

Dawn Renee Bresnahan

Assistant Professor
Berry College

Animal Science
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EDUCATION

Post-Doctoral Fellow

2009-2014

Emphasis: Equine Reproductive Physiology
Principal investigator: Dr. Elaine Carnevale

Colorado State University
College of Veterinary and Biomedical Sciences
Department of Biomedical Sciences
Fort Collins, CO

Ph.D. Veterinary Science

2003-2008

Emphasis: Equine Reproductive Physiology
Principal investigator: Dr. Barry Fitzgerald

University of Kentucky
Gluck Equine Research Center
Lexington, KY

M.S. Veterinary Science

2000-2003

Emphasis: Equine Reproductive Physiology
Principal investigator: Dr. Barry Fitzgerald

University of Kentucky
Gluck Equine Research Center
Lexington, KY

B.S.A Animal Science

1996-2000

Advisor: Libby Luger

University of Georgia
College of Agriculture and Environmental
Sciences
Athens, GA

PROFESSIONAL RESEARCH INTERESTS

- Effect of maternal obesity on metabolism, inflammation, and lipid homeostasis in equine uteri and blastocysts.
- Examining the impact of obesity and metabolic disorders on the ovarian follicular environment.
- Evaluating differences in the metabolites in serum and follicular fluid from obese and non-obese mares, as well as embryo metabolism *in vitro* using non-targeted metabolomics.
- Characterizing the lipid fingerprint of individual oocytes and embryos to evaluate the impact of obesity and cell culture using laser assisted mass spectrometry.
- Using bovine oocytes in a heterologous assay for assessing equine sperm treatments for IVF.
- Examining the role of age and anti-inflammatory administration on the ovarian follicular environment and gene expression in granulosa cells.
- Evaluating alterations in the expression of maternal effects genes in individual oocytes from young and aged mares at varying time points during oocyte maturation.
- Bovine *in vitro* fertilization to evaluate culture techniques prior to use in equine oocytes and embryos.

Ph.D. “The Impact of Insulin on the Matrix Metalloproteinase (MMP) System During Equine Follicular Development and Atresia”

- Characterized the expression and activity of MMPs and their inhibitors (TIMP) in equine granulosa cells both *in vivo* and *in vitro*.
- Evaluated the impact of elevated insulin on MMPs and TIMPs *in vitro*.
- Evaluated the impact of elevated insulin on MMPs and TIMPs *in vivo*.

M.S. “Development of a Model for Inducing Insulin Resistance in Mares: Implications Regarding the Duration of the Estrous Cycle”

- Developed a method for inducing transient insulin resistance in mares.
- Used method to evaluate the impact of insulin resistance on the subsequent estrous cycle.

PREVIOUS WORK EXPERIENCE

Equine Reproduction Lab, Colorado State University

Fort Collins, CO

Postdoctoral Fellow (November 2009-present)

- Prepare and submit grants
- Manuscript preparation
- Design and implement experiments
- Mentor undergraduate and graduate students
- Use micromanipulation techniques to perform intracytoplasmic sperm injections (ICSI) for the clinical program and various research projects
- Assist with surgeries, ICSI, and other needs of the clinical assisted reproduction program

Palmetto Arabians, LLC

Timmonsville, SC

Assistant Breeding Manager (December 2008-October 2009)

- Consulted on design and supplies for new breeding center
- Taught and performed palpation and ultrasound per rectum to determine ovulation
- Determined pregnancy by ultrasound evaluation
- Performed collections and preparation of semen from stallions for use on site, cooling and transport
- Performed artificial insemination
- Trained and conditioned horses for future performance
- Performed general farm maintenance and managed supplies

University of Kentucky-Department of Veterinary Science

Lexington, KY

Graduate Research Assistant (August 2000 – October 2008)

- Designed and carried out experiments pertaining to attainment of the MS and PhD degrees
- Performed ultrasound guided transvaginal follicle aspiration (TVA)
- Inserted indwelling intravenous catheters and performed venipuncture for the collection of blood samples
- Performed radioimmunoassays, PCR, RNA isolations and numerous other lab procedures
- Developed primary tissue culture experiments
- Reviewed articles for publication
- Taught and undergraduate endocrinology lecture
- Performed statistical data analysis and manuscript preparation

