SAES-422 Multistate Research Activity Accomplishments Report

Sections

Status: Approved

Basic Information

- **Project No. and Title:** NE1727 : Influence of ovary, uterus, and embryo on pregnancy success in ruminants (/projects/18329)
- **Period Covered:** 10/01/2017 to 09/30/2018
- **Date of Report:** 07/16/2018
- **Annual Meeting Dates:** 05/13/2018 to 05/15/2018

Participants

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Brief Summary of Minutes of Annual Meeting

Attached file: NE1727 Minutes 2018.pdf (/system/Sea/minutes_attachments/000/051/298/original/NE1727 Minutes 2018.pdf)

Accomplishments

Identification of the impact that thermal stress has on ovarian signaling is resulting in a mechanistic map being developed, upon which strategies to ameliorate seasonal infertility can be based.

We have identified that dairy cows have an amazing capacity to develop tolerance to chronic lipopolysaccharide exposure and that no effect of this exposure on the growing dominant follicle is observed.

Molecular signaling protein alterations during the follicular and/or luteal phase from lipopolysaccharide or thermal stress treated gilts have been identified.

Determined influence of a physiological stressor, obesity, on the ovarian capacity to respond to a toxic environmental stress.

Identified molecular proteins within the oocyte that contribute to viability of the oocyte.

We have cultured ovarian oocytes to investigate intra-oocyte mechanisms of heat stress induced infertility.

Zinc depletion during preantral development impairs oocyte-somatic cell communication and oocyte growth and competence to complete meiosis.

NR5A2 is a regulator of luteal progesterone production and may be translationally regulated by miRNA.

Changes in the profile of lipids within the CL indicate potential roles for these small molecules as regulators of immune cells, components of intercellular signaling pathways and cell death.

We have shown that bovine granulosa and theca express CCN1, along with αV, αIIb, α6, β1, β3 and β5 integrin subunits. The suppressive effect of PSI on CCN1 expression in KGN cells was accompanied by a decrease in phosphorylated NF-κB activity, while the suppressive effect of Calphostin C and PSI on CCN1 expression in HGrC1 cells probably did not involve NF-κB.

We have determined the effects of Ovsynch manipulation on intraovarian events and pregnancy in multiparous dairy cows.

We have manipulated ERK signaling (via growth factors) in bovine granulosa cells (GCs) to gain insight about its role in immune-mediated apoptosis of GCs and selection of bovine follicles.

Our results provide new information on the property of ZNFO, which will help further elucidation of the molecular mechanisms involved in ZNFO-dependent transcriptional regulation during maternal- embryonic transition.

We determined that feeding rumen-protected methionine to high-producing, multiparous dairy cattle reduced pregnancy loss in multiparous dairy cows.

We determined that high energy diets could reduce oocyte quality, leading to lack of fertilization.

We have defined two other mechanisms that underlie reduced fertility in animals fed high energy diets, namely high progesterone catabolism and reduced embryo quality.

An important practical finding was that loss of body condition score from 21 days before calving until 21 days after calving led to reduced fertility in lactating dairy cows.

We have determined that early plane of nutrition impacts the progression of uterine gland development in heifers, and that this outcome may be mediated by changes in the expression of several local controllers of gland development.

Our recent findings support the contention that maternal obesity modifies a subset of important mediators of embryonic and extraembryonic development in ovine and porcine conceptuses.

We determined that maternal obesity also modifies uterine gene expression during early pregnancy in sheep.

We determined that Bos indicus and Bos taurus cattle differ in their ability to produce viable offspring following nutrient restriction during early pregnancy.

We have discovered that the cytokine, interleukin-6, improves development of the inner cell mass (ICM) in bovine embryos.

We determined that early weaning of beef heifers can have long-term effects on physiology. Some of these changes have implications for lifetime productivity and may be beneficial in some production systems.

We investigated the effects of steroid content of follicle fluid on the cumulus-oocyte complex. Cumulus cell expansion and gene expression differed with estradiol and progesterone concentrations, but in vitro embryo development to the blastocyst stage did not.

We determined that a lack of Ca2+ oscillations is not the main reason of the poor success of ICSI in the bovine. This was demonstrated using both in in vitro matured mouse and bovine oocytes injected with bovine sperm.

