

United States Department of Agriculture
Project Initiation

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Project Title

F.U.S.E. Animal Science - Fellowship for Undergraduate Scientific Exchange in Animal Science

Project Details

Sponsoring Institution National Institute of Food and Agriculture	Project Status ACTIVE
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Program Code [A7401] Research and Extension Experiences for Undergraduates	

Project Director

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Recipient Organization

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Performing Department

(N/A)

Non Technical Summary

U.S. agriculture depends on a skilled workforce that can both generate new knowledge and apply it in real-world settings, yet many undergraduate students receive training in research or Extension, but not both. This gap limits workforce readiness at a time when agriculture faces increasing challenges related to food security, resilience, animal health, and rural economic vitality. The FUSE (Fellowship for Undergraduate Scientific Exchange) Animal Science Fellowship Program addresses this need by preparing undergraduate students with hands-on experience that connects scientific research directly to agricultural practice. By strengthening the pipeline of well-trained animal science professionals, the program supports not only agriculture, but also local communities, economies, and food systems that rely on a resilient and innovative workforce. The project will train undergraduate students through mentored research, farm-based experiences, and Extension activities that translate science into practical solutions for producers and stakeholders. Students will work in laboratories, on farms, and alongside Extension professionals to

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collect data, analyze results, and communicate findings in ways that are useful to farmers, industry, and the public. They will also receive professional development and networking opportunities to prepare them for careers in agriculture, industry, graduate education, and public service. The ultimate goal of this project is to develop a new generation of animal science professionals who are better prepared to solve complex agricultural challenges, support food production, and strengthen the long-term resilience of U.S. agriculture for the benefit of producers, communities, and consumers.

Animal Health Component

Animal Health Component: 20%

Research Effort Categories

Basic	40%
Applied	40%
Developmental	20%

Classification

Knowledge Area (KA)	Subject of Investigation (SOI)	Field of Science (FOS)	Percent
315	3910	1060	10%
305	3910	1020	16%
303	3910	1080	16%
302	3910	1010	16%
301	3910	1020	16%
307	3910	1060	10%
311	3910	1103	16%

Knowledge Area

[315] Animal Welfare/Well-Being and Protection

[305] Animal Physiological Processes

[303] Genetic Improvement of Animals

[302] Nutrient Utilization in Animals

[301] Reproductive Performance of Animals

[307] Animal Management Systems

[311] Animal Diseases

Subject Of Investigation

[3910] Cross-commodity research--multiple animal species

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Field Of Science

[1060] Biology (whole systems)

[1020] Physiology

[1080] Genetics

[1010] Nutrition and metabolism

[1103] Other microbiology (includes protozoology, phycology, etc.)

Keywords

Animal Science, Extension, Fellowship, Research, Undergraduate, Mentorship, Fuse, Scientific Exchange

Goals / Objectives

The major goal of the FUSE Animal Science Fellowship Program is to strengthen the U.S. agricultural workforce by preparing undergraduate students for careers in animal science through integrated research and Extension training. The program is designed to develop well-rounded, workforce-ready graduates who possess cross-functional technical skills, experience with emerging agricultural technologies, and the ability to translate scientific knowledge into practical applications for producers, industry, and communities. By intentionally combining hands-on research, Extension engagement, mentorship, and professional development, FUSE Animal Science addresses a critical gap in undergraduate training and builds capacity for future leaders in animal science and agriculture. Objectives: Ignite future careers in animal science through cross-functional skill development. Provide experiential learning opportunities that include significant research and Extension components in animal sciences to develop exceptional animal science candidates for the future agricultural workforce. Provide experiences in innovative agricultural technologies such as robotics/automation in livestock production and livestock gene editing/genomics. Promote science communication through conference/Extension activities, professional development, and professional networking.

