, TAMU. She is currently employed at the Brazilian Agency for Agricultural Research (Embrapa), Center for Dairy Cattle research in Juiz de Fora, Brazil. **Dr. Marcel Amstalden** chaired her graduate advisory committee.

*** Samantha Duran** is a new BIMS M.S. student in Dr. Qinglei Li's laboratory. She completed her Bachelor of Science degree in Animal Science in December, 2012. Her research interests are in female infertility. In Dr. Li's lab , her research is currently focused on identifying the role of transforming growth factor b signaling in the function and dysfunction of female reproductive organs.



*** Rodolfo Cardoso,** DVM, received the 2014 Tom Slick Graduate Research Fellowship, College of Agriculture and Life Sciences, TAMU. Rodolfo has also been selected as one of the finalists for the Trainee Research Award competition for Platform presentation during the 2014 SSR Annual Meeting in Grand Rapids, Michigan for the abstract entitled "Nutritional Programming of Accelerated Puberty in Heifers: Evidence for Involvement of Melanocortin Signaling to Kisspeptin Neurons in the Arcuate Nucleus".

*** Yang Gao**, graduate student in the laboratory of Dr. Qinglei Li, recently received a High-Impact Achievement Award for First Authored Publication for his publication, Gao Y, Wen H, Wang C, Li Q. SMAD7 antagonizes key TGFβ superfamily signaling in mouse granulosa cells in vitro. Reproduction. 2013 Jun 14;146(1):1-11.

*** Xiaoqiu Churchill Wang** was selected to participate in the Frontiers in Reproduction (FIR) course at Woods Hole, MA. The 6 week-long laboratory and lecture course (May 4-June 15, 2014) is designed for scientists-in-training who are interested in improving basic conceptual knowledge and methodological skills to pursue a research career in the reproductive sciences. The course is in its 7th year of operation with over 288 alumni worldwide. (Continued on page 10)

IFRB Seminar Series, Spring 2014

The IFRB Seminar Series, Reproductive Biology Forum, has been held weekly during the Fall and Spring Semesters since 1990. The 2014 IFRB Seminar Series, coordinated by **Dr. Qinglei Li**, continues to provide an excellent combination of seminars from internationally recognized reproductive biologists from outside and inside the university along with advanced IFRB trainees. Seminars are immediately followed by a luncheon involving graduate student and postdoctoral trainee discussions with the seminar speaker.

January 31, Dr. Marcel Amstalden, Chair IFRB, IFRB General Business Meeting

February 7, Dr. Jason W Ross , Department of Animal Science, Iowa State University "Small RNA expression during oocyte maturation and early events in pig reproduction." Hosted by **Dr. Fuller Bazer**

February 14, Dr. Cynthia J. Meininger, Department of Medical Physiology, Texas A&M Health Science Center, Temple, "Fighting vascular complications of diabetes by modulating tetrahydrobiopterin levels in endothelial cells." Hosted by **Dr. Guoyao Wu.**

February 21, **Dr. Lori Raetzman,** School of Molecular and Cellular Biology, University of Illinois-Urbana Champaign, "Neuroendocrine development: Kickin' it up a Notch." Hosted by **Dr. Marcel Amstalden**

February 28, Dr. Laura Schultz, University of Missouri, "Leptin in pregnancy: Lifelong consequences for offspring health." Hosted by **Dr. Kathrin Dunlap**

March 7, Dr. Amutha Selvamani, Texas A&M Health Science Center, "MicroRNAs as therapeutics following ischemic stroke in a rat model." Hosted by **Dr. Qinglei Li.**

March 14, Spring break – No Forum

March 21, Michelle Bedenbaugh, M.S. Candidate, Physiology of Reproduction, Texas A&M University, "Regulation of ESR1 in kisspeptin neurons during reproductive maturation in ewe lambs." Hosted by **Dr. Marcel Amstalden.**

Jean (Jing) Xu, Ph.D. Candidate, Physiology of Reproduction, Texas A&M University, "The autocrine effects of IFNT on ovine trophectoderm cells." Hosted by **Dr. Fuller W. Bazer**

March 28, Dr. T. Rajendra Kumar, Department of Molecular & Integrative Physiology, University of Kansas Medical Center, "Gonadotropin re-routing & ovarian function." Hosted by **Dr. Qinglei Li.**

