Managing Arthropod Pests in Animal Agriculture

Flies, ticks, and other arthropods are serious pests in animal agriculture. They can damage skin, cause inflammation and allergic reactions, and transmit disease-causing pathogens. Flies, in particular, are responsible for billions of dollars in damage and control costs each year in the United States. Losses and costs experienced by producers are often passed along to consumers as higher prices. In addition, movement of these pests from agricultural settings to nearby communities has resulted in lawsuits, zoning limitations, and animosity between farmers and residents. Controlling arthropod pests is increasingly challenging due to emerging pests, insecticide resistance, environmental changes, and changing livestock management practices.

Scientists from land-grant universities across the U.S. are working together to understand how arthropod pests interact with animal agriculture systems so they can identify economically and environmentally sustainable ways to protect livestock and humans and ensure a safe, secure food supply.

The multistate approach is essential.

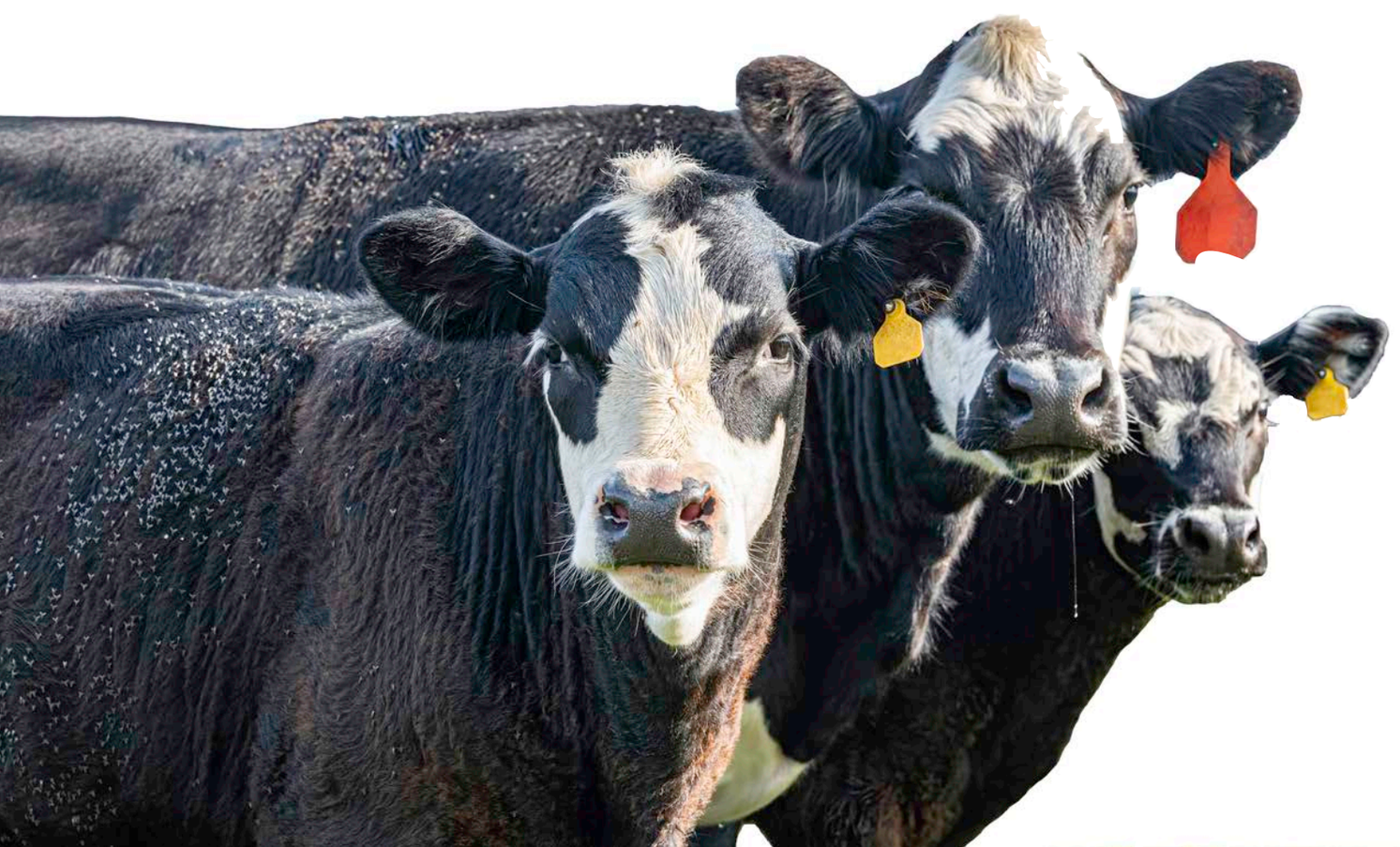
Few states have more than one veterinary entomologist; many states have none. In recent years, the number of research, teaching, and Extension personnel who work with animal production has declined. As part of this multistate project, academic, government, and industry scientists from across the country can easily share ideas, tools, data, and other resources, coordinate activities, and deliver solutions to the communities who need them. This collaboration drives innovation, minimizes effort duplication, and maximizes impact.

S1076: Arthropod Management in Animal Agriculture Systems and Impacts on Animal Health and Food Security is supported in part by USDA NIFA through Hatch Multistate Research Fund allocations to participating State Agricultural Experiment Stations at land-grant universities. The project is also supported by additional partners and funding sources. Participating institutions include: Auburn University, University of Arkansas, University of California, Riverside, Cornell University, University of Florida, University of Georgia, University of Houston, Kansas State University, University of Kentucky, University of Manitoba, University of Nebraska, New Mexico State University, Pennsylvania State University, University of Tennessee, Texas A&M AgriLife Research, USDA-ARS.
Learn more: https://nimss.org/projects/18973

This Impact Statement was produced in 2025 by the Multistate Research Fund Impacts Program, which is supported by agInnovation, the State Agricultural Experiