

BIOGRAPHICAL SKETCH**NAME:** Ortega Obando, Martha Sofia**eRA COMMONS USER NAME** (credential, e.g., agency login): ortegaobando**POSITION TITLE:** Assistant Professor**EDUCATION/TRAINING**

INSTITUTION AND LOCATION	DEGREE	COMPLETION DATE	FIELD OF STUDY
Zamorano Agriculture University, Tegucigalpa, Honduras	B.S.	12/2003	Agricultural Sciences
Pontifical Catholic University of Chile, Santiago, Chile	M.S.	07/2011	Animal Sciences
University of Florida, Gainesville, Florida, USA	Ph.D.	12/2016	Animal Molecular and Cellular Biology
University of Missouri, Columbia, Missouri, USA	Postdoctoral Training	08/2019	Reproductive Biology

A. Personal Statement

I have the required training, skills and motivation necessary to successfully complete the proposed research project. My background is in reproductive biology with specific training on bovine early embryonic development and physiological genomics. My program focuses on elucidating paternal and maternal contributions to early embryonic development and placentation, we use approaches such as gene editing, to investigate the effect of reproduction-related genes on development and physiology. As principal or co-investigator on extramural grants, I have substantial expertise for the proposed research. The current application builds on my recent work on paternal contributions to early embryo development. Products of my work in this topic are currently under review or in preparation for publication (4 manuscripts). My expertise and experience in several areas of the proposed project, have prepared me to assist in the completion of this project in a timely manner.

1. Clark KN, **Ortega MS***. Paternal effects on early embryo development in bovine. *Reproduction, Fertility and Development* 2021; 34: 257-258.
2. Fallon L, Clark KN, **Ortega MS***. Paternal contributions to early embryonic stress affect development in the bovine. *Reproduction, Fertility and Development* 2021: 263-264.
3. Lockhart KN, Drum JN, Rizo JA, Balboula AZ, Spinka C, Spencer TE, **Ortega MS***. Sire conception rate and its relationship with preimplantation embryonic development. 2022 *Revision submitted* *Journal of Dairy Science*. (JDS.2022.22558).
4. Fallon L, Hamilton L, Spencer TE, Sutovsky P, Zigo M, **Ortega MS***. The Development of New Biomarkers of Spermatozoa Quality in Cattle. Poster Presentation, 55th Annual Meeting of the Society for the Study of Reproduction 2022; Spokane, WA.

B. Positions, Scientific Appointments, and Honors**Positions and Employment**

Aug. 2022- Assistant Professor, Department of Animal and Dairy Sciences, University of Wisconsin-Madison, Madison, WI
 2019-2022 Assistant Professor, Division of Animal Sciences, University of Missouri, Columbia, MO
 2017-2019 Postdoctoral Fellow, Division of Animals Sciences, University of Missouri, Columbia, MO

2012-2016 Graduate Fellow, Department of Animal Sciences, University of Florida, Gainesville, FL
2009-2011 Graduate Fellow, Department of Animal Sciences, Pontifical Catholic University, Santiago, Chile

Other Experience and Professional Memberships

2020- Associate Editor, Animal Reproduction Science
2020- Associate Editor, CABI Agriculture and Bioscience
2020- Review Editor, Frontiers in Animal Science
2017- Member, Society for the Study of Reproduction
2014- Member, American Dairy Science Association
2013- Member, International Embryo Technology Society

Fellowships

2017-2019 Preparing Future Faculty to Increase Faculty Diversity, Postdoctoral Fellowship, University of Missouri
2018 Wakonse Training Conference on College Teaching
2012-2016 Graduate Fellowship, University of Florida
2009-2011 Chilean International Cooperation Agency, Graduate Fellowship
2008 Norman E. Borlaug Fellow

Awards

2017 Postdoctoral Research Poster Winner, 14th Annual Gilbert S. Greenwald Symposium
2017 Trainee competition runner-up, SSR-ASAS Triennial Reproduction Symposium
2017 Graduate Research Award, Sigma Xi Chapter, University of Florida
2016 Student Research Competition runner up, International Embryo Technology Society.