April 5, Xiaoqiu (Churchill) Wang, Ph.D. Candidate, Physiology of Reproduction, Texas A&M University, "Arginine decarboxylase and agmatinase: an alternative pathway for de novo Biosynthesis of Polyamines for Development of Mammalian Conceptuses." Hosted by **Dr. Fuller W. Bazer.**

Yang Gao, Ph.D. Candidate, Biomedical Sciences, Texas A&M University. "TGFβ signaling regulates uterine epithelial cell function." Hosted by **Dr. Qinglei Li.**

April 11, Dr. Carey Satterfield, Department of Animal Science, Texas A&M University, "Adaptive mechanisms of placental nutrient transport." Hosted by **Dr. Qinglei Li.**

April 18, Texas Forum for Reproductive Sciences, 20th Annual Meeting, an Antonio, TX

April 25, Chelsie Burroughs Steinhauser (Ph.D. Candidate), Texas A&M University, "Nutrient and ion transport at the maternal/fetal interface in pigs." Hosted by **Dr. Gregory Johnson**

Eddie Ying (Ph.D. Candidate), Texas A&M University, "Uteroferrin enhances fetal erythropoiesis at terminal stages." Hosted by **Dr. Fuller Bazer.**

International Scholars

*** Dr. Heloisa de Siqueira Canesin** is a visiting scientist from Brazil, working with **Dr. Katrin Hinrichs** in the Equine Embryo Laboratory. Her research interests are on equine oocyte vitrification. Heloisa started as a Research Assistant at Texas TAMU in February, 2014. She studied at Sao Paulo State University (UNESP Botucatu), Brazil, where she completed her M.S. in Animal Reproduction in 2013, focusing on uterine hemodynamics in mares.

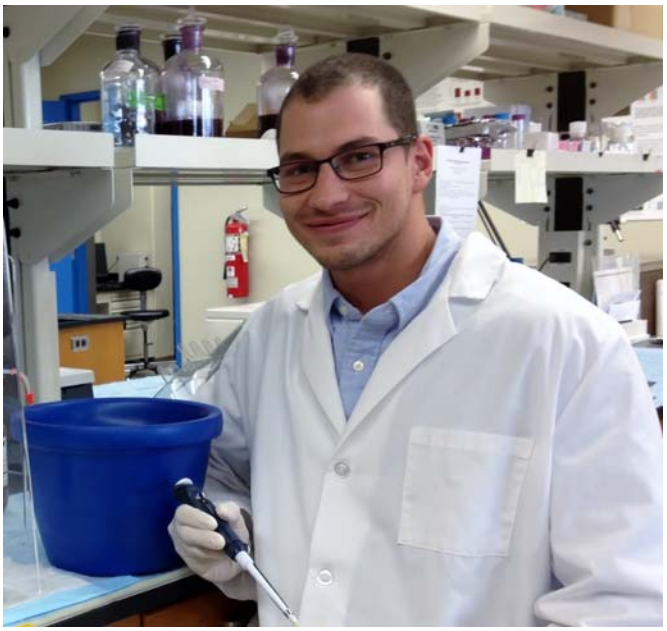
She graduated with a veterinarian degree from Federal University of Lavras, Brazil, in 2010, where she developed research projects with animal reproduction and worked during two years in extension projects with equine reproductive assistance in small farms.

*** Dr. Mehmet Can Gündüz** is visiting **Dr. Hinrich's** laboratory from Turkey to learn about equine oocyte recovery by transvaginal ultrasound-guided follicle aspiration and intracytoplasmic sperm injection. He received his DVM from Istanbul University in 2000. He has worked as a Research Assistant in Obstetrics and Gyneacology Department, Istanbul University and trained at the Human IVF Lab, Istanbul University for six months. He visited the IVF Lab at the School of Veterinary Medicine, Ludwig Maximilian University, Germany in 2002, and received his PhD from Istanbul University in 2005. He has spoken at international meetings in equine reproduction and has numerous publications in international journals.

*** Dr. Joao Gatto Brom de Luna**, is a veterinarian from Brazil, visiting **Dr. Hinrich's** laboratory for a year, working on isolation of somatic cells from frozen equine semen. He graduated in 2014 from Northern Rio de Janeiro State University (UENF) and subsequently worked at Sao Paulo State University (UNESP – Botucatu and Jaboticabal) as a student intern with large animal clinics and equine reproduction.