University of Georgia – College of Veterinary Medicine Teaching Hospital

Athens, GA

Large Animal Medicine Technician (November 1999 – July 2000) - 25h/wk

- Performed numerous treatments on patients such as administration of eye medications and IV fluids
- Insertion of indwelling intravenous catheters
- Aided with endoscopy, and neurological exams as well as other veterinary medical procedures
- Processed incoming emergencies
- Submitted samples using hospital computer system

Small Animal Surgical Orderly (May 1998 – November 1999) - 20h/wk

- Implemented sterile technique for the proper handling and preparation of surgical procedures
- Disinfected and sanitized operating rooms after surgical procedures and prepared rooms for subsequent procedures
- Prepared animals for surgery
- Trained all newly hired surgical orderlies
- Stocked operating rooms with medical supplies as needed

Small Animal Caretaker (October 1997 – August 1998) - 20h/wk

- Inventoried and stocked surgical wards with treatment supplies
- Cleaned discharge cages for new patients
- Aided nurses and students with the administration of preventative and post-operative treatments
- Helped ensure the comfort and well-being of patients

TEACHING

- Berry College, ANS 105, Introduction to Agricultural Sciences
- Berry College, ANS 120, Introduction to Animal Science
- Berry College, ANS 201, Orientation to Animal Sciences
- Berry College, ANS 326, Anatomy and Physiology
- Berry College, ANS 327, Reproductive Physiology
- Berry College, BCC 100, First Year Seminar
- Colorado State University Equine Reproduction Laboratory Short Courses- assist teaching the laboratory portions of the short courses including: artificial insemination, assisting the foaling mare, stallion collection, and evaluation, cooling, and freezing semen (2009-present)
- Colorado State University Equine Reproduction Laboratory Junior Practicum and Senior Rotations- assist teaching basics of equine reproductive clinical procedures such as mare palpation, artificial insemination, uterine lavage, and other techniques (2009-present)
- Guest lecturer for Colorado State University BMS 642-Research Techniques for Gametes and Embryos-lectures for sperm capacitation and IVF, and microinjection of sperm and cloning (2013)
- Guest lecturer for Colorado State University ANEQ 440-Equine Industry and Issues
- Guest lecturer for Colorado State University BMS 680-Comparative Reproductive Physiology

PROFESSIONAL ORGANIZATIONS

- Honors thesis committee for undergraduate student Danielle Kurkowski (2013)
- Grand Awards Judge for the State of Colorado Science and Engineering Fair (2013)
- Planning committee for Colorado State University's College of Veterinary Medicine and Biomedical Sciences Research Day Symposia (2012 & 2013)
- Trainee member of the International Embryo Transfer Society (2012-present)

Dawn R. Sessions-Bresnahan

- Student member of the Society for Conservation Biology (2007-2010)
- Trainee member of the Society for the Study of Reproduction (2002-present)
- Trainee member of Equine Science Society (2001-present)

***AD HOC* REVIEWER**

- Reproduction Fertility and Development (2014)
- Theriogenology (2012)
- Animal Reproduction Science (2010)
- Journal of Animal Science (2007, 2008)

GRANTS

- National Institutes of Health Contraception and Infertility Loan Repayment Program Award, “The relationship between aging, inflammation, and metabolism and fertility” (2012-2014, \$12,600)
- College Research Council, co-investigator, “Effect of maternal obesity on metabolism, inflammation, and lipid homeostasis in equine uteri and blastocysts” (2013-2014, \$13,600)

AWARDS AND HONORS

- Member of Delta Epsilon Iota Academic Honor Society (2008-present)
- Graduate Research Assistantship, Department of Veterinary Science (2000-2008)
- Travel grants to present research at the Society for the Study of Reproduction and the International Federation of Fertility and Sterility conferences (2006)
- Graduate Student Representative of Gluck Equine Research Center (2002-2003)

RESEARCH TECHNIQUES

DNA and RNA:

RNA isolation, RT-PCR and semi-quantitative real-time RT-PCR, spectrophotometry, gel electrophoresis, primer/probe design, sequence alignment, cDNA sequencing

