SAES-422 Reports, Appendix D

**Project/ Activity Title: NCERA57 – Swine Reproductive Physiology (Multistate Research Coordinating Committee and Information Exchange Group)**

**Date of Annual Report:** 08/10/2017

**Annual Meeting Dates:** 06/15/2017

**Period the Report Covers:** 10/01/2016 - 09/01/2017

**Participants**

Members: Feugang, Jean (jn181@ads.msstate.edu) – Mississippi State; Ross, Jason (jwross@iastate.edu) – Iowa State; Safranski, Tim (SafranskiT@missouri.edu) – University of MO; Geisert, Rodney (geisertr@missouri.edu)– University of MO; White, Brett (bwhite2@unl.edu) – University of NE; Davis, Duane(davis@k-state.edu) – Kansas State; Miller, Dave (djmille@illinois.edu) – University of IL; Rempel, Lea (Lea.Rempel@ars.usda.gov) – USDA, ARS, USMARC; Miles, Jeremy (Jeremy.Mile@ars.usda.gov) – USDA, ARS, USMARC.

Non-Member Representative: Mote, Benny (benny.mote@unl.edu)– University of NE

Visiting Students: Morton, Jodi – Kansas State

**Summary of Minutes:**

June 15, 2017:

On Thursday, June 15, welcome and introduction was given by institutional co-host, Dr. Tim Safranski. Dr. Bill Lamberson, Interim Chair of the Division of Animal Science, gave an overview of the University of Missouri – College of Agriculture, Food and Natural Resources (CAFNR), of which, approximately 500 undergraduate and 60 graduate students are within the Animal Science curriculum. Current NCERA57 Chair, Dr. Lea Rempel, USMARC, opened the annual meeting portion with greetings and appreciation to University of Missouri, the local hosts, Drs. Tim Safranski and Rod Geissert for their generous hospitality and coordination of the meeting facility. Station reports from several institutions were given.

Station Reports: Each institution provided a brief presentation of current research with group discussions.

1. Kansas State University, Dr. Duane Davis

Recent studies completed at Kansas State evaluated split nursing to enhance the intake of colostrum in small pigs. The removed pigs were placed in a plastic tub with a heat lamp and after 1.5 h were returned to the farrowing crate. Weight gain to d7 was greater (P < 0.05) for when the heaviest pits were removed but not when the first half of pigs farrowed were removed.  Pigs born in the first half of the birth order had greater (P < 0.05) immunocrits than pigs born in the last half of the litter and pigs in higher birth weight categories had greater (P < .001) weights at d7 and 20. Immunocrit and colostrum intake were positively correlated.

Another series of studies confirmed the ability of litter separation and boar exposure to induce estrus, ovulation, and allow fertility in lactating sows. A potentially practical method was developed that allowed the sows and pigs to remain in farrowing crates with a boar introduced for stimulation once/d. A robot controlled remotely guided the boar to each pair of sows for stimulation. The pigs were alternately allowed to nurse one of each pair of sows for 12 h/d.

1. Mississippi State University, Dr. Jean Feugang

Dr. Jean M Feugang presented an overview of the recent development in nanotechnology that can enhance livestock productivity through assisted reproduction. The current status of semen purification procedures leading to the selection of best or high quality spermatozoa for successful in vitro/in vivo fertilization was provided (e.g., swim-up, filtration, density gradient centrifugation, and lab-on-chips). Furthermore, a special focus on new developed quantum dot nanoparticles for sperm imaging, liposomes for imaging and delivery, and magnetic nanoparticles for sperm selection. Our previous and current works indicate the beneficial use of these nanoparticles on boar spermatozoa, with the expectation of their further optimization to tremendously impact swine productivity.