Trainee Spotlight

The new Gordon Conference on Mammalian Reproduction: Translating Basic Science into Clinical Applications will be held August 10-15, 2014 Colby -Sawyer College, New London, NH.
The program of invited talks is complete and can be viewed at http://www.grc.org/programs.aspx?year=2014&program=mammrepro
An application to attend the conference can be accessed and submitted online at http://www.grc.org/application.aspx?id=16761

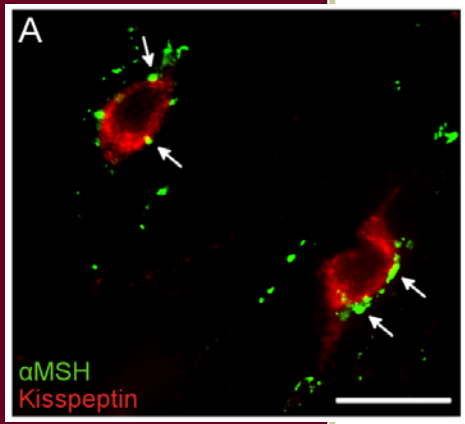


Rodolfo Cardoso, DVM, is a doctoral candidate in Physiology of Reproduction under the mentorship of **Drs. Gary Williams and Marcel Amstalden.** He received a Veterinary degree and a M.S. degree in Animal Reproduction from Sao Paulo State University (Botucatu, Brazil) before joining Texas A&M University as a graduate student. Rodolfo successfully defended his dissertation focused on the postnatal nutritional programming of puberty in heifers on May 19, 2014. The manipulation of nutrition during juvenile development creates valuable opportunities for exploring the structural and functional changes in the neuronal pathways that regulate sexual maturation in mammals. It can also result in the development of managerial strategies that optimize the timing of puberty, a major goal of the livestock industry. In beef heifers, the establishment of regular estrous cycles well in advance of the initial breeding season is critical for early conception and pregnancy, resulting in increased lifetime productivity. However, *Bos indicus*-influenced heifers (prevalent in Texas) are later-maturing animals and frequently attain a skeletal size required to support a healthy and safe pregnancy well before pubertal onset.

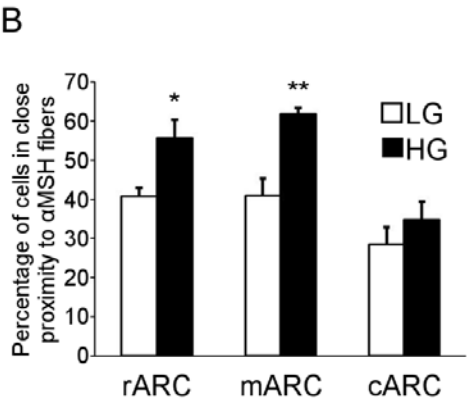
Studies conducted by Rodolfo and colleagues have demonstrated that the interval between 4 and 7 months of age (juvenile period) is a critical window of opportunity for nutritionally programming the neuroendocrine axis for early puberty in bovine females. His findings have revealed that age at onset of puberty can be optimally timed by exposing heifers to a compensatory gain (Stair-step) nutritional regimen during early calfhood. This managerial approach, while resulting in reproductive maturation consistently at around 12 months of age, also avoids a high incidence of precocious puberty (before 10 months of age) and can potentially result in significant improvements in growth and life-long lactation performance.

In addition, through the use of surgical, immunohistochemical, and molecular biology techniques, Rodolfo's research has characterized important functional modifications in metabolic-sensing pathways in the hypothalamus that control reproductive functions. His findings suggest that hypothalamic release of neuropeptide Y (NPY), a neuropeptide that inhibits GnRH release, is decreased in prepubertal heifers that gain body weight at accelerated rates during juvenile development. Moreover, proopiomelanocortin (POMC) neurons located in the arcuate nucleus may also be an important mechanism involved in the nutritionally-programmed acceleration of puberty. Heifers that gained body weight at accelerated rates during calfhood exhibited increased arcuate POMC expression and an increased number of neurons immunoreactive for alpha melanocyte-stimulating hormone (α-MSH), a product of the POMC gene. The work also demonstrated that kisspeptin neurons in the arcuate nucleus may be an important conduit for melanocortin stimulatory effects on GnRH neurons, because numerous α-MSH projections innervate kisspeptin neurons in a nutritionally-dependent fashion.