Protein:

Radioimmunoassay, gelatin zymography, reverse gelatin zymography, Bradford total protein assay, Immunohistochemistry

In Vitro:

Equine granulosa cell primary tissue culture, CHO, 3T3 cell line culture, adipocyte cell culture, *in vitro* fertilization, intracytoplasmic sperm injection (ICSI), culture and cryopreservation of ICSI produced embryos, confocal microscopy

In Vivo:

Blood collection, drug administration (PO, IV and IM), jugular venous catheter placement, adipose tissue biopsy, hyperinsulinemic euglycemic clamp to test insulin sensitivity, rectal palpation and ultrasonography in mares, artificial insemination, embryo collection, and transvaginal follicle aspiration

PUBLICATIONS

Refereed Publications:

- Carnevale EM and **Bresnahan DR**, 2017, Effects of age and metabolic disease on the equine oocyte and embryo. *Clinical Theriogenology* 9(3):341-346.
- Sessions-Bresnahan, D. R.**, K. L. Schauer, A. L. Heuberger, E. M. Carnevale. 2016. Effect of Obesity on the Preovulatory Follicle and Lipid Fingerprints of Equine Oocytes *Biol Reprod* 94 (1) 15, 1-12.
- Sessions-Bresnahan DR**, Carnevale EM. 2015. Age-associated alterations in granulosa cell transcript abundance in equine preovulatory follicles. *Reproduction, Fertility and Development*. 27:906-913.
- Sessions-Bresnahan, D. R.**, J.K. Graham, E.M. Carnevale. 2014. Validation of a heterologous fertilization assay and comparison of fertilization rates of equine oocytes using in vitro fertilization, perivitelline and intracytoplasmic sperm injections. *Theriogenology* 82:274-282.
- Sessions-Bresnahan, D. R.**, E. M. Carnevale. 2014. The effect of equine metabolic syndrome on the ovarian follicular environment. *Journal of Animal Science* 92(4):1485-1494.
- Carnevale, E. M. and **D. R. Sessions**. 2012. *In vitro* production of equine embryos. *Journal of Equine Veterinary Science* 32(7):367-371.
- Sessions, D. R.**, M. M. Vick, and B. P. Fitzgerald. 2009. Characterization of Matrix Metalloproteinase-2 and -9 and their inhibitors in equine granulosa cells *in vivo* and *in vitro*. *Journal of Animal Science* 87(12):3955-3966.
- Vick M. M.**, B. A. Murphy, D. R. Sessions, S. E. Reedy, E. L. Kennedy, D. W. Horohov, R. F. Cook, and B. P. Fitzgerald. 2008. Effects of systemic inflammation on insulin sensitivity in horses and inflammatory cytokine expression in adipose tissue. *American Journal of Veterinary Research* 69(1):130-9.
- Murphy, B. A. Elliott, J. A., **D. R. Sessions**, M. M. Vick, E. L. Kennedy and B. P. Fitzgerald. 2007. Rapid phase adjustment of melatonin and core body temperature rhythms following a 6-h phase advance of the light/dark cycle in the horse. *Journal of Circadian Rhythms* 5:5.
- Murphy, B. A., M. M. Vick, **D. R. Sessions**, R. F. Cook, B. P. Fitzgerald. 2007. Acute systemic inflammation transiently synchronizes clock gene expression in equine peripheral blood. *Brain Behav Immun* 21(4):467-76.
- Vick, M. M., A. A. Adams, B. A. Murphy, **D. R. Sessions**, D. W. Horohov, R. F. Cook, B. J. Sheldon, B. P. Fitzgerald. 2007. Relationship among inflammatory cytokines, obesity, and insulin sensitivity in the horse. *Journal of Animal Science* 85(5):1144-55.
- Vick, M. M., **D. R. Sessions**, B. A. Murphy, E. L. Kennedy, S. E. Reedy and B. P. Fitzgerald. 2006. Obesity is associated with altered metabolic and reproductive activity in the mare: Effects of Metformin on insulin sensitivity and reproductive cyclicity. *Reprod Fertil Dev* 18(6):609-17.
- Murphy, B. A., M. M. Vick, **D. R. Sessions**, R. F. Cook, B. P. Fitzgerald. 2006. Evidence of an oscillating peripheral clock in an equine fibroblast cell line and adipose tissue, but not in peripheral blood. *Journal of Comparative Physiology A* 192(7):743-51.