1. University of Missouri, Drs. Rod Geisert and Tim Safranski

True effects of heat stress on the sow may be greater if heat stress (HS) of the pregnant sow causes long-term developmental damage to subsequent offspring. Sows respond to HS during gestation with increased rectal temperature, respiration rate, and skin temperature. An additional coping mechanism is reduced activity that may change body composition (favoring fatter less muscled sows). The HS sows have shorter gestation length and reduced birth weight of their litters. Lactation performance appears normal because weaning weights are not changed when sows are heat-stressed during lactation. Heat stress during gestation causes insulin resistance during lactation but this metabolic state does not seem to affect lactation or rebreeding performance. Boars and gilts from sows that are gestational heat stress have a variety of unique phenotypes related to body temperature regulation, carcass composition, and reproduction.  Most studies have found greater body temperature and greater fat deposition in offspring from heat stress sows. With respect to reproduction, the data suggest damage to both the developing ovary and testis caused by gestational heat stress. Most of the available data are preliminary. Further replication is necessary to confirm the observed effects of gestational heat stress which have the potential to significantly impact the economics of the swine industry.

1. USDA, ARS, US Meat Animal Research Center, Drs. Jeremy Miles and Lea Rempel

Dr. Lea Rempel provided a presentation upon the use of genomics and metabolomics to investigate the genetic and physiological events associated with weaning-to-estrus interval. Several genetic regions with potential candidate genes were identified in first and second parity dams. These regions included Sus scrofa chromosomes 1 and 9 for parity 2 dams. Others have reported QTL for puberty in gilts and a QTL for swine matings on SSC 9 in the same region. A candidate gene of interest that lies within this region is *SET and MYND domain containing 2*, which can inhibit estrogen receptor 1. Furthermore, a preliminary LCMS plasma metabolite profiling study suggested that parity 1 females that fail to return to estrus following weaning had greater abundance of the putative metabolites; mesitylene, pentylbenzene, and 1,3-octadiene. Elevated benzene products have been shown to reduce intrafollicular estradiol and decrease oocyte retrieval in humans.

The business meeting reconvened following the station reports. Members decided that we need to encourage other institutions to participate therefore recruitment efforts for the NCERA57 group were discussed. Several potential recruits were mentioned and current members volunteered to initiate an invitation to the NCERA57. The following current members volunteered to contact possible recruits. Jason Ross will contact Clay Isom; Billy Flowers will contact Shelly Rhoads, Steve Moeller, and Troy Ott; and Jeremy Miles will contact USDA, ARS, BARC.

A secretary for 2018 was elected and we are glad to say that Kara Stewart, Purdue, was nominated by Duane Davis, seconded by Tim Safranski, and unanimously voted into this position. Jeff Clapper was promoted from current secretary into the position of NCERA57 Chair for 2018. Congratulations to the elected officials for 2018 NCERA57.

John Parrish mentioned that the NCERA57 program was likely up for renewal in 2018 and that we should be aware. We will work via email interactions over the course of the next year to prepare the renewal since the 2018 meeting will be shortened due to the mini-symposium. Online efforts will include developing new objectives and updating the accomplishments for the current 12 objectives. A draft renewal document will need to be completed by October, 2018.

Dr. Chris Hostettler, Director of Animal Science for the National Pork Board (NPB) gave updates on their organization (9 committees, 6 of which are in Science and Technology). Explained the Animal Science committee is interested in reproduction, genetics, and nutrition. There is an effort on sow lifetime productivity with the goal to raise number of pigs in a lifetime from 34 to 43. This goal fits the strategic plan of NPB by increasing sustainability. A special sow lifetime productivity pre-/ post- weaning survival RFP went out this spring and five proposals were received. Dr. Hostetler talked about annual funding for sow lifetime productivity ($425K), nutritional efficiency ($?) and seasonality ($200-300K), and that all expire in 2017. So the Animal Science committee will have to decide focus (extension of programs or a redirect). He anticipates they will be interested in learning about sow prolapse and mortality issues in the breeding herd.

A brief USDA-NIFA update was provided by Dr. Adele Turzillo in the form of an email. Program outcomes for FY2016 for Animal Health and Production and Animal Products provided $28 million total program funds. Eight areas of research interest have been developed within the request for applications for FY 2017. These include; 1) Food, Agriculture, Natural Resources and Human Sciences Education and Literacy Initiatives, 2) Foundational Programs, 3) Food Security Challenge Area, 4) Food Safety Challenge Area, 5) Childhood Obesity Prevention Challenge Area, 6) Water for Food Production Systems Challenge Area, 7) Resilient Agroecosystems in a Changing Climate Challenge Area, and 8) Sustainable Bioenergy and Bioproducts Challenge Area.