During his tenure at Texas A&M, Rodolfo has presented the results of his studies at several national and international scientific meetings, including the 2012 annual meeting of the Society for the Study of Reproduction (SSR), where he received an USDA–Ag Research Merit Award. He has co-authored 5 peer-reviewed articles and has 3 first-author manuscripts currently in review for publication or in preparation for submission. Rodolfo has served as the IFRB graduate student representative from 2012-13 and is currently a Tom Slick Senior Graduate Fellow, with anticipated graduation in the summer. Rodolfo will be joining the laboratory of Dr. Vasantha Padmanabhan at the University of Michigan Department of Pediatrics as a post-doctoral trainee investigating fetal origins of pubertal and adult reproductive disorders..



Panel A
Kisspeptin-immunoreactive neurons (red) in close apposition (arrows) with αMSH-containing fibers (green) in the arcuate nucleus. Scale bar: 50 μm



Panel B
The percent of kisspeptin neurons in close proximity to αMSH fibers in the rostral and medial aspects of the arcuate nucleus is greater in heifers fed to gain body weight at high rates (HG) during the juvenile period compared to heifers gaining body weight a low rates (LG). *P < 0.05; **P < 0.01.

A Snapshot of IFRB Research

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 the 4 month period January 1 through May, 2014:

Assaad H, Yao K, Tekwe CD, Feng S, Bazer FW, Zhou L, Carroll RJ, Meininger CJ, Wu G. Analysis of energy expenditure in diet-induced obese rats. Frontiers Biosci 2014; (in press)

Bae SM, Lim W, Jeong W, Lee JY, Kim J, Han JY, Bazer FW, Song G. Hormonal regulation of beta-catenin during development of the avian oviduct and its expression in epithelial cell-derived ovarian carcinogenesis. Mol Cell Endocrinol 2014; 382:46-54.

Bae H, Lim W, Bae SM, Bazer FW, Choi Y, Song G. Avian prostatic acid phosphatase: estrogen regulation in the oviduct and epithelial cell-derived ovarian carcinomas. Biol Reprod. 2014 May 14. pii: biolreprod.114.118893. [Epub ahead of print]

Bai Y, Lee PF, Gibbs HC, Bayless KJ, Yeh AT. Dynamic multicomponent engineered tissue reorganization and matrix deposition measured with an integrated nonlinear optical microscopy -optical coherence microscopy system. J Biomed Opt. 2014 Mar;19(3):36014.

Bake S, Selvamani A, Cherry J, Sohrabji F. stroke for middle-aged female rats. PLoS One. 2014 Mar 11;9(3):e91427.

Balaraman S, Lunde ER, Sawant O, Cudd TA, Washburn SE, Miranda RC. Maternal and neonatal plasma microRNA biomarkers for fetal alcohol exposure in an ovine model. Alcohol Clin Exp Res. 2014 May;38(5):1390-400.

Banu SK. 2014. Heavy Metals and the Ovary, In: Ovarian Toxicology, Editor: Patricia B. Hoyer. CRC Press, Taylor & Francis group.

Barhoumi R, Mouneimne Y, Chapkin RS, Burghardt RC. Effects of fatty acids on benzo[a] pyrene uptake and metabolism in human lung adenocarcinoma A549 cells. PLoS One. 2014 Mar 20;9(3):e90908.

Bazer FW Johnson GA. Pig blastocyst-uterine interactions. Differentiation 2014 87(1-2):52-65

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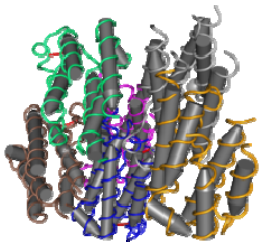
One Health: Interferon Tau (cont'd from page 1)



Unlike other interferons, they were not virally inducible and produced only by mononuclear cells of the conceptus trophectoderm, a precursor to the placenta. Having discovered the new interferon tau (IFNT) protein, Bazer proceeded to learn about the properties of interferons. "For example, interferon alpha was being used to treat people with diseases such as hepatitis, but those people suffered many undesirable side effects," Bazer explained. "That was due to the cytoxicity of that interferon. Being treated with interferon alpha daily is like having the flu every day for many months; first you get fever, loss of appetite and GI problems which can ultimately lead to anorexia, dementia and so forth." "I knew from our experiments that the sheep conceptus (embryos and their membranes) produce very high amounts of IFNT and that it was not having cytoxic effects on the cells in the uterus. It wasn't making the sheep sick, which was highly significant," he continued. Cytoxicity is due to inflammatory effects and since the uterus did not show evidence for inflammation, I reasoned that IFNT must either not affect inflammation or even be anti-inflammatory."

