

NC1201 ACCOMPLISHMENTS REPORT

Project Number: NC1201

Project Title: Methods to Increase Reproductive Efficiency in Cattle

Period Covered: 2025–2026

Date of Report: 08/06/2026

Annual Meeting Dates: 06/10/2026 to 06/11/2026

MEETING PARTICIPANTS: George Smith – Administrative Advisor; Victor Gomez-Leon and Nicholas Wege Dias – Kansas State University; Pedro Fontes – University of Georgia; Felipe Carvalho da Silva – North Carolina State University; Fabio S. Lima – University of California-Davis; Rick N. Funston – University of Nebraska; Paul M. Fricke – University of Wisconsin-Madison; J. Richard Pursley – Michigan State University; George Perry – Texas A&M University; Jordan M. Thomas – University of Missouri.

BRIEF SUMMARY OF MINUTES OF ANNUAL MEETING

The 2026 Annual Meeting was held at Michigan State University in East Lansing, Michigan. The meeting included station reports, a USDA-NIFA update, discussion of new collaborative opportunities, and a tour of the Michigan State University Dairy. The group reviewed research accomplishments from 2025–2026. NC1201 collaborations focused on refinement of reproductive management programs, validation of reproductive tools under field conditions, and identification of mechanisms contributing to reproductive success or failure. The upcoming NC1201 renewal was also discussed. Nicholas Dias will lead the renewal effort, with assistance from beef and dairy members. Pedro Fontes volunteered to assist based on experience with the previous renewal. Recruitment of additional participants was also discussed. The group unanimously approved moving future annual meetings to an in-person-only format. The 2027 annual meeting will be held June 16–17 in Columbia, Missouri, hosted by the University of Missouri. Jordan Thomas will serve as president and Felipe Carvalho da Silva will serve as secretary. Kamilah Grant provided an update on staffing and organization within NIFA.

ACCOMPLISHMENTS

Objective 1: Increase the efficiency and predictability of sustainable reproductive technologies and management programs for cattle

- Increasing gonadorelin from 100 to 200 µg at the first GnRH treatment of breeding Ovsynch increased LH release, ovulatory response, and first-service pregnancy per AI. The study was conducted across commercial dairies in California and Wisconsin and provides a practical refinement to an established fertility program. **(CA, WI).**
- Presynchronization with PGF2α before a 5-day CIDR-Synch protocol decreased progesterone and increased ovulatory response at initiation of the protocol but did not increase pregnancy per AI in dairy heifers. Inclusion of the progesterone insert decreased early estrus and increased pregnancy per AI to timed AI with sex-sorted semen. **(WI, KS).**
- A simplified dairy fertility program produced overall pregnancy per AI similar to Presynch-Ovsynch. The distribution of estrus-based and timed inseminations differed from that

expected, identifying areas for further refinement before broad application in large commercial dairies. (KS, TX, WI).

- Extending proestrus in dairy embryo-transfer recipients increased estrus expression and reduced pregnancy loss between the 39- and 80-day pregnancy diagnoses. Recipient utilization was unchanged. (KS, NY).
- Work toward development of an injection-only synchronization protocol for beef cows using hCG: hCG effectively induced corpus luteum formation when used during presynchronization without an exogenous progesterone insert. Pregnancy rates following timed AI at 66 h were not optimized in the no-CIDR treatment, and additional work is needed to refine insemination timing and the protocol. (MO, TN).
- Reproductive tract score and anogenital distance were evaluated in 1,262 beef heifers across four states. Reproductive tract score predicted pregnancy to timed AI, whereas anogenital distance did not after accounting for body weight. These data support reproductive tract score as a prebreeding selection tool and do not support anogenital distance as a stand-alone fertility measure. (KS, TN, NC).
- Collaborative work with multi-sire semen was expanded to compare fresh and frozen multi-sire and single-sire semen in commercial beef heifers. The ongoing study is testing whether fresh multi-sire semen can improve consistency and pregnancy success relative to single-sire and frozen multi-sire treatments. (NE, MO).