Sessions, D. R., S. E. Reedy, M. M. Vick, B. A. Murphy, B. P. Fitzgerald. 2004. Development of a model for inducing transient insulin resistance in the mare: Preliminary implications regarding the estrous cycle. *Journal of Animal Science* 82:2321-2328.

Fitzgerald, B.P., S. E. Reedy, **D. R. Sessions**, D. M. Powell, C. J. McManus. 2002. Potential signals mediating the maintenance of reproductive activity during the non-breeding season of the mare. *Reproduction Suppl.*59:115-129.

Powell, D. M., B. P. Fitzgerald, S. E. Reedy, **D. R. Sessions**. 2002. Effect of short-term exercise training on insulin sensitivity in obese and lean horses. *Equine Veterinary Journal* 34:81-84.

Non-refereed Publications:

Fitzgerald, B. P., **Sessions, D. R.**, and M. M. Vick. Oct 2002. Insulin resistance in the horse: Significance and pharmacological management. *Equine Disease Quarterly* 11 (1): 4.

Submitted or in preparation:

Sessions-Bresnahan, D. R., A. L. Heuberger, E. M. Carnevale. 2016. Maternal obesity is associated with increased inflammation in uteri and disrupted lipid homeostasis in blastocysts. (in preparation for submission to *Biology of Reproduction*).

Abstracts:

Sessions-Bresnahan DR, Carnevale EM. 2014. Age-associated alterations in granulosa cell transcript abundance in equine preovulatory follicles. Havemeyer Symposia: Comparative Aspects of Reproductive Aging in the Mare and Woman. Estes Park, CO. October 10-12, 2014.

Sessions-Bresnahan, D.R., K. L. Schauer, A. L. Heuberger, J. E. Prenni, E. M. Carnevale. 2014. Alterations in the equine oocyte and follicle associated with obesity and metabolic syndrome. Eleventh International Symposium on Equine Reproduction. Hamilton, New Zealand. January 26-31.

Sessions-Bresnahan, D.R., K. L. Schauer, J. E. Prenni, E. M. Carnevale. 2013. Effect of short-term obesity on the follicular milieu and lipid fingerprint of individual mare oocytes. Forty-sixth Annual Meeting of the Society for the Study of Reproduction. Montreal, Canada. Abstract 564.

Sessions-Bresnahan, D.R., E.M. Carnevale. 2013. Altered gene expression in equine granulosa cells associated with aging. Colorado State University's 14th Annual College of Veterinary Medicine and Biomedical Sciences Research Day.

Sessions, D.R., E.M. Carnevale. 2012. Alterations in the ovarian follicle associated with equine metabolic syndrome. Forty-fifth Annual Meeting of the Society for the Study of Reproduction. State College, PA. Abstract 476.

Sessions, D.R., E.M. Carnevale. 2012. Effect of equine metabolic syndrome on the intrafollicular environment and fertility. Colorado State University's 13th Annual College of Veterinary Medicine and Biomedical Sciences Research Day.

Sessions, D. R., J.K. Graham, E.M. Carnevale. 2011. Comparison of fertilization rates of equine oocytes using in vitro fertilization, perivitelline and intracytoplasmic sperm injections. The 38th Annual Conference of the International Embryo Transfer Society. *Reproduction, Fertility and Development* 24 (1): 198-199. Pheonix, AZ. Abstract 173.

Carnevale, E. M., **D.R. Sessions**, J.E. Stokes, J.K. Graham. 2011. Comparison of fertilization methods with equine oocytes. Havemeyer Foundation Workshop: Equine *In Vitro* Fertilization. Hilton Head, SC

Sessions, D. R., J.K. Graham, E.M. Carnevale. 2011. Comparison of fertilization rates of equine oocytes using in vitro fertilization, perivitelline and intracytoplasmic sperm injections. The Rocky Mountain Reproductive Sciences Symposium.

da Silveira J.C., **D. R. Sessions**, D.N. Rao Veeramachaneni, Q.A. Winger, E.M. Carnevale, G. J. Bouma. 2011. MiRNAs within the ovarian follicle: Identification of cell-secreted vesicles as miRNA carriers. *Biol Reprod* 85 (1 Supplement) 207.