An interdisciplinary team organized at Texas A&M began testing his hypothesis. "We checked cytoxicity in the blood cells of cats infected with feline immunodeficiency virus and confirmed that IFNT was significantly less cytotoxic than interferon alpha," Bazer continued. "Then we tested it further by treating animal models for diseases caused by an inflammatory state. We were able to confirm that IFNT, administered orally, actually slowed the progression of those diseases."

How IFNT reduced inflammation and halted the adverse effects of these diseases remains unknown. Recently a multi-disciplinary team including Drs. Bazer, Guoyao Wu, Beiyan Zhou, Carmen Tekwe, Cynthia Meininger, Raymond Carroll, and a number of trainees from Colleges of Agriculture & Life Sciences, Medicine, Veterinary Medicine and Science combined their expertise in biology, nutrition, epidemiology, physiology and pharmacology and statistics to focus on the link between inflammation, obesity and the anti-inflammatory properties of IFNT and apply them to the challenge of reducing obesity and the risk for obesity-induced inflammation and metabolic syndrome. Their rationale for this research was that obesity is a worldwide epidemic resulting from a chronic imbalance between food energy intake and whole-body energy expenditure, as well as inflammation and oxidative stress.

Obesity contributes to adverse health outcomes known collectively as metabolic syndrome that includes insulin resistance, type 2 diabetes mellitus, obstructive sleep apnea, osteoarthritis, stroke, hypertension, cardiovascular disease, atherosclerosis, and certain types of cancer, such as colon and breast cancers.

In a paper that appeared late last year they reported results of a study using the Zucker Diabetic Fatty (ZDF) rat to determine effects of IFNT on obesity and time of onset of type 2 diabetes. These rats are bred to get fat and develop type 2 diabetes and they wanted to know if IFNT could reduce the amount of white (bad) fat and increase the amount of brown (good) fat in the ZDF rats. The results were exciting; the IFNT-treated ZDF rats exhibited a 40% decrease in white fat and a 46% increase in beneficial brown fat, which corresponded to an increase in whole-body energy expenditure, improved metabolic status and reduced oxidative stress. In other words, the IFNT corrected the imbalance that causes obesity and obesity-related diseases. Similar positive results occurred when the team used non-obese diabetic mice. Orally ingested IFNT was found to delay the onset of diabetes, and prolong sensitivity to insulin in the mice models of diabetes.

In a separate series of interdisciplinary studies involving Drs. Beiyan Zhou, Robert Chapkin, Stephen Safe, Chaodong Wu and Bazer, IFNT has been shown to be a potent regulator of inflammatory responses, by specifically guiding adipose tissue macrophages into an anti-inflammatory phenotype that reduces adipose tissue inflammation that contributes to the pathogenesis of obesity-associated diseases and cardiovascular disease.

The One Health impacts of IFNT continue to be translated for the benefit of animal and human health. Because IFNT displays high species cross-reactivity, despite its absence in humans, it has shown efficacy in reducing replication of human immunodeficiency virus, feline immunodeficiency virus, and human papillomavirus. While IFNT shares similar antiviral activity to IFN-alpha, it is the current interferon of choice for treatment of viral infections because it lacks the associated toxicity. There have been numerous patent applications and clinical trials initiated for use of IFNT for such applications as autoimmune disease including multiple sclerosis, psoriasis, rheumatoid arthritis, hepatitis, and cell proliferative disorders.

Trainee News (cont'd from page 7)

*** Sarah E. Schmidt** was awarded the M.S. degree in Physiology of Reproduction in May 2014 under the direction of Drs. Tom Welsh and Ron Randel. Her thesis title was: "Effects of Prenatal Stress on Insulin Sensitivity, Physiological Stress Responses, Growth, and Temperament of Brahman Calves." She will enroll in a doctoral program at the Department of Animal and Dairy Sciences, Michigan State University.

*** Victoria Smith** completed her MS degree in Biology under the direction of **Dr. Duncan S. MacKenzie** this semester. Her thesis was titled "Mechanisms of individual variation in reproductive behavior in female swordtails, Xiphophorus birchmanni."

***Patali Shikhi Cheruku,** a senior undegraduate student in **Dr. Beiyan Zhou's** lab for the past three years received her notification of her acceptance into the NIH Post-Bacc Program beginning immediately after her May, 2014 graduation. The NIH Post-Bac program accepts a small group students for a one or two year period involving research training within a NIH qualified laboratory. Shikhi has been working on a leukemia project in Dr. Zhou's lab and will present her first-author poster in the American Society of Hematology conference in December. She will join a well-established laboratory in the same field at the NHLBI.