We found that bovine sperm heads are highly resistant to sperm head decondensation, which compromises the ability of in vitro maturated oocytes to reprogram the sperm nucleus.

We identified treatments that abruptly change the metabolic status of bull sperm, enhancing the ability of those sperm upon ICSI to initiate Ca2+ oscillations. This also improved the ability of these sperm to undergo decondensation and support pre-implantation embryo development.

We have developed the Short-Resynch protocol. This new reproductive management strategy for re-insemination of lactating dairy cows improves reproductive performance and has other benefits for dairy herd management. Compared to traditional resynchronization strategies widely used on dairy farms, Short-Resynch increased pregnancy rates, increased the fertility of subgroups of sub-fertile cows, while taking advantage of inseminations at detected estrus after a previous insemination.

We demonstrated that the Short-Resynch program resulted in similar pregnancy rate than one of the most effective resynchronization of ovulation programs available for dairy farms (i.e., Resynch-25) thorough more inseminations at detected estrus, a short interval between inseminations, and increased P/AI for sub-fertile cows.

We found that it is possible to collect up to five CL biopsies 48 h apart on the same CL of lactating dairy cows. Five serial CL biopsies from the same CL in lactating dairy cows did not reduce circulating concentrations of P4, CL size, or affect blood flow. Serial CL biopsies did not cause CL regression during the period of biopsy collection.

We determined that a reproductive management strategy designed to increase insemination of cows in estrus after NPD resulted in similar reproductive performance (time to pregnancy) than a typical resynchronization of ovulation protocol used in dairy farms.

Proof of concept studies were performed using in vitro mouse follicles and COCs to understand how TNF and H_2O_2 signaling impact transcriptional and post-transcriptional mRNA synthesis and stability, respectively. We have demonstrated that obesity induces ovarian inflammation which in turn increases the abundance of oocyte-specific transcription factors, oocyte-specific growth factors, and maternal effect genes. Current studies are discriminating between transcriptional and post-transcriptional regulation of these candidate mRNAs in primary follicles, secondary follicles, and cumulus-oocyte complexes by acute treatments with TNF and H_2O_2. Pathway activation by TNF and H_2O_2 in follicles and COCs are also being elucidated.

We determined that increased abundance of specific polymorphic alleles in the IGF-I and TNFα genes in Holstein cows are favorably associated with increased conception rate to 1st AI and a shorter calving to conception interval during lactation ie. higher fertility.

We found that sperm epigenome (chromatin dynamics) as well as functional genome (macromolecules) are associated with bull fertility, and identified key sperm and seminal plasma metabolites that are associated with bull fertility.

Impacts

1. Low pregnancy rates in beef and dairy cows result in increased costs to producers associated with rebreeding or culling animals, and recouping heifer development costs. Reduced fertility is also a major cause of reduced milk (dairy) and meat (beef) production which impacts the food supply. The focus of the NE1727 multistate project “Influence of ovary, uterus, and embryo on pregnancy success in ruminants”, is to understand how altered ovarian function, impaired oocyte quality, and disruptions of conceptus-uterine interactions contribute to infertility, and devise management strategies that will overcome these factors in order to optimize the chances that animals successfully achieve a pregnancy. To achieve this goal, the following three objectives will be performed: (1) Determine the impact of altered ovarian function on reproductive performance; (2) Identify alterations in embryo development and uterine and CL function associated with declining pregnancy establishment; and (3) Identify changes in genetics and reproductive management that lead to improved pregnancy rates. As investigators in NE1727, we will use our collective expertise to understand the mechanisms by which internal and external forces modify these important physiological processes and to use this information about core biological processes to rationally develop new and innovative tools to increase cyclicity and breeding efficiency, and reduce early embryonic failures, thereby improving reproductive efficiency of both dairy and beef cattle operations in the United States.

Publications

Peer-reviewed journal articles published in 2017 reporting research from this project

Hale, B.J., Hager, C.J., Siebert, J.T., Selsby, J.T., Baumgard, L.H., Keating, A.F., Ross, J.W. 2017. Heat stress induces autophagy in pig ovaries during follicular development. Biology of Reproduction. 97(3):426-437.