Sessions, D. R., J.C. Da Silveira, B.D.L. Rodrigues, Q.A. Winger, G.J. Bouma, and E.M. Carnevale. 2010. Effect of aging and oocyte maturity on mRNA content of maternal effect genes in the equine oocyte and early ICSI derived embryos. The Rocky Mountain Reproductive Sciences Symposium.

Sessions, D. R., J.C. Da Silveira, B.D.L. Rodrigues, Q.A. Winger, G.J. Bouma, and E.M. Carnevale. 2010. Effect of aging and oocyte maturity on mRNA content of maternal effect genes in the equine oocyte and early ICSI derived embryos. Colorado State University Biomedical Sciences Research Retreat.

Sessions, D. R., E. M. Woodward, B. P. Fitzgerald. 2010. Relationship between elevated insulin and matrix metalloproteinases-2 and -9 and their inhibitors in equine granulosa cells *in vivo*. The Tenth International Symposium on Equine Reproduction. *Animal Reproduction Science* 2010, Vol 121, Supplement 1-2. Abstr 40.

Fitzgerald, B. P., **Sessions, D. R.**, and Vick M. M. 2008. Obesity and reproduction in the mare. In: The chronically infertile mare (Abstract book). The Havemeyer Foundation: page 23.

Sessions, D. R., M. M. Vick, B. P. Fitzgerald. 2007. Expression of MMP-2, -9 and TIMP-2 in equine granulosa cells and the impact of elevated insulin *in vitro*. Fortieth Annual Meeting of the Society for the Study of Reproduction. Abstr. 319.

Sessions, D. R., M. M. Vick, B. P. Fitzgerald. 2007. The effect of insulin on MMP and TIMP expression in equine granulosa cells. Nineteenth World Congress on Fertility and Sterility. POS-128. International Convention Center, Durban, South Africa.

Murphy, B. A., M. M Vick, **D. R. Sessions**, R. F. Cook, B. P. Fitzgerald. 2007. Molecular evidence of immune-circadian interaction in the horse. Program Number P602. San Diego, CA: Plant & Animal Genomes XV Conference.

Murphy B. A., M. M. Vick, **D. R. Sessions**, R. F. Cook, B. P. Fitzgerald. May 2006. Acute systemic inflammation induces upregulation of circadian clock genes *Per2* and *Bmal1* in equine peripheral blood. Proc Soc Res Biol Rhythms Tenth Mtg Abstr 221. Destin, FL.