IFRB Faculty Spotlight

The Texas Forum for Reproductive Sciences was organized by Drs. Dan Carson, Barbara Sanborn, Stan Glasser and Fuller Bazer. The first meeting was held at the Institute for Biosciences and Technology in Houston.

At the 20th Annual Texas Forum for Reproductive Sciences, which was held in honor of Dr. Fuller W. Bazer, the meeting opened with recognition of Dr. Bazer's contributions to the field of reproductive biology. Following are some of the comments offered by Dr. Robert Burghardt who was invited to present Dr. Bazer with a plaque and summarize some of his accomplishments.

We acknowledge Dr. Fuller Bazer, Distinguished Professor and O.D. Butler Chair in Animal Science as one of the organizers of the Texas Forum for Reproductive Sciences. He, along with Drs. Dan Carson, Barbara Sanborn and Stan Glasser, developed the idea of a regional meeting initially focused on female reproduction from 1995 to 2005 before expanding to encompass all reproductive sciences.

Dr. Bazer is internationally recognized for his scientific leadership in reproductive biology among scientists spanning the fields of animal agriculture, biology, and veterinary and human medicine. The most outstanding and significant achievements of Dr. Bazer's research at the University of Florida and Texas A&M University has, and continues to be, in defining interactions between the maternal uterine environment and developing conceptuses in livestock species based on the integration of scholarship in animal sciences, physiology, biochemistry and molecular biology to define expression, endocrine control, and function of molecules secreted into the uterus during pregnancy and required for conceptus development. Scientific achievements include the discovery of uteroferrin, a purple acid phosphatase produced by uterine glands under the control of progesterone, which was shown to supply maternal iron to the developing conceptus and to stimulate hematopoiesis. He discovered that estradiol is the pregnancy recognition signal from swine conceptuses and interferon tau as the pregnancy recognition signal from ruminant conceptuses, as well as their mechanisms of action for ensuring maintenance of functional ovarian corpora lutea for production of progesterone. He identified roles of interferon tau to effect changes in expression of genes in uterine epithelia that are critical to conceptus development including genes for transporters of nutrients such as glucose, fructose and arginine that stimulate proliferation, migration and adhesion of trophectoderm cells via the mTOR cell signaling pathway. He showed that interferon tau is less cytotoxic to human cells than other Type I interferons and is consequently being studied as a novel potential therapeutic agent for treatment of viral diseases, and autoimmune diseases including obesity and diabetes. He is also unraveling the roles of fructose in development of ungulate conceptuses that are mediated via products of the hexosamine pathway. He discovered and identified functions for many proteins secreted by uteri of sheep, pig, horse and cow that act as enzymes, nutrient transporters, growth factors, cytokines, chemokines, extracellular matrix proteins and adhesion factors essential for conceptus development.

Those major discoveries led to changes in the way that animals are managed to increase conceptus survival and pregnancy success. Current research strives to understand mechanisms whereby interferon tau and uteroferrin mitigate adverse outcomes from inflammatory diseases such as obesity and diabetes, as well as prove efficacious in treatment of viral diseases and hematopoeitic disorders in animals and humans. With over 530 papers, an h-index of 55 and more than 10,000 citations, he continues to publish at a remarkable rate.

His accomplishments have been recognized by numerous awards from a spectrum of societies and organizations such as the American Society of Animal Science's Physiology and Endocrinology Award and the L.E. Casida Award for Graduate Education, all of the major awards from the Society for the Study of Reproduction including the Research, Distinguished Service, Trainee Mentoring, and the highest award, the Carl G. Hartman Award and the Alexander von Humboldt Research Award in Agriculture and the Wolf Prize in Agriculture to name a few.

He was a Director (1984-1987) and President (1996-1997) of the Society for the Study of Reproduction and Editor-in-Chief of Biology of Reproduction and has served on Editorial Boards of the Journal of Animal Science, Domestic Animal Endocrinology and Theriogenology and is now Associate Editor for Molecular Human Reproduction and the Journal of Animal Science and Biotechnology. He has a long list of service on review panels and study sections and advisory committees. He has served in key administrative positions at Texas A&M University and the Texas A&M Health Sciences Center such as Director, Center for Animal Biotechology and Genomics, Director, Institute of Biosciences and Technology, Texas Medical Center, Houston, Vice President for Research and Interim Dean of the Graduate School of Biomedical Sciences, Texas A&M Health Sciences, Associate Vice Chancellor and Associate Director, Texas Agricultural Experiment Station, and Executive Associate Dean of the College of Agriculture and Life Sciences, and Associate Vice President for Research, Texas A&M University. Dr. Bazer also served as World Class University Professor, Biomodulation Major, Seoul National University, Republic of Korea.