Kvidera, S.K., Horst, E.A., Sanz-Fernandez, M.V., Abuajamieh, M., Ganesan, S., Gorden, P.J., Green, H.B., Schoenberg, K.M., Trout, W.E., Keating, A.F., Baumgard, L.H. 2017. Characterizing effects of feed restriction and glucagon-like peptide 2 administration on biomarkers of inflammation and intestinal morphology. Journal of Dairy Science. 100(11):9402-9417.

Ganesan, S., Dickson, M.J., Keating, A.F. Pesticides. In: Encyclopedia of Reproduction. *In Press.*

Ross, J.W., Hale, B.J., Seibert, J.T., Romoser, M. R., Adur, M.K., Keating, A.F., Baumgard, L.H. 2017. Physiological mechanisms through which heat stress compromises reproduction in pigs. Molecular Reproduction and Development. 84(9): 934-945.

McNeel AK, Vallet JL, Snelling WM, Wright EC, Larimore EL, Amundson OL, Miles JR, Chase Jr CC, Lents CA, Sonstegard TE, Schroeder SG, Wood JR, Cupp AS, Perry GA, and Cushman RA (2017) Beef heifers with diminished numbers of antral follicles have decreased uterine protein concentrations, *Anim Reprod Sci* 179:1-9 PMID: 28215453

Romereim SM, Summers AF, Pohlmeier WE, Zhang P, Hou X, Talbott HA, Cushman RA, Wood JR, Davis JS, and Cupp AS (2017) Gene expression profiling of bovine ovarian follicular and luteal cells provides insight into cellular identities and functions, *Mol Cell Endocrinol* 439:379-394 PMID: 27693538

Romereim SM, Summers AF, Pohlmeier WE, Zhang P, Hou X, Talbott HA, Cushman RA, Wood JR, Davis JS, and Cupp AS (2017) Transcriptomes of bovine ovarian follicular and luteal cells, *Data in Brief* 10:335-339 PMID: 28004024

Talbott H, Hou X, Qiu F, Guda C, Yu F, Cushman RA, Wood JR, Wang C, Cupp AS, and Davis JS (2017) Early transcriptome responses of the bovine mid-cycle corpus luteum to prostaglandin F2 alpha includes cytokine signaling, *Mol Cell Endocrinology* 452: 93-109, PMID: 28549990

Talbott H, Hou X, Qiu F, Zhang P, Guda C, Yu F, Cushman RA, Wood JR, Wang C, Cupp AS, and Davis JS (2017) Transcriptomic and bioinformatics analysis of the early time-course of the response to prostaglandin F2 alpha in the bovine corpus luteum, Data in Brief 14:695-706, PMCID: PMC5596332

Wood JR and Cupp AS (2017) Female Endocrinology –Aromatization. *Encyclopedia of Reproduction, Second Edition* (accepted, in press)

Águila L, Felmer R, Arias ME, Navarrete F, Martin-Hidalgo D5, Lee HC, Visconti P, Fissore R. 2017. Defective sperm head decondensation undermines the success of ICSI in the bovine. Reproduction. 154:207-218.

Cerny, K.L., R.A.C. Ribeiro, Q. Li, J.C. Matthews and P.J. Bridges. 2017. Effect of lipopolysachharide (LPS) on the expression of inflammatory mRNAs and microRNAs in the mouse oviduct. Reproduction, Fertility and Development. doi: 10.1071/RD17241.

Li, Q., R. Hegge, P.J. Bridges and J. C. Matthews. 2017. Pituitary genomic expression profiles of steers are altered by grazing of high vs. low endophyte-infected tall fescue forages. PLoS One. 12(9): e0184612.

Willis, E.L., P.J. Bridges and J.E. Fortune. 2017. Progesterone receptor and prostaglandins mediate LH-induced changes in messenger RNAs for ADAMTS proteases in theca cells of bovine periovulatory follicles. Molecular Reproduction and Development. 84:55-66.

Miles, E.D., B.W. McBride, P.J. Bridges and J.C. Matthews. 2017. Effect of 17β-estradiol administration on hepatic expression of glutamine synthetase, β-catenin, and GPR30 in aged beef cows. Canadian Journal of Animal Science. 97:281-289.