Objective 2: Evaluate mechanisms that regulate reproductive processes impacting production efficiency in cattle

- Research on paternal nutrition progressed from effects on the bull and semen to post-fertilization development. Overnutrition of young bulls reduced cleavage and blastocyst development and tended to reduce day-15 conceptus length. Follow-up evaluation found no detectable treatment effects on major fetal morphometric measures during the first trimester, although pregnancies from high-gain sires had larger amniotic vesicles. (GA, TN; **collaboration with FL**).
- Preliminary collaborative data indicated that vaginal fluid from estrous and CIDR-vaginitis-positive cows better preserved progressive sperm motility ex vivo. Significant between-season variation emphasizes the need for additional within-bull replication. (KS, TN).
- Studies of prebreeding vaccination identified immune and endocrine responses associated with abnormal reproductive cycles. Modified-live vaccines containing IBR antigen altered cytokine concentrations and negatively affected luteal function, while companion work evaluated cortisol responses during the first 11 days after vaccination. (TX, USDA-ARS NE).
- Ongoing collaborative work is evaluating relationships among estrus intensity and duration, periovulatory estradiol and progesterone, ovarian dynamics, and endometrial expression of reproductive receptors in synchronized dairy heifers. (KS, TX, OH).

Objective 3: Disseminate reproductive management information to stakeholders to improve sustainability of cattle enterprises

NC1201 members continued Extension and scientific programming for producers, veterinarians, students, and industry personnel. Programs included artificial insemination and reproductive management schools, dairy fertility workshops, producer meetings, webinars, podcasts, and scientific presentations. Several programs documented short-term outcomes. In North Carolina, 96.3% of participants in artificial insemination training were very satisfied with the program; 61%

planned to develop a reproductive management program and 52% planned to incorporate estrous synchronization and AI. Kansas Dairy Fertility Roundtables conducted with Paul Fricke and J.P. Andrade reached stakeholders representing approximately 70% of the Kansas dairy herd.

Plans for the coming year: NC1201 will complete ongoing multistate studies, develop new collaborations identified during the annual meeting, and prepare the project renewal during fall 2026. The renewal will emphasize progress resulting from multistate collaboration, continued relevance of project objectives, and the distinct contribution of NC1201 to cattle reproductive research and Extension.

IMPACTS

NC1201 research continued to improve the precision and practical application of reproductive technologies. Multistate studies identified a low-cost modification to breeding Ovsynch that improved ovulatory response and fertility, clarified the role of progesterone during synchronization of dairy heifers, and identified management of proestrus as a means of reducing pregnancy loss in embryo-transfer recipients. In beef cattle, collaborative work advanced development of an injection-only synchronization approach using hCG, continued evaluation of multi-sire semen, and provided large-scale validation of reproductive tract score as a useful prebreeding selection tool. Mechanistic studies also identified effects of paternal nutrition on embryo development and immune and endocrine responses associated with vaccination and impaired luteal function. Extension programs produced measurable gains in knowledge and intent to adopt reproductive technologies and reached producers, veterinarians, students, and industry personnel responsible for large numbers of beef and dairy cattle.