It was decided that the 2018 meeting/mini-symposium would be held at Brookings, SD (SDSU) with the new swine research and educational facility as well as a large commercial and production swine base in SD and MN. Jeff Clapper was unable to attend the meeting in person, but we did manage to establish a conference call in order to develop a draft agenda and appoint responsibilities to NCERA57 members. The NCERA57 2018 meeting and symposium to be held May 21-23, 2018 with the mini-symposium to be held May 22, 2018 at SDSU, Brookings, SD. A committee was formed consisting of Lea, Jason, Tim, and Jeff to work out the finer details. The draft agenda is as follows:

10:00-12:00 Open house and swine facility tour

12:00 Lunch, sponsored by JBS United Animal Health (Duane Davis will contact)

1:00 Tribute to Dr. Phil Dzuik (Steve Webel)\*

1:10 PRRS Update, SDSU or other local swine vet

1:40 Anatomy and Physiology of Pregnancy and Parturition, NCERA member will present that will ‘set-up’ the following presentation

2:10 Uterine prolapse and sow mortality (Gene Gourley or Mark Fitzsimmons suggested)

3:00 Break

3:30 Pre-weaning survival with normal and large litters (NCERA member or other)

4:10 Failure of the parity 1 female to return to estrus (NCERA member)

4:45 General discussion and adjournment

\*Dr. Phil Dziuk, a founding member of this committee, will be given special recognition at the 2018 mini-symposium. Duane Davis volunteered to ask Steve Webel to provide a brief memoriam (5-10 minutes) and possibly sponsor the meal for the symposium.

Tim Safranski will contact the Chris Hostetler, NPB, about providing Pork Checkoff funds to assist with the costs for the symposium. Jeff Clapper will coordinate and secure the facilities and request funding support from the department head, Dr. Joe Cassady and or the university, for speakers and a portion of the meal. The conference call with Jeff Clapper was concluded.

No other business was needed to discuss therefore the meeting was officially adjourned.

**Accomplishments:**

Reported peer –reviewed publications from cooperating institutions within the NCERA-57 group yielded 49 manuscripts, abstracts, proceeding and book chapters associated with swine reproduction, physiology or genetics.

**Impacts:**

Committee members performed research this past year that has provided insights into key aspects of swine production and reproduction, in particular. Areas of investigation encompassed applied approaches to improve reproductive efficiency as well as more basic approaches to gain a fundamental understanding of mechanisms of biological mechanisms involved in swine reproduction. Areas of research included; identification of genes involved in signal transduction pathways of porcine oocytes at fertilization, how in utero heat stress affects growth and reproduction of boars, supplements to semen extenders, steroidogenesis in boar testis, inducement of puberty and artificial insemination techniques, factors affecting motility patterns of spermatozoa, and genetic influences affecting puberty, postweaning estrus, heat stress, and feeding behavior in pigs.

**Publications:**

**Boar Performance (IN, NE, IL)<p>**

J. A. Proctor, D. W. Lugar, M. C. Lucy, T. J. Safranski and K. R. Stewart. 2017. Effects of in Utero Heat Stress on Boar Growth and Reproduction Prior to, during, and after Puberty. Midwest ASAS, Omaha, NE. Abstract.<p>

D. W. Lugar, W. A. Krom, J. A. Proctor, P. D. Mings, and K. R.Stewart. 2017. Effects of Supplemental Betaine to Semen Extenders on Semen Quality in Boars. Midwest ASAS, Omaha, NE. Abstract.<p>

Lents, C.L., J.F. Thorson, A.T. Desaulniers and B.R. White. 2017. RFamide-related peptide 3 and gonadotropin-releasing hormone-II are autocrine-paracrine regulators of testicular function in the boar. Mol. Reprod. Dev. May 5. doi: 10.1002/mrd.22830. [Epub ahead of print] Review.<p>

Gonzalez-Pena D, Knox RV, Rodriguez-Zas SL. 2016. Contribution of semen trait selection, artificial insemination technique, and semen dose to the profitability of pig production systems: A simulation study. Theriogenology. 85:335-44.<p>

Silva E, Frost D, Li L, Bovin N, Miller DJ. 2017. Lactadherin is a candidate oviduct Lewis X trisaccharide receptor on porcine sperm. Andrology doi: 10.1111/andr.12340<p>