C. Contributions to Science

(*) Corresponding author

1. During the last five years I've been working on elucidating the male's role on early pregnancy establishment/loss. First, defining critical periods where male exert effects on pregnancy including fertilization, formation of an embryo, and placenta formation. Our preliminary data indicates that sperm of low fertility males do have effects on early embryo development beyond fertilization that result in early embryonic arrest and loss. In addition, placental-specific products also seem to be regulated by sire (Ortega et al 2022) and could help explaining losses during the first month of pregnancy. Moreover, sex specific effects in placenta function were found (Drum et al, 2022). These results have opened many new questions about the sperm role in embryogenesis and placentation. Results from this work have been presented as talks by me or poster and oral presentations by my trainees in scientific meetings including the Society for the Study of Reproduction (2021), International Embryo Technology Society (2020-2022), Brazilian Society of Embryo Transfer (2022). Two scientific manuscripts have been submitted, and two more are being prepared for submission as result of this research.
 - a. Drum JN, Madureira G, Macedo MC, Rosa C, Seneda M, Campos D, Wiltbank MC, Sartori R, **Ortega MS***. Sexual dimorphism of in vitro derived conceptus at day 32 of pregnancy. Front. Anim. Sci. 2022; doi: 10.3389/fanim.2022.807217.
 - b. **Ortega MS***, Rizo JA, Drum JN, O'Neil EV, Pohler KG, Kerns K, Schmelze A, Green JA, Spencer TE. (2022) Development of an improved in vitro model of bovine trophectoderm differentiation. Front. Anim. Sci 2022; <https://doi.org/10.3389/fanim.2022.898808>
 - c. **Ortega MS**, Moraes JGN, Patterson DJ, Smith MF, Behura SK, Poock S, Spencer TE. Influences of sire conception rate on pregnancy establishment in dairy cattle. Biology of Reproduction 2018; ioy141. doi.org/10.1093/biolre/iy141
2. Another area my group has been focused is understanding the role of candidate genes on reproduction with focus on early embryonic development. The CRISPR-CAS9 system has been used as approach to this research. We have validated the mutation responsible for the Holstein Haplotype for Fertility (HH2) which

was previously undefined and will allow improved selection for fertility. Efforts have also been made to clarify which genes in the bovine are responsible for lineage commitment in the early embryo, our results confirmed increased similarities between the bovine and human preimplantation embryo (Ortega et al 2020).

- a. **Ortega MS**, Bickhart DM, Clark KN, Null DJ, Hutchison JL, McClure, Cole JB. (2021) Truncation of IFT80 causes early embryonic loss in cattle. *J. Dairy Sci.* 2022;105(11):9001-9011. doi: 10.3168/jds.2022-21853. Epub 2022 Sep 7.
 - b. **Ortega MS***, Kelleher AM, O'Neil EV, Benne J, Cecil R, Spencer TE. (2020). NANOG is required to form the epiblast and maintain pluripotency in the bovine embryo. *Molecular Reproduction and Development.* 2020; 87:152-160.
 - c. O'Neil EV, Brooks K, Burns GW, **Ortega MS**, Denicol AC, Aguiar LH, Pedroza GH, Benne J, Spencer TE. Prostaglandin-endoperoxidase synthase 2 is not required for preimplantation ovine conceptus development in sheep. *Molecular Reproduction and Development* 2020; 87: 142-151.
3. To increase our understanding of the drivers for preimplantation development, I have also studied how maternally derived molecules regulate preimplantation embryonic competence and improve pregnancy. The goal of this work is to improve fertility and pregnancy outcomes when using assisted reproductive technologies, specifically in vitro embryo production. This research also tackles on improving cryopreservation of embryos that has a direct impact on management strategies for increasing dairy cattle fertility.
- a. Stoecklein KS, Garcia-Guerra A, Duran BJ, Prather RS, **Ortega MS***. Actions of FGF2, LIF, and IGF1 on Bovine Embryo Survival and Conceptus Elongation following Slow-rate Freezing. *Front. Anim. Sci.* 2022; 3:1040064. doi: 10.3389/fanim.2022.1040064.
 - b. Stoecklein KS, **Ortega MS***, Spate LD, Murphy CN, Prather RS. Improved cryopreservation of in vitro produced bovine embryos using FGF2, LIF, and IGF1. *PLoS ONE* 2021; <https://doi.org/10.1371/journal.pone.0243727>.
 - c. Jeensuk S, **Ortega MS**, Saleem M, Hawryluk B, Scheffler TL, Hansen PJ. Actions of WNT family member 5A to regulate characteristics of development of the bovine preimplantation embryo. *Biol Reprod.* 2022; 107:928–944, <https://doi.org/10.1093/biolre/iaoc127>.
 - d. Siqueira LG, Tribulo P, Chen Z, Denicol AC, **Ortega MS**, Negrón-Pérez VM, Kannampuzha-Francis J, Pohler KG, Rivera RM, Hansen PJ. Colony-stimulating factor 2 acts from days 5 to 7 of development to modify programming of the bovine conceptus at day 86 of gestation. *Biol Reprod* 2017; 96:743–757.
4. My doctoral research resulted in validation of the markers in candidate genes associated with three measures of cow fertility. A set of 39 markers have been added to several commercial genotyping arrays and to the markers used for routine national genomic evaluation of dairy cattle. The addition of these markers to the national genetic evaluation system will produce accuracy gains as large as those seen when 320,000 markers from a high-density chip were added. These results translate directly to increase genetic gain and higher fertility in the dairy herd.
- a. **Ortega MS**, Denicol AC, Cole JB, Null DJ, Hansen PJ. Use of single nucleotide polymorphisms in candidate genes associated with daughter pregnancy rate for prediction of genetic merit for reproduction in Holstein cows. *Anim Genet* 2016; 47:288–297.
 - b. **Ortega MS**, Denicol AC, Cole JB, Null DJ, Taylor JF, Schnabel RD, Hansen PJ. Association of single nucleotide polymorphisms in candidate genes previously related to genetic variation in fertility with phenotypic measurements of reproductive function in Holstein cows. *J Dairy Sci* 2017; 100:3725–3734
5. Given the potential major impacts of genetic markers on physiology, I performed studies to gain understanding of how single mutations could affect overall cow physiology and preimplantation embryonic development, as well of genetic basis for adaptation to heat stress. Results from this work provide insights in preimplantation development, and candidates for marker assisted selection to improve fertility and adaptation to adverse conditions such a heat stress.
- a. **Ortega MS**, Rocha-Frigoni NAS, Mingoti GZ, Roth Z, Hansen PJ. Modification of embryonic resistance to heat shock in cattle by melatonin and genetic variation in *HSPA1L*. *J Dairy Sci* 2016; 99:9152–9164.