SELECTED LEVERAGED FUNDING

- Lima, F.S. USDA-NIFA Animal Reproduction. *Unraveling nerve growth factor- β role on the hypothalamic-pituitary-ovarian axis in cattle.* **\$650,000; 2023–2027.**
- Pursley, J.R. Michigan Alliance for Animal Agriculture. *Effect of sexed vs. conventional semen on pregnancy losses following transfer of in vitro produced embryos in dairy cows.* **\$150,000; funded 2026.**
- Pursley, J.R. Michigan Alliance for Animal Agriculture. *Optimizing Early Pregnancy Diagnosis in Dairy Cattle with PAGs and Ultrasound to Improve Farm Profitability.* **\$150,000; active 2026.**
- Perry, G.A. and T.H. Welsh. USDA Animal Health and Disease Research. *Immunological Mechanisms Linking Pre-Breeding Vaccination to Negative Impact of Vaccines on Beef Cattle Production.* **\$90,000; 2025–2027.**
- Rosasco, S., S.M. Zoca, and G.A. Perry. Western SARE. *Influence of nutritional management and pulmonary hypertension risk on fertility in developing beef bulls.* **\$300,000; 2025–2028.**
- Courter, J.T., J.M. Thomas, and J.R.V. Franken. USDA-NIFA AFRI – Critical Agricultural Research and Extension. *Stacking the Use of Modern Genomic and Sex-Selection Technologies to Increase Adoption of Rotational Breeding Systems for Beef Cattle.* **\$299,440; 05/01/2026–04/30/2029.**

PEER-REVIEWED PUBLICATIONS (*COLLABORATIVE EXAMPLES SELECTED*)

- Fontes, P.L.P., D.B. Davis, L. Melo-Gonçalves, S. Burato, M.S. Smith, A. Stelzlzeni, F.F. Fluharty, R.L. Stewart Jr., R.F. Cooke, J.J. Bromfield, A. Else-Keller, K. Kerns, L. Strickland, and S.M. Zoca. 2026. Overnutrition induced metabolic dysregulation and partially decreased semen quality in young beef bulls. *J. Anim. Sci.* 104:skag004. doi:10.1093/jas/skag004.
- Tariq, A., L. Melo-Gonçalves, T.S. Maia, Q.A. Hoorn, D.B. Davis, S.M. Zoca, R.L. Stewart Jr., P.L.P. Fontes, and J.J. Bromfield. 2026. Overnutrition of young bulls delays in vitro embryonic development and decreases embryo quality. *Biol. Reprod.* 114(1):102–115. doi:10.1093/biolre/ioaf216.
- Lima, F.S., R.G.S. Bruno, R.M. Cleale, F. Silvestre, R. Wallace, T.H. Short, G. Peña, D.B. Melo, T.C. Marques, W.M. Coelho Jr., S. Salman, M.C.G.M. Silva, R. Martinez, P.J.L. Monteiro, and M.C. Wiltbank. 2026. Increasing gonadorelin hydrochloride dose at the first GnRH of breeding Ovsynch enhances luteinizing hormone release, ovulatory response, and pregnancy in first-service lactating dairy cows. *J. Dairy Sci.* 109(7):7523–7535. doi:10.3168/jds.2025-27334.
- Rocha, C.C., M.B.C. Maldonado, F.S. Mesquita, A. Bennett, A. Waheed, G.R. Mendina, G.L. Dasqueve, F.A.C.C. Silva, M.F.G. Nogueira, A.D. Ealy, T. Hansen, and M. Binelli. 2026. Fertility classification of the cow and peri-estrus sex-steroid hormones is associated with endometrial epithelial cell responses to conceptus and inflammatory signals. *Cell Tissue Res.* 403(3):32. doi:10.1007/s00441-026-04058-5.

REFEREED ABSTRACTS AND OTHER PUBLICATIONS (*COLLABORATIVE EXAMPLES SELECTED*)

- Brown, W.M., V.E. Gomez-Leon, M. Schultz, I. Martinez Keller, A. Sarmiento, M.R. Lauber, and P.M. Fricke. 2026. Effect of presynchronization with PGF2 α 2 days before a 5-day CIDR synch protocol with and without a CIDR insert on early expression of estrus and pregnancy outcomes in nulliparous dairy heifers. *Proceedings of the International Congress on Animal Reproduction*, Obihiro, Japan. (WI, KS).
- Christenson, D., J. Thomas, D. Kelly, and R. Funston. 2026. Artificial insemination of beef heifers with multi-sire semen. *Nebraska Beef Cattle Report*. University of Nebraska-Lincoln. MP 1255:7–8. (NE, MO).