



Researchers in 23 states.

Improving Reproduction in Cattle & Sheep



Project area includes 70% of breeding ewes, 56% of breeding cows in the U.S.



Gains in calf or lamb production worth at least \$1 billion per year to U.S. producers.

THE CHALLENGE

Reproductive inefficiency is the greatest constraint on the profitability of U.S. livestock systems. Early pregnancy loss alone costs U.S. livestock producers up to \$3.7 billion each year. If reproductive efficiency is not improved, producers will continue to face serious losses, and consumers may experience lower supplies and higher prices for meat, dairy, and other goods from cattle and sheep.

Reproductive efficiency is influenced by a wide variety of factors related to animal health, physiology, genetics, hormones, nutrition, environment, and management practices. No single institution has the expertise, facilities, or resources to address reproductive inefficiency across different species, environments, and production systems.



THE MULTISTATE APPROACH

Since 1970, researchers at land-grant institutions have worked together to shed light on factors that influence the reproductive performance of cattle and sheep and provide data-driven solutions. Their discoveries and recommendations have reshaped livestock industry practices, delivering measurable gains in productivity and resilience.

Using federal capacity funding to bring researchers together, this Hatch Multistate project is able to:

- **Address complex issues** more thoroughly than a single researcher, facility, or state.
- **Share expertise across disciplines**, including physiology, molecular biology, immunology, nutrition, biostatistics, and livestock management.
- **Span multiple species and regions.** Over 56% of U.S. breeding cows and 70% of breeding ewes are in states represented by project scientists. A wide reach allows more comprehensive data collection and testing of solutions.
- **Provide continuity** that facilitates long-term research and impact.
- **Collaborate effectively** with federal agencies and international organizations.
- **Leverage competitive grants** by demonstrating established teams with track records of productivity.

Led by land-grant institutions, this project:

- **Integrates research and Extension** to ensure knowledge flows both ways between labs and farms.
- **Educates and trains the next generation** of scientists and producers, supporting the workforce pipeline.

PROJECT HIGHLIGHTS

Discoveries are reshaping industry practices and improving calf and lamb production.

- Bull screening programs can now screen for the mutation that causes HH2, a genetic condition in Holstein dairy cows linked to early embryonic loss. Screening is enabling phaseout of HH2 from Holstein bull pools, reducing embryonic loss across the nation's most popular dairy breed.
- SLICK-genotype bulls, which have greater tolerance to heat, are now commercially available to producers in warm regions worldwide.
- The Open Cow Test is now deployed across beef and dairy systems nationally. The test detects non-pregnancy earlier, enabling producers to re-breed open cows 2 to 3 weeks sooner than conventional methods. Shortening the time between calving improves herd productivity.
- Research on the genetics of puberty status may allow easier identification of heifers with genetically delayed puberty, allowing producers to cull these heifers sooner and save up to \$2,500 per heifer in development costs.
- Using validated artificial insemination synchronization protocols, producers can increase pregnancy rates and yield up to 25% more calves.
- Commercial artificial insemination laboratories are piloting deep-learning algorithms that analyze sperm images for specific biomarkers in order to improve sire selection and reduce embryonic loss due to subfertile sires.
- Research identified new molecular targets for improving reproductive longevity.
- Findings have changed gestational nutrition guidelines for livestock.

Research results and recommendations are delivered directly to stakeholders.

Project members share research findings to producers, veterinarians, and other stakeholders through Extension publications, workshops, webinars, and meetings. Hands-on reproductive management workshops in multiple states have led to annual returns of \$1,000 to \$5,000 per ranch.

Project members are advancing the field.

Methodological tools developed by project members are now publicly accessible resources for the global research community. Project members have authored over 340 peer-reviewed journal articles and multiple book chapters in recent years.

Education and training sustain a national pipeline of scientists.

Project members taught and trained more than 120 graduate students and postdoctoral scholars and helped students secure fellowships with federal agencies and industry associations. Project members also developed artificial insemination tools that have benefited instructor lesson plans and students in Kansas, Kentucky, and Nebraska.

ECONOMIC IMPACT

A 1% improvement in calf or lamb production due to this project's innovations (a conservative estimate) would be worth over \$1 billion annually to U.S. producers. Thriving beef, dairy, and sheep industries are important for the economy. These industries generate about \$243 billion in total production value and support 2.3 million jobs.

BEYOND LIVESTOCK

Many discoveries have broader relevance. This project has attracted over \$4 million in National Institutes of Health funding, forming a bridge between federally funded agricultural research and human biomedical science. Findings have informed perinatal medicine, revealed links to endometrial cancer suppression, and improved understanding of and possible therapies for PMOS (formerly called PCOS, a leading cause of infertility in women).



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