Winters RA, Nettenstrom LM, Lopez DG, Willenburg KL, Vishwanath R, Miller DJ. 2017. Effect of sorting porcine spermatozoa by sex chromosomes on oviduct cell binding. Submitted.<p>

**Sow and Gilt Performance (IN, NE, IL, KS, USMARC)<p>**

Cabezon, F. K.R. Stewart, A.P. Schinckel, B.T. Richert, M. Gandarillas, M. Pasache, and W.A. Peralta. 2016. Effect of betaine supplementation during summer on sow lactation and subsequent farrowing performance. Professional Animal Scientist, 32(5), pp 698-706.<p>

Cabezón, F.A., Schinckel, A.P., Richert, B.T., Stewart, K.R., Gandarillas, M. and Peralta, W.A., 2016. Analysis of lactation feed intakes for sows including data on environmental temperatures and humidity. The Professional Animal Scientist, 32(3), pp.333-345.<p>

N.M. Chapel, C.J. Byrd, D. W. Lugar, K. R. Stewart, T.J. Safranski, L.H. Baumgard, and J.S. Johnson. 2017. The effects of *in utero* heat stress on fasting heat production in growing pigs. Midwest ASAS, Omaha, NE. Abstract.<p>

Thorson, J.F., N.L. Heidorn, V. Ryu, K. Czaja, D.J. Nonneman, C.R. Barb, G.J. Hausman, G.A. Rohrer, L.D. Prezotto, R.B. McCosh, E.C. Wright, B.R. White, B.A. Freking, W.T. Oliver, S.M. Hileman and C.A. Lents. 2017. Neuropeptide FF receptor function affects gonadotropin secretion and age at puberty in gilts. Biol. Reprod. 96:617-634.<p>

Knox RV, Esparza-Harris KC, Johnston ME, Webel SK. 2017. Effect of numbers of sperm and timing of a single, post-cervical insemination on the fertility of weaned sows treated with OvuGel®. Theriogenology 92:197-203.<p>

Knox RV, Shen J, Greiner LL, Connor JF. 2016. Effect of timing of relocation of replacement gilts from group pens to individual stalls before breeding on fertility and well-being. J. Anim. Sci. 94:5114-5121.<p>

Knox RV. Artificial insemination in pigs today. Theriogenology. 2016.85: 83-93.<p>

Arend L, Knox RV, Greiner L, Graham A, Connor J. 2016. Effects of feeding melatonin during proestrus and early gestation in gilts and P1 sows to minimize the effects of seasonal infertility. Midwest ASAS/ADSA Annual Meeting.<p>

Arend LS, Duangkamol P, Knox RV. 2016. Administration of melatonin during the follicular and early luteal phase to mimic short days and minimize seasonal infertility for prepubertal gilts housed under differing hours of light and heat. Allen D. Leman Swine Conf. St. Paul, MN.<p>

Vaughn, M., C. Serrano, D. Burnett, D. Davis, J. Woodworth, and J. Gonzalez. 2016. Influence of Porcine Plasma Supplementation on Gestating Sow Serum IGF-1 Concentration and Litter Weights. Professional Agricultural Workers Journal. 4: No. 1, 6.<p>

H. L. Frobose, M. D. Tokach, J. M. DeRouchey, S. S. Dritz, R. D. Goodband, J. L. Nelssen, and D. L. Davis. 2017. Follicle development, incidence of lactational estrus, and ovulation in sows exposed to different suckling reduction strategies. International Conference on Pig Reproduction. June 11-14, Columbia, MO.<p>

J.M. Morton, A.J. Langemeier, T. Rathbun, D.L. 2017. Split suckling and birth weight affects colostrum intake and pre-weaning weight gain. International Conference on Pig Reproduction. June 11-14, Columbia, MO.<p>

Vallet JL, Meyer S. 2016. Effect of glucosamine supplementation on litter size in a commercial setting - NPB #14-238. National Pork Board.<p>

Vallet, J.L., Miles, J.R. 2017. The effect of farrowing induction on colostrum and piglet serum immunocrits is dependent on parity. Journal of Animal Science 96(2): 688-696. doi:10.2527/jas.2016.0993.<p>