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- Murphy, B. A., M. M. Vick, **D. R. Sessions**, R. F. Cook, B. P. Fitzgerald. 2006. Investigation of the equine molecular clock in a fibroblastic cell line, adipose tissue and peripheral blood. Program Number P600. San Diego, CA: Plant & Animal Genomes XIV Conference.
- Vick, M. M., **D. R. Sessions**, B. A. Murphy, and B. P. Fitzgerald. Sept 2005. Inflammation, insulin resistance and laminitis: Does adipose tissue play a role? Waltham International Nutritional Sciences Symposium on Equine Laminitis. Omni Shorum Hotel, Washington D.C.
- Murphy, B. A., R. F. Cook, M. M. Vick, **D. R. Sessions**, B. P. Fitzgerald. 2005. Oscillating expression of core clock genes in the horse. Program Number 60.15. Washington, DC: Society for Neuroscience, 2005. Online.
- Kennedy, E. L., M. M. Vick, **D. R. Sessions**, S. E. Reedy, B. A. Murphy, and B. P. Fitzgerald. 2004. Administration of cortisol suppresses the preovulatory rise in LH but does not inhibit ovulation. *Biology of Reproduction Suppl.* 70 (1):Abstr 360.
- Vick, M. M., **D. R. Sessions**, S. E. Reedy, B. A. Murphy, E. L. Kennedy, B. P. Fitzgerald. 2003. Development of a model for treating insulin resistance in mares. *Journal of Animal Science* 81 (Suppl. 1), Abstr 286.
- Fitzgerald, B. P., S. E. Reedy, **D. R. Sessions**, M. M. Vick, B. A. Murphy. 2003. Obesity disrupts the duration of the estrous cycle in the mare. *Journal of Animal Science* 81 (Suppl. 1):Abstr 406.
- Reedy, S. E., M. M. Vick, **D. R. Sessions**, B. A. Murphy, E. L. Kennedy, and B. P. Fitzgerald. 2003. Induction of an inflammatory response by administration of lipopolysaccharide in the horse is unaccompanied by changes in leptin. *Biology of Reproduction Suppl.* 68 (1):Abstr. 615.
- Vick, M. M., S. E. Reedy, B. A. Murphy, **D. R. Sessions**, E. L. Kennedy, B. P. Fitzgerald. 2003. Induction of insulin resistance in the horse by administration of LPS: Possible role of TNF- α . *Biology of Reproduction Suppl* 68 (1):Abstr. 614.
- Sessions, D. R.**, S. E. Reedy, M. M. Vick, B. P. Fitzgerald. 2002. Development of a model for inducing insulin resistance in mares: Implications regarding the duration of the estrous cycle. Thirty-Fifth Annual Meeting of the Society for the Study of Reproduction. *Biology of Reproduction Suppl.* 66(1):339-340.
- Powell, D. M., B. P. Fitzgerald, S. E. Reedy, **D. R. Sessions**. 2002. Effect of short-term exercise training on insulin sensitivity in obese and lean horses. *Sixth International Conference on Equine Exercise Physiology*.
- Fitzgerald, B. P., D. M. Powell, S. E. Reedy, **D. R. Sessions**. 2001. Evidence that obesity and associated insulin resistance in mares does not account for the continuation of estrous cycles during the non-breeding season. *Biology of Reproduction Suppl.* 64(1):Abstr 626.

ORAL PRESENTATIONS

- Age-associated alterations in granulosa cell transcript abundance in equine preovulatory follicles. Havemeyer Symposia: Comparative Aspects of Reproductive Aging in the Mare and Woman. Estes Park, CO. October 10-12, 2014.

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Alterations in the equine oocyte and follicle associated with obesity and metabolic syndrome. 2014.
Eleventh International Symposium on Equine Reproduction. Hamilton, New Zealand.

Techniques used to enhance fertility in horses and applications in other species. August 2012. Merial-NIH
National Veterinary Scholars Symposium. Loveland, CO.

Effects of aging and metabolic status on the equine ovarian follicle. February 2012. Animal Reproduction
and Biotechnology Laboratory Seminar Series, Department of Biomedical Science, College of
Veterinary Medicine, Colorado State University, Fort Collins, CO.

The impact of insulin on the matrix metalloproteinase system during equine follicular development and
atresia. July 2009. Equine Reproductive Lab, Department of Biomedical Science, College of
Veterinary Medicine, Colorado State University, Fort Collins, CO.

The impact of insulin on the matrix metalloproteinase system during equine follicular development and
atresia. September 2008. Departmental Seminar, Maxwell Gluck Equine Research Center,
University of Kentucky, Lexington, KY. PhD defense.

The role of insulin in follicular maturation and development in the mare. January 2008. Department of
Reproductive Sciences, Conservation and Research Center, Smithsonian Institute. Front Royal,
VA.

Operation Oocyte Freedom: The Role of Insulin in Follicular Maturation and Ovulation. December 2007.
Forum for Reproductive Sciences. University of Kentucky, Lexington, KY.

Development of a model for inducing insulin resistance in mares: Implications regarding the duration of
the estrous cycle. August 2003. Departmental Seminar, Maxwell Gluck Equine Research Center,
University of Kentucky, Lexington, KY. MS thesis defense.

Insulin resistance: Development of a model and implications to reproduction. November 2001.
Departmental Seminar, Maxwell Gluck Equine Research Center, University of Kentucky,
Lexington, KY.