Dr. Bazer's modesty belies his essential role as the visionary and intellectual leader and mentor of interdisciplinary collaborators. At both the University of Florida and Texas A&M, he successfully merged the talents of researchers in multiple colleges and departments. At A&M he has been a major force in organizing and providing leadership for the vitality of our IFRB, our weekly seminar series, the Reproductive Biology Forum, the annual Dr. Raymond O. Berry memorial lectureship in reproductive immunology and the organization of the Texas Forum for Reproductive Sciences.

20th Annual Texas Forum for Reproductive Sciences

Held in Honor of Dr. Fuller W. Bazer

The 20th Annual Texas Forum for Reproductive Sciences (TFRS) was held on April 17-18, 2014 at the University of Texas at San Antonio (UTSA) Downtown Campus. This year, the meeting was held in honor of Dr. Fuller W. Bazer, one of the founding members of the TFRS annual meeting.

About 100 participants from all major Texas universities registered for the meeting. The meeting opened with the recognition of Dr. Bazer and his contributions to the field of reproductive biology, spanning the fields of animal agriculture, biology, and veterinary and human medicine. He was also acknowledged for his leadership in organizing the annual meeting with Drs. Barbara Sanborn (then at the UT Health Science Center Houston, now at Colorado State University), Dan Carson (then at M.D. Anderson Cancer Center, now at Rice University), and Stan Glasser (then at Baylor College of Medicine, now Professor Emeritus).

Keynote lectures were presented by **Dr. Gregory Johnson** from Texas A&M University – Osteopontin and Integrins Physically and Functionally Modify the Uterus and Placenta" and Drs. Brian Hermann from UTSA – "Translating Spermatogonial Stem Cell Transplantation to the Clinic."

The annual meeting serves as a venue for the exchange of research ideas and discoveries in the spectrum of reproductive sciences. Platform and poster sessions focus almost exclusively on trainee presentations.

Texas A&M University was well represented at the meeting. Three trainees were selected for presentation of platform session talks: **Xiaoling Zhu**, "Interferon gamma (IFNG) and interferon delta (IFND) support pre-implantation conceptus elongation and survival in pigs." **Jing Xu,** "Autocrine effects of IFNT on ovine trophectoderm cells." **Yang Gao,** "The role of transforming growth factor β signaling in myometrial development."

Trainees selected for poster presentations included, **Xi Ma**, "Effects of magnesium on the performance of sows and their piglets." **Shengdi Hu**, "The beneficial effects of arginine on reducing white adipose tissue in obese db/db mice." **Yongfeng Sun**.,"Arginine decarboxylase (ADC) and agmatinase (AGMAT): an alternative pathway for synthesis of polyamines in pig conceptuses and uteri." **Matthew Snyder**, "Suppression of epigenetic modifiers alters the bovine embryonic developmental program during in vitro culture." **Xiaoqiu Wang**, "Arginine decarboxylase and agmatinase: an alternative pathway for de novo biosynthesis of polyamines for development of mammalian conceptuses."

Chelsie Burroughs Steinhauser, "Cell localization of SLC2 glucose transporter family member mRNA on endometria and placentae from pregnant pigs." **Heewon Seo**, "Supplementation of pigs with arginine increases folding at the uterine-placental interface: a mechanism to increase nutrient transport from mother to fetus to improve fetal development and survival."

Several current and former trainees currently in Research Scientist or Postdoctoral positions also presented their work at the meeting including Drs. Xilong Li, and Haijun Gao.

Save the date for the 21th Annual Texas Forum for Reproductive Sciences, April 10-11, 2015.

Trainee News (cont'd from page 9)

*** Chelsie Burroughs Steinhauser** received a 2014, College of Veterinary Medicine & Biomedical Sciences Graduate Student Research Trainee Grant. The long term research goal is to establish the roles of glucose and fructose in fetal and placental development in pigs, and to determine how they relate to birth weight and fetal survivability. The short term research goals are to: 1) localize hexose sugar transporters to cells in endometria and placentae; 2) determine which cells synthesize fructose from glucose within endometria and placentae; and 3) determine which endometrial and placental cells utilize fructose

*** Grace Chang** recently completed her M.S. degree in Biomedical Sciences working in the laboratory of Dr. Greg Johnson. During her training program she investigated the temporal and spatial distribution of several mRNAs and corresponding proteins involved in paracellular permeability and glucose transport in pig placentae.