**Growth, Development, Physiology (NE, IL, USMARC)<p>**

McNeel, A.K., É.M. Soares, A.L. Patterson, J.L. Vallet, E.C. Wright, E.L. Larimore, O.L. Amundson, J.R. Miles, C.C. Chase Jr., C.A. Lents, J.R. Wood, A.S. Cupp, G.A. Perry and R.A. Cushman. 2017. Beef heifers with diminished numbers of follicles have decreased uterine protein concentrations. Anim. Reprod. Sci. 179:1-9.<p>

Yates, D.T., C.N. Cadaret, K.A. Beede, H.E. Riley, A.R. Macko, M.J. Anderson, E.E. Camacho and S.W. Limesand. 2016. Intrauterine growth-restricted sheep fetuses exhibit smaller hindlimb muscle fibers and lower proportions of insulin-sensitive Type I fibers near term. Am. J. Physiol. Regul. Integr. Comp. Physiol. 310:R1020-1029.<p>

Abedal-Majed, M.A., M. Magamage, R. Vinton, S. Kurz, A.K. McNeel, H.C. Freetly, R.A. Cushman, J.R. Wood and A.S. Cupp. 2016. Effect of diet on ability of vascular endothelial growth factor A (VEGFA) isoforms to alter follicular progression in bovine ovarian cortical cultures. Society for the Study of Reproduction 48th Annual Meeting, San Diego, CA. p. 287-288.<p>

Cadaret, C.N., K.A. Beede, H.E. Riley and D.T. Yates. 2016. Impacts of β agonists and pro-inflammatory cytokines on basal and insulin-stimulated glucose metabolism in rat soleus. Pediatr. Res. 80:623 (Abstr.).<p>

Cushman, R., S. Tenley, É. Soares, A. McNeel, C. Chase, J. Vallet, J. Wood, G. Perry and A. Cupp. 2016. Influence of ovarian reserves in beef heifers on uterine morphometry and function. Society for the Study of Reproduction 48th Annual Meeting, San Diego, CA. p. 306.<p>

Springman, S.A., H.R. Nielson and R.N. Funston. 2016. Impact of heifer development system on subsequent average daily gain and reproduction in two different breeding seasons. J. Anim. Sci. 94 (Suppl. 5):124-125 (Abstr.).<p>

Springman, S.A., H.R. Nielson, T.L. Meyer and R.N. Funston. 2016. Effect of post-weaning heifer development system on average daily gain, pregnancy rates, and subsequent feed efficiency as a pregnant heifer. J. Anim. Sci. 94 (Suppl. 5):6-7 (Abstr.).<p>

Tenley, S., A. Summers, R. Spuri-Gomes, M.A. Abedal-Majed, J. Bergman, S. Kurz, J. Wood, R. Cushman and A.S. Cupp. 2016. A portion of heifers attaining “Early Puberty” do not display estrus, are anovulatory and have altered sex hormone binding globulin concentrations. Society for the Study of Reproduction 48th Annual Meeting, San Diego, CA. p. 120-121.<p>

Romereim, S.M.,X. Hou, H.A. Talbott, R.A. Cushman, J.R. Wood, J.S. Davis and A.S. Cupp. 2016. A comparison of ovarian follicular and luteal cell gene expression profiles provides insight into cellular identities and functions. Society for the Study of Reproduction 48th Annual Meeting, San Diego, CA. p. 297.<p>

Riccio G, Ellerbrock R, Canisso I, Knox R, Kline K. 2016. Motility of stallion spermatozoa after centrifugation and cooling in INRA96® or Walworth Extender. Journal of Agricultural Science and Technology. A 6 143-147.<p>

Silva E, Miller DJ. 2016. Involvement of specific oviduct cell glycans in sperm binding to form a reservoir. J Vet Andrology 1:24-28.<p>

Phoophitphong D., Tummaruk P, Knox RV. 2016. Serum estradiol-17B concentration after estrus induction using PG600 in gilts. 24th International Pig Veterinary Society Congress. P0-PW1-247.<p>

Tummaruk T, Phoophitphong D, Knox RV. Follicle development, ovulation, and evidence of silent heat in gilts after estrus induction using gonadotrophin under tropical climate. 24th International Pig Veterinary Society. Dublin. 2016. PO-PW1-239.<p>