- b. **Ortega MS**, Wohlgemuth S, Tribulo P, Siqueira LGB, Null DJ, Cole JB, Silva D, V M, Hansen PJ. A single nucleotide polymorphism in *COQ9* affects mitochondrial and ovarian function and fertility in Holstein cows. *Biol Reprod* 2017; 96:652–663.
- c. **Ortega MS**, Kurian JJ, McKenna R, Hansen PJ. Characteristics of candidate genes associated with embryonic development in the cow: Evidence for a role for *WBP1* in development to the blastocyst stage. *PLOS ONE* 2017; 12: e0178041.
- d. Dikmen S, Wang X-Z, **Ortega MS**, Cole J, Null D, Hansen P. Single nucleotide polymorphisms associated with thermoregulation in lactating dairy cows exposed to heat stress. *J Anim Breed Genet* 2015; 132:409–419.

Complete List of Published Work [29 research articles, reviews and book chapters; h-index = 16 (All) 15 (Since 2017)]: <https://www.ncbi.nlm.nih.gov/myncbi/18sYkbgKsFjwjo/bibliography/public/>

D. Research Support

Ongoing Research Support

1. USDA-AFRI 2022-67015-36371 Animal reproduction Ortega (PD) Period 2022-2024
Genetic contributions of the female to oocyte competence and embryo development in dairy cattle.
PD: M.Sofia Ortega (University of Wisconsin); Co-PD: Milo Wiltbank (University of Wisconsin), Ahmed Z. Balboula (University of Missouri)
2. USDA-AFRI 2022-67015-36301 Animal Reproduction Balboula (PD) Period 2022-2027
Improving the quality of preimplantation bovine embryos by regulating cathepsins.
PD: Ahmed Z. Balboula; CO-PD: M.Sofia Ortega (University of Wisconsin), Rocio M. Rivera (University of Missouri), Michael F. Smith (University of Missouri)
3. USDA-AFRI 2022-67015-37086 Nutrition and Lactation Meyer (PD) Period 2021-2026
Maternal versus fetal effects on partitioning of nutrients and their effects on epigenomic regulation.
PD: Allison M. Meyer (University of Missouri), Co-PD: Rocio M. Rivera (University of Missouri), M.Sofia Ortega (University of Wisconsin)
4. USDA-AFRI 2021-67015-33675 Animal Reproduction Pohler (PD) Period 2020-2023
Physiological Function of Prostaglandins and Pregnancy Associated Glycoproteins in Late Embryonic Mortality in Cattle.
PD: Ky G. Pohler; Co-PD: M.Sofia Ortega (University of Wisconsin), Jonathan Green (University of Missouri)