Project Methods

Project Methods, Efforts, and Evaluation The FUSE Animal Science Fellowship Program employs a structured, objective-driven training model that integrates undergraduate research, Extension engagement, and professional development to prepare students for careers in animal science and agriculture. Program methods are designed as a sequenced pathway in which student activities build progressively from foundational training to applied research and Extension practice, culminating in professional dissemination and workforce readiness. A defining feature of the program is the intentional alignment of student activities with project objectives, ensuring that each research, Extension, and professional development experience directly contributes to measurable outcomes in knowledge, action, and condition. This integrated approach represents a significant departure from traditional undergraduate research programs by fully embedding Extension, mentorship, and workforce preparation alongside scientific training. The FUSE Animal Science Fellowship Program employs an integrated, cohort-based training model that combines rigorous scientific research methods with applied Extension practice to prepare undergraduates for the modern agricultural workforce. Fellows are embedded in established research and Extension programs and are assigned to one of six defined animal science focus areas: animal nutrition; livestock production with robotics and automation; livestock gene editing and genomics; animal disease, immunology, and parasitism; animal welfare; or animal reproduction. Within each focus area, fellows engage in hypothesis-driven research, applied field studies, and systems-based assessments using discipline-appropriate scientific methods and standardized animal science protocols. A defining and unique feature of FUSE is the intentional and structured integration of Extension methodology alongside research training. Each fellow is supported by a four-member mentoring team consisting of two faculty mentors (one research-focused and one Extension-focused), a graduate student mentor, and a County Extension Agent. This team-based approach ensures that research findings are translated into practical outputs through Extension publications, producer-focused materials, demonstrations, and outreach events. Fellows actively

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engage in farm visits, production site evaluations, and Extension programs to understand stakeholder needs and apply scientific knowledge in real-world agricultural settings. The program follows a structured annual timeline that includes in-person and virtual modules, a summer-long intensive research and Extension experience, and dissemination of results at national venues such as the American Society of Animal Science Annual Meeting and the FUSE Animal Science Conference. Throughout the program, fellows are trained to interpret and communicate results to scientific, Extension, industry, and public audiences, reinforcing applied problem-solving and science communication skills. This dual emphasis on research excellence and Extension application represents a significant departure from traditional undergraduate research experiences and is central to the program's workforce-focused design.

Objective 1: Ignite future careers in animal science through cross-functional skill development. To address this objective, undergraduate fellows are embedded within active research and Extension programs and assigned to defined animal science focus areas. Students begin with foundational training in laboratory safety, animal handling and welfare, research ethics, and Extension principles, followed by hands-on participation in ongoing projects. This early immersion establishes career awareness while building baseline technical and professional skills.

Objective 2: Provide experiential learning through integrated research and Extension activities. Students engage in hypothesis-driven research, applied field studies, and on-farm activities using established animal science methodologies. Activities include experimental setup, biological and production data collection, laboratory analyses, data management, and statistical analysis. In parallel, fellows work with Extension faculty and County Extension Agents to participate in farm visits, production site evaluations, stakeholder interactions, and development of Extension publications. This coordinated approach ensures that students understand both the generation of scientific knowledge and its application in real-world agricultural systems.

Objective 3: Expose students to innovative technologies relevant to modern animal agriculture. Within their research and Extension activities, fellows receive direct exposure to emerging technologies such as genomics, automation, precision livestock tools, and advanced animal health and management practices. Students learn not only how these technologies are used, but also how to evaluate their effectiveness, limitations, and relevance to producers and industry.

Objective 4: Strengthen science communication and professional readiness. As students progress, emphasis shifts toward interpretation and communication of results. Fellows prepare scientific abstracts, posters, Extension materials, and oral presentations, receiving iterative feedback from mentors. Students present their work at professional venues, including the American Society of Animal Science Annual Meeting, and participate in a capstone FUSE Conference. These activities reinforce applied problem-solving, professional communication, and networking skills essential for workforce readiness.

Across all objectives, student activities follow a scaffolded model that moves from guided participation to independent contribution. This objective-driven sequencing represents a significant departure from traditional undergraduate research experiences by fully integrating research, Extension, and professional development into a cohesive training pathway, ensuring that students achieve measurable outcomes aligned with the goals of the project.

Efforts supporting these target audiences include structured undergraduate research experiences in laboratory, field, and on-farm settings; Extension and outreach activities such as farm visits, demonstrations, Extension publications, and stakeholder engagement; and professional development programming including workshops, mentoring, networking, and conference participation. Additional efforts include formal and informal instruction in research methods, data analysis, scientific communication, and Extension practice; development of training materials and curricula; experiential learning through internships and mentoring teams; and dissemination of results through professional meetings, webinars, and online resources.

Project Evaluation Evaluation is an integrated component of the FUSE Animal Science Fellowship Program and will be used to measure progress toward project outcomes and impacts. A mixed-methods approach will be employed, combining quantitative and qualitative data to assess changes in student knowledge, actions, and workforce readiness. Evaluation activities will occur throughout the project period and support both formative improvement and summative assessment. Quantitative evaluation data will include the number of students recruited, retained, and completing the fellowship; participation in research, Extension, and professional development activities; and production of research presentations, Extension publications, and outreach products. Pre- and post-assessments will measure gains in research skills, Extension knowledge, scientific literacy, and professional competencies. Qualitative data will be collected through student surveys, mentor feedback, and reflective assessments.