Lents CA, Brown-Brandl TM, Rohrer GA, Oliver WT, Freking BA. 2016. Plasma concentrations of acyl-ghrelin are associated with average daily gain and feeding behavior in grow-finish pigs. Domestic Animal Endocrinology. 55:107-113.<p>

Rempel LA, Miles JR, Parrish J. 2016. Evaluation of contributions to seasonal reproductive inefficiency; NPB #14-052. National Pork Board. Available: <http://research.pork.org/FileLibrary/ResearchDocuments/14-052-REMPEL-final%20rpt.pdf>.<p>

Thorson, J., Heidorn, N.L., Ryu, V., Czaja, K., Nonneman, D.J., Barb, C.R., Hausman, G.J., Rohrer, G.A., Prezotto, L.D., McCosh, R.B., Wright, E.C., White, B.R., Freking, B.A., Oliver, W.T., Hileman, S.M., Lents, C.A. 2017. Relationship of neuropeptide FF receptors with pubertal maturation of gilts. Biological Reproduction 96(3):617-634. doi:10.1095/biolreprod.116.144998.<p>

**Basic Science and Technology (IN, KS, NE, IL)<p>**

Herrick JR, Wang C, Machaty Z. 2016. The effects of permeating cryoprotectants on intracellular free-calcium concentrations and developmental potential of *in vitro*-matured feline oocytes. Reprod Fertil Dev 28:599-607.<p>

Machaty Z. 2016. Signal transduction in mammalian oocytes during fertilization. Cell Tissue Res 363:169-183.<p>

Silva PV, Zhang L, Jaeger LA, Machaty Z. 2016.Effects of ORAI1 down-regulation on oocyte maturation in pigs. Proc 18th International Congress on Animal Reproduction. Tours, France, p.280.<p>

Zhang L, Chao C-H, Jaeger LA, Machaty Z. 2016. Repetitive interactions between STIM1 and ORAI1 at fertilization in pig oocytes. Proc 18th International Congress on Animal Reproduction. Tours, France, p. 50.<p>

Machaty Z, Miller AR, Zhang L. 2017. Egg activation at fertilization. In: “Vertebrate development”. (Eds.: F. Pelegri, M. Danilchik, A. Sutherland). Adv. Exp. Med. Biol., Vol. 953. pp. 1-47. Springer, Cham, Switzerland.<p>

Zhang L, Machaty Z. 2017. Targeted gene knockdown in early embryos using siRNA. In: “Zygotic genome activation”. (Ed.: K. Lee). Methods Mol Biol., pp. 207-217. Humana Press, New York, NY, USA.<p>

J. Morton, T. Rathbun and D.L. Davis. 2016. Relationships between pig weights at birth and weaning and expression of EGR1, Pref1, Cox1 and Cox2 in Wharton’s jelly and epididymal fat pad. Proc. Perinatal Biology Symposium: Interconnecting Animal and Human Systems to Understand Life-Disease.<p>

Brauer, V.M., J.R. Wiarda Bell, A.T. Desaulniers, R.A. Cederberg and B.R. White. 2016. Functional activity of the Gnrhr2 gene promoter in testis-derived cells is partially conferred by nuclear factor-κB, specificity protein 1 and 3 (SP1/3) and overlapping early growth response 1/SP1/3 binding sites. Gene 587:137-146.<p>

Romereim, S.M., A.F. Summers, W.E. Pohlmeier, P. Zhang, X. Hou, H.A. Talbott, R.A. Cushman, J.R. Wood, J.S. Davis and A.S. Cupp. 2016. Transcriptomes of bovine ovarian follicular and luteal cells. Data Brief 10:335-339.<p>

Romereim, S.M., A.F. Summers, W.E. Pohlmeier, P. Zhang, X. Hou, H.A. Talbott, R.A. Cushman, J.R. Wood, J.S. Davis and A.S. Cupp. 2017. Gene expression profiling of bovine ovarian follicular and luteal cells provides insight into cellular identities and functions. Mol. Cell. Endocrinol. 439:379-394.<p>