Faculty Awards, etc. (cont'd from page 4)

At the same meeting of the Society of Reproductive Biology and Comparative Endocrinology (SRBCE), 32nd Annual Meeting, Jan. 7-9, Holy Cross College, Bharathidasan University, Tamil Nadu, India, **Joe Arosh** was invited to present a lecture entitled "Endometriosis and infertility in women."

* **Fuller W. Bazer,** was invited to present a lecture at the College of Medicine, Texas Tech University Health Science Center, Lubbock, TX, on Feb. 5-6, entitled "The Many Faces of Interferon Tau."

Dr. Bazer has also been invited to speak at the Gordon Research Conference on Mammalian Reproduction, August 10-15, 2014, New London, NH. The title of his talk is "Conceptus Uterine Cross-Talk: Mechanisms for Pregnancy Recognition Signaling and Conceptus Development."

* **Dr. Greg Johnson** was invited again to serve as a faculty member in the 2014, Frontiers in Reproduction course at the Marine Biological Laboratories, Woods Hole, MA, May 4 - June 15, 2014. He and Dr. Tom Spencer will presented sections on Implantation, Development of Reproductive Tract and Transgenesis, and Placental Structure.

* **Qinglei Li,** was invited to present a lecture in the Interdisciplinary Faculty of Toxicology Seminar Series in April. The title of his seminar was "TGFβ Signaling, Female Reproduction and Cancer. "

Dr. Li has also been invited to attend and present a lecture at the 3rd SKLRB Symposia on Frontiers in Reproductive Biology, Chinese Academy of Sciences, Beijing, China in October. The title of his presentation is "TGF-beta Signaling in Female Reproductive Tract Development, Function, and Disease."

* **Brandie Taylor** was invited to present a talk at the Society for Pediatric & Perinatal Epidemiologic Research Meeting, Seattle, WA, June 2014. The title of her presentation is "Serum leptin measured in early pregnancy is higher in women with preeclampsia compared to normotensive pregnant controls." Co-authors are Ness RB, Olsen J, Hougaard DM, Skogstrand K, Roberts JM, Haggerty CL.

* **Duncan MacKenzie** was invited to present an invited plenary lecture entitled "Getting Past N=1. Changing Cultures of Sea Turtle Science Make an Unlikely Candidate a Model Species for Comparative Endocrinology" at the 34th Annual Symposium on Sea Turtle Biology and Conservation in New Orleans on April 14.

47th SSR Annual Meeting Grand Rapids, MI

SSR

Society for the Study of Reproduction

The 47th Annual Meeting of the Society for the Study of Reproduction will be held in Grand Rapids, Michigan, July 19-23, 2014. The theme of the Meeting is "Fertility: A Global Challenge."

Speakers include Anna Glasier, M.D., University of Edinburgh delivering the Keynote Address; Jeffrey T. Jensen, M.D. and Christina C. Wang in the President's Symposium; Milo C. Wiltbank, Ph.D., in a special AgResearch Plenary Lecture; Sir Ian Wilmut, FRS, Ph.D. will present the Historical Perspectives Lecture and Richard E. Green will deliver the State-of-the-Art Lecture; Robert J. Norman, AO, M.D. will present the ASRM Exchange Lecture. Dr. Kanako Hayashi, Former IFRB postdoctoral trainee, now Assistant Professor at Southern Illinois University, is the recipient of the 2014 Society for the Study of Reproduction New Investigator Award. She will present the New Investigator Lecture, "The Impact of Epithelial Genes in Endometrial and Ovarian Cancer."

This year 5 trainees who have submitted first authored abstracts accepted for presentation at the Annual SSR meeting will receive travel funds to attend the SSR meeting. Trainees include **Chelsie Burroughs Steinhauser, Rodolfo Cardoso, Yang Gao, Xiaoqiu (Churchill) Wang, Jing (jean) Xu and Wei (Eddie) Ying. Two trainees, Brittni Littlejohn and Meghan Roberts will present their work at the Joint Meeting of the American Dairy Science Association/American Society of Animal Science**

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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, reproductive toxicology, and uterine biology. The outcomes of this research are impacting Texas, our nation and the world.