Hester J, Hanna-Rose W and Diaz FJ. 2017. Zinc depletion reduces fertility and disrupts oocyte development in C. elegans. Comparative Biochemistry and Physiology 191, 203-209.

Tian X, Anthony K and Diaz FJ. 2017. Transition metal chelator induces progesterone production in mouse cumulus-oocyte complexes and corpora lutea. Biological Trace Mineral Research. doi:10.1007/s12011-016-0841-x.

Krumm, C. S., S. L. Giesy, L. S. Caixeta, W. R. Butler, H. Sauerwein, J. W. Kim, and Y. R. Boisclair. Effect of hormonal and energy-related factors on plasma adiponectin in transition dairy cows. J Dairy Sci. 100 (11):9418-9427, 2017.

Cheong, S. H., O. G. Sa Filho, V. A. Absalón Medina, A. Schneider, W. R. Butler, and R. O. Gilbert. Uterine and systemic inflammation influences ovarian follicular function in postpartum dairy cows. PLoS One 12 (5):e0177356, 2017.

Jaskiewicz NJ, Parisi S, Hermawan C, Townson DH 2017 O-GlcNAcylation enhances the tumorigenic properties of cervical cancer cells in vitro. Clinical Obstetrics, Gynecology and Reproductive Medicine 3(3):1-6

Mattos FCSZ, Canavessi AMO, Wiltbank MC, Bastos MR, Lemes AP, Mourao GB, Susin I, Coutinho LL, Sartori R (2017). Investigation of mechanisms involved in regulation of progesterone catabolism using an overfed versus underfed ewe-lamb model. *J Anim Sci* 95:5537-46.

Barletta RV, Maturana M, Carvalho PD, Del Valle TA, Netto AS, Renno FP, Mingoti RD, Gandra JR, Mourao GB, Fricke PM, Sartori R, Madureira EH, Wiltbank MC (2017). Association of changes among body condition score during the transition period with NEFA and BHBA concentrations, milk production, fertility, and health of Holstein cows. *Theriogenology* 104:30-6.

Hackbart KS, Bender RW, Carvalho PD, Vieira LM, Dresch AR, Guenther JN, Gencoglu H, Nascimento AB, Shaver RD, Wiltbank MC (2017). Effects of propylene glycol or elevated luteinizing hormone during follicle development on ovulation, fertilization, and early embryo development. *Biol Reprod* 97:550-63.

Pereira MHC, Wiltbank MC, Guida TG, Lopes FR, Vasconcelos JLM (2017B). Comparison of 2 protocols to increase circulating progesterone concentration before timed artificial insemination in lactating dairy cows with or without elevated body temperature. *J Dairy Sci* 100:8455-70.

Garcia-Guerra A, Motta JCL, Melo LF, Kirkpatrick BW, Wiltbank MC (2017A). Ovulation rate, antral follicle count, and circulating anti-Mullerian hormone in Trio allele carriers, a novel high fecundity bovine genotype. *Theriogenology* 101:81-90.

Garcia-Guerra A, Kirkpatrick BW, Wiltbank MC (2017B). Follicular waves and hormonal profiles during the estrous cycle of carriers and non-carriers of the Trio allele, a major bovine gene for high ovulation and fecundity. *Theriogenology* 100:100-13.

Prata AB, Pontes GCS, Monteiro PLJ, Drum JN, Wiltbank MC, Sartori R (2017). Equine chorionic gonadotropin increases fertility of grazing dairy cows that receive fixed-time artificial insemination in the early but not later postpartum period. *Theriogenology* 98:36-40.

Mollo MR, Monteiro PLJ, Surjus RS, Martins AC, Ramos AF, Mourao GB, Carrijo LHD, Lopes G, Rumpf R, Wiltbank MC, Sartori R (2017). Embryo production in heifers with low or high dry matter intake submitted to superovulation. *Theriogenology* 92:30-5.

Pereira MHC, Sanches CP, Guida TG, Wiltbank MC, Vasconcelos JLM (2017A). Comparison of fertility following use of one versus two intravaginal progesterone inserts in dairy cows without a CL during a synchronization protocol before timed AI or timed embryo transfer. *Theriogenology* 89:72-8.

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Report a Bug

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Toledo MZ, Baez GM, Garcia-Guerra A, Lobos NE, Guenther JN, Trevisol E, Luchini D, Shaver RD, Wiltbank MC (2017). Effect of feeding rumen-protected methionine on productive and reproductive performance of dairy cows. *PLoS ONE* 12:e0189117.

Wijma, M. M. Pérez, M. Masello, D. G. García, M. L. Stangaferro, and J.O. Giordano. 2017. A resynchronization of ovulation program based on ovarian structures present at nonpregnancy diagnosis reduced time to pregnancy in lactating dairy cows. J. Dairy Sci. 101:1697-1707.

Wijma, M.L. Stangaferro, M. Masello, G. E. Granados, and J.O. Giordano. 2017. Resynchronization of ovulation protocols for dairy cows including or not including gonadotropin-releasing hormone to induce a new follicular wave: Effects on re-insemination pattern, ovarian responses, and pregnancy outcomes. J. Dairy Sci. 100:7613-7625.

S.H. Cheong, O.G. Sá Filho, V.A. Absalon-Medina, A. Schneider, W.R. Butler, R.O. Gilbert. Uterine and systemic inflammation influences ovarian follicular function in postpartum dairy cows. PLoS ONE. 2017 May 12(5):e0177356 doi:https://doi.org/10.1371/journal.pone.0177356. PMID: 28542500

Ealy, A.D. and Wooldridge, L.K. 2017. The evolution of interferon-tau. Reproduction 154:F1-F10.

Hughes, C.K., Xie, M.M., McCoski, S.R. and Ealy, A.D. 2017. Activities for leptin in bovine trophoblast cells. Dom. Anim. Endocrinol. 58:84-89.

Kelley, D.E., Galvao, K.N., Mortensen, C.J., Risco, C.A. and Ealy, A.D. 2017. Using Doppler ultrasonography on day 34 of pregnancy to predict pregnancy loss in lactating dairy cattle. J. Dairy Sci. 100:3266-3271.

Lu, Y., Bradley, J.S., McCoski, S.R., Gonzalez, J.M., Ealy, A.D. and Johnson, S.E. 2017. Reduced skeletal muscle fiber size following caloric restriction is associated with calpain-mediated proteolysis and attenuation of IGF-1 signaling. Am. J. Regul. Integr. Comp. Physiol. 312:R806-R815.

Lugar, D.W., Rhoads, M.L., Clark-Deener, S.G., Callahan, S.R., Revercomb, A.K., Prusa, K.J. and Estienne, M.J. (2017). Immunological castration temporarily reduces testis size and function without long-term effects on libido and sperm quality in boars. Animal 11:643-649.

MacGhee, M.E., Bradley, J.S., McCoski, S.R., Reeg, A.M., Ealy, A.D. and Johnson, S.E. 2017. Plane of nutrition affects growth rate, organ size and skeletal muscle satellite cell activity in newborn calves. J. Anim. Physiol. Anim. Nutr. 101:475-483.

Reinholt, B.M., Bradley, J.S., Jacobs, R.D., Ealy, A.D. and Johnson, S.E. 2017. Tissue organization alters gene expression in equine induced trophectoderm cells. Gen. Comp. Endocrinol. 247:174-182.

Talbot, N.C., Sparks, W.O., Phillips, C., Ealy, A.D., Powell, A.M., Caperna, T.J., Garrett, W.M., Donavan, D.M. and Blomberg, L.A. 2017. Bovine trophectoderm cells induced from bovine fibroblasts with induced pluripotent stem cell reprogramming factors. Mol. Reprod. Dev. 84:468-485.

Wilson, M.L., McCoski, S.R., Geifer, A.J., Akers, R.M., Johnson, S.E. and Ealy, A.D. 2017. The influence of postnatal nutrition on reproductive tract and endometrial gland development in dairy calves. J. Dairy Sci. 100:3243-3256.

Xie, M., McCoski S.R., Johnson, S.E., Rhoads, M.L. and Ealy, A.D. 2017. Combinatorial effects of epidermal growth factor, fibroblast growth factor 2 and insulin-like growth factor 1 on trophoblast cell proliferation and embryogenesis in cattle. Reprod. Fertil. Dev. 29:419-430.

Zezeski, A.L., McCracken, V.L., Poole, R.K., Al Naib, A., Smith, J.K., McCann, M.A. and Rhoads ML. (2017) Metabolic and reproductive characteristics of replacement beef heifers subjected to an early weaning regimen involving high-concentrate feeding. Animal 11:820-825.

Conference papers and abstracts/presentations:

Yost, E.E., Arzuaga, X., Carlson, L., Keating, A.F., Lehmann, G. 2017. Focusing and refining the evaluation of reproductive endpoints in a systematic review of PCBs. International Symposium on Systematic Review and Meta-Analysis of Laboratory Animal Studies.

Ganesan, S., Nteeba, J. and Keating, A.F. 2017. Impact of glyphosate on ovarian signaling pathways regulating folliculogenesis and steroidogenesis. Society for the Study of Reproduction annual meeting.

Hines, E.A., Romoser, M., Keating, A.F., Baumgard, L.H., Niemi, J., Williams, N.H., Haberl, B., Kerr, B., Touchette, K.T., Ross, J.W. 2017. Supplementation of arginine does not improve gilt reproductive performance under commercial conditions. Society for the Study of Reproduction annual meeting.

Hines, E.A., Romoser, M., Keating, A.F., Baumgard, L.H., Niemi, J., Haberl, B., Kerr, B., Touchette, K., Ross, J.W. 2017. Effect of maternal arginine supplementation on offspring performance of pigs in a commercial production environment. Importance of nutrition and environment on birth weight, muscle growth, health and survival of the neonate workshop meeting.

Baumgard, L.H., Kvidera, S.K., Horst, E.A., Dickson, M.J., Ydstie, J.A., Shouse, C.S., Mayorga, E.J., Al-Qaisi, M., Lei, S., Bidne, K.L., Seibert, J.T., Hall, B.J., Keating, A.F., Ross, J.W., Selsby, J.T., Rhoads, R.P. 2017. Consequences of leaky gut on the immune system, metabolism, physiology and animal performance. American Society of Dairy Science annual meeting.

Dickson, M.J., Kvidera, S.K., Horst, E.A., Ydstie, J.A., Bidne, K.L., Wiley, C.E., Gunn, P.J., Keating, A.F., Baumgard, L.H. Chronic lipopolysaccharide infusion has no impact on dominant follicular size but affects 17β-estradiol in lactating dairy cows. American Society of Dairy Science annual meeting.

Kvidera, S.K., Horst, E.A., Sanz Fernandez, M.V., Abuajamieh, M., Ganesa, S., Gordon, P.J., Green, H.B., Schoenberg, K.M., Trout, W.E., Keating, A.F., Baumgard, L.H. 2017. Glucagon-like peptide 2 administration improves biomarkers of inflammation and intestinal morphology in feed restricted lactating Holstein cows. American Society of Dairy Science annual meeting.

Kvidera, S.K., Dickson, M.J., Horst, E.A., Ydstie, J.A., Shouse, C.S., Bidne, K.L., Mayorga, E.J., Al-Qaisi, M., Ramirez, H.A., Keating, A.F., Baumgard, L.H. 2017. Effects of continuous and increasing lipopolysaccharide infusion on basal metabolism in lactating cows. American Society of Dairy Science annual meeting.

Dickson, M.J., Kvidera, S.K., Horst, E.A., Ydstie, J.A., Shouse, C.S., Mayorga, E.J., Al-Qaisi, M., Bidne, K.L., Ramirez, H.A., Keating, A.F., Baumgard, L.H. 2017. Metabolic responses to a glucose tolerance test and epinephrine challenge post-continuous lipopolysaccharide infusion in lactating cows. American Society of Dairy Science annual meeting.

Dickson, M.J., Kvidera, S.K., Horst, E.A., Ydstie, J.A., Shouse, C.S., Mayorga, E.J., Al-Qaisi, M., Bidne, K.L., Ramirez, H.A., Keating, A.F., Baumgard, L.H. 2017. Chronic lipopolysaccharide infusion reduces productivity in lactating dairy cows. American Society of Dairy Science annual meeting.

McCain AR, Beede KA, Yates DT, and Wood JR (2017) Maternal and Paternal Obesity Differentially Affect Fetal Growth with Maternal Obesity Associated Growth Restriction Attributed to Decreased 11□-Hydroxysteroid Dehydrogenase Expression *Society for the Study of Reproduction*, Washington, DC

Report a Bug

Timme KA, Xie F, Davis JS, and Wood JR (2017) Ovarian Inflammation and Oxidative Stress Associated with Diet Induced Obesity (DIO) Impacts RNA-Binding Protein Expression and Potentially mRNA Stability in the Murine Ovary and Oocyte. *Society for the Study of Reproduction*, Washington, DC

Romereim SM, Summers AF, Pohlmeier WE, McFee RM, Spuri-Gomes R, Kurz SG, Davis JS, Wood JR, and Cupp AS (2017) A High-Androgen Microenvironment Inhibits Granulosa Cell Proliferation and May Alter Cell Identity. *Society for the Study of Reproduction*, Washington, DC

Abedal-Majed MA, Hart ML, Largen V, Magamage MPS, Kurz SG, Sargent KM, Bergman J, McFee RM, Cushman RA, Davis JS, Wood JR, and Cupp AS (2017) Ovarian Cortex from High A4 Cows Secrete Excess A4 and Exhibits Increased Oxidative Stress, Macrophage Markers and Arrested Follicle Development Which can be Partially Rescued by Angiogenic VEGFA Isoforms. *Society for the Study of Reproduction*, Washington, DC

Nafziger S, Abedal-Majed MA, Tenley S, Summers A, Hart ML, Harsh G, Bergman J, Kurz SG, Wood JR, Cushman RA, and Cupp AS (2017) Endocrine Profiles during Attainment of Puberty may Predict Reproductive Longevity in Heifers. *Society for the Study of Reproduction*, Washington, DC

Wood JR (2017) Maternal Obesity, the Gut Microbiota, and Oocyte mRNAs: Potential Impact on the Developing Embryo and Fetus. *4th World Congress on Reproductive Biology*, Naha, Okinawa, Japan (invited speaker)

McCain AR, Beede KA, Yates DT, Shankar K, and Wood JR (2017) Maternal Obesity Results in Fetal Growth Restriction Associated with Reduced Placental Efficiency and an Altered Placental Transcriptome. *14th Annual Gilbert Greenwald Symposium on Reproduction*, Kansas City, KS

Timme KA, Xie F, Davis JS, and Wood JR (2017) Ovarian Inflammation and Oxidative Stress Associated with Diet Induced Obesity (DIO) Impacts RNA-Binding Protein Expression and Potentially mRNA Stability in the Murine Ovary and Oocyte. *14th Annual Gilbert Greenwald Symposium on Reproduction*, Kansas City, KS

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Abedal-Majed MA, Hart ML, Largen V, Magamage MPS, Kurz SG, Sargent KM, Bergman J, McFee RM, Cushman RA, Davis JS, Wood JR, and Cupp AS (2017) Ovarian Cortex from High A4 Cows Secrete Excess A4, and Exhibit Increased Oxidative Stress and Arrested Follicle Development which can be Partially Rescued by Angiogenic VEGFA Isoforms. *14th Annual Gilbert Greenwald Symposium on Reproduction*, Kansas City, KS

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Romereim SM, Tenley SC, Abedal-Majed MA, Bergman JW, Kurz SG, Davis JS, Wood JR, and Cupp AS (2017) Letrozole: A Steroid-Free Estrous Synchronization Method. *Nebraska 2017 Beef Cattle Report*, in press

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Abedal-Majed, MA (2017) Effect of Post-Weaning Diet, Excess Androstenedione, and Vascular Endothelial Growth Factor A (VEGFA) Isoforms on Follicular Progression in Bovine Ovarian Cortical Cultures (Nebraska).

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Active collaboration within the group

NY, PA, NH, VT and WV: Samples collected to investigate associations between fertility outcomes and SNP in candidate genes from dairy cows.

IA and UK: Samples shared to determine the effect of LPS treatment on ovarian inflammation.

PA and WV: Samples shared for analysis of molecular regulators of luteal function.

VT and NY: Samples assayed (NY) for analysis of progesterone concentrations.

NY and WI: Samples collected to investigate the effect of supplementation with rumen-protected methionine on reproductive traits of lactating dairy cows.

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