Romereim, S.M., and A.S. Cupp. 2016. Mesonephric cell migration into the gonads and vascularization are processes crucial for testis development. Results Probl. Cell. Differ. 58:67-100.<p>

Xie, F., R.L. Krisher and J.R. Wood. 2016. Oxidative stress during oocyte *in vitro* maturation increases the abundance of *Dppa3* and *Pou5f1* maternal effect gene transcripts in matured oocytes and two-cell embryos, indicative of altered post-transcriptional regulation of maternal mRNAs. Society for the Study of Reproduction 48th Annual Meeting, San Diego, CA. p. 344.<p>

Daigneault B, Miller DJ. 2017. Transient receptor potential cation channel subfamily P member 2 (TRPP2) regulates motility and intracellular calcium of porcine sperm. Submitted.<p>

Sharif M, Silva E, Shah ST, Miller DJ. 2017. Redistribution of soluble N-ethylmaleimide-sensitive-factor attachment protein receptors in mouse sperm membranes prior to the acrosome reaction. Biol Reprod 96:352-365. doi: 10.1095/biolreprod.116.143735, PMID: 28203732<p>

Daigneault BW and DJ Miller. 2016. TRPP2 regulates motility and intracellular calcium of porcine sperm. 42nd IETS Annual Conference.<p>

Dutta S and DJ Miller. 2016. Oviduct glycans prolong the lifespan of bovine sperm. 49th Annual Meeting of the Society for the Study of Reproduction.<p>

Elsokary MM and DJ Miller. 2017. Mature oocytes trigger the release of bovine sperm from an immobilized oviduct glycan. 43rd IETS Annual Conference. Austin, TX Reprod Fertil Dev<p>

Elsokary MM, Miller DJ. 2017. Mature cumulus-oocyte complexes trigger the release of bovine sperm from an immobilized oviduct glycan. 50th Annual Meeting of the Society for the Study of Reproduction.<p>

Lotti S, Rubessa M, Knox RV, Wheeler MB. 2017. Effects of liposomes on sperm motility and DNA binding efficiency. International Embryo Transfer Society. <p>

Machado SA, Miller DJ. 2017. The release of porcine sperm from oviduct cells is induced by progesterone and requires CatSper. 50th Annual Meeting of the Society for the Study of Reproduction.<p>

Machado SA, Sharif M, Kadirvel G, Bovin N, Miller DJ. 2017. Oviduct glycans regulate sperm Ca2+ influx and sperm viability. 50th Annual Meeting of the Society for the Study of Reproduction.<p>

Sharif M, Kerns K, Sutovsky P, Miller DJ. 2017. Proteasomal activity is necessary for porcine sperm release from immobilized oviduct glycans. 50th Annual Meeting of the Society for the Study of Reproduction.<p>

Winters R and Miller DJ. 2016. Effect of sorting boar spermatozoa by sex chromosomes on oviduct cell binding. 49th Annual Meeting of the Society for the Study of Reproduction.<p>

Winters RA, Hamilton DN, Bhatnagar AS, Fitzgerald R, Bovin N, Miller DJ. 2017. Porcine sperm binding to oviduct cells and their glycans as supplements to laboratory semen analysis. 50th Annual Meeting of the Society for the Study of Reproduction.<p>

**Genetics and Genomics (NE, USMARC)<p>**

Desaulniers, A.T., R.A. Cederberg, G.A. Mills, C.A. Lents and B.R. White. 2017. Production of a gonadotropin-releasing hormone 2 receptor knockdown (GnRHR2 KD) swine line. Transgenic Res. May 22. doi: 10.1007/s11248-017-0023-4. [Epub ahead of print].<p>

McDonald, E.A., J.E. Smith, R. A. Cederberg and B.R. White. 2016. Divergent activity of the gonadotropin-releasing hormone receptor gene promoter among genetic lines of pigs is partially conferred by nuclear factor (NF)-κB, specificity protein (SP)1-like and GATA-4 binding sites. Reprod. Biol. Endocrinol.14:36.<p>

Cagnone G, Tsai T-S, Srirattana K, Rossello F, Powell DR, Rohrer G, Cree L, Trounce IA, St John JC. 2016. Segregation of naturally occurring mitochondrial DNA variants in a mini-pig model. Genetics. 202(3):931-944.<p>

Desaulniers AT, Cederberg RA, Lents CA, White BR. 2016. Use of genetically engineered swine to elucidate testis function in the boar. Large Animal Genetic Engineering Summit. September 18-20 2016, Bethesda, Maryland, p. 15-16, Symposium Proceedings. (2pp).<p>

Freking BA, Lents CA, Vallet JL. 2016. Selection for uterine capacity improves lifetime productivity of sows. Animal Reproduction Science. 167:16-21.<p>

Nonneman, D.J., Lents, C.A., Keel, B.N., Rohrer, G.A. 2017. USMARC update on swine reproduction research. In proceedings: Plant and Animal Genome Conference XXIV. Jan. 14-18, 2017. San Diego, CA. W914.<p>

Rohrer, G.A., Cross, A.J., Lents, C.A., Miles, J.R., Nonneman, D.J., Rempel, L.A. 2017. Genetic improvement of sow lifetime productivity. [abstract] Journal of Animal Science 95(Suppl 2), p.11-12.<p>

Rohrer, G.A., Nonneman, D.J. 2017. Genetic analysis of teat number in pigs reveals some developmental pathways independent of vertebra number and several loci which only affect a specific side. Genetics Selection Evolution 49:4. doi:10.1186/s12711-016-0282-1.<p>

White, B.R., Desaulniers, A.T., Cederberg, R.A., Mills, G.A., Lents, C.A. 2017. A transgenic boar model to elucidate the role of gonadotropin-releasing hormone 2 (GnRH2) and its receptor in regulating testes and sperm function. Journal of Animal Science 95(Suppl 2) p. 150. doi:10.2527/asasmw.2017.308.<p>

Wijesena, H.R., Lents, C.A., Reithoven, J., Trenhaile-Grannemann, M.D., Thorson, J.F., Keel, B.N., Miller, P.S., Spangler, M.L., Kachman, S.D., Ciobanu, D.C. 2017. Integration of genomic approaches to uncover sources of variation in age at puberty and reproductive longevity in sows. Journal of Animal Science 95 (Suppl 2) p.12. doi:10.252<p>

**Teaching and Extension (NE, IL)<p>**

Broadhead, D.L., L.A. Stalker, J.A. Musgrave and R.N. Funston. 2017. Methods to increase productivity of spring calving production systems in the Nebraska sandhills. Nebraska 2017 Beef Cattle Report, p.22-24.<p>

Desaulniers, A.T., R.M. McFee and B.R. White. 2016. Smoothing the transition fromclassroom to hog farm: Use of case studies to enhance swine industry knowledge and interest in college students. Nebraska Pork Talk, Nebraska Pork Producers Association. 48:14-15.<p>

Springman, S.A., H.R. Nielson, J.A. Musgrave, J. Nollette, A. Applegarth and R.N. Funston. 2017. Impact of heifer development system in two different breeding seasons. Nebraska 2017 Beef Cattle Report, p.8-10.<p>

Springman, S.A., H.R. Nielson, T.L. Meyer, M. Kirby, J. Teichert and R.N. Funston. 2017. Effect of heifer development system on reproduction and subsequent gain as a pregnant heifer. Nebraska 2017 Beef Cattle Report, p.5-7.<p>

Tibbitts, B.T., T.L. Meyer, D.J. Kelly and R.N. Funston. 2017. Timed insemination vs. modified estrus detection in beef heifers. Nebraska 2017 Beef Cattle Report, p.11-12.<p>

Tibbitts, B.T., H.R. Nielson, K.C. Ramsay and R.N. Funston. 2017. Growth and reproductive performance of yearling beef heifers implanted with Revalor G in the Nebraska sandhills. Nebraska 2017 Beef Cattle Report, p.13-15.<p>

Desaulniers, A.T., R.M.McFee and B.R. White. 2016. Case-based reasoning enhances learning in an undergraduate reproductive biology course. Society for the Study of Reproduction 48th Annual Meeting, San Diego, CA. p. 199.<p>

Gonzalez-Pena D, Knox RV, Rodriguez-Zas SL. 2016. Contribution of semen trait selection, artificial insemination technique, and semen dose to the profitability of pig production systems: A simulation study. Theriogenology. 85:335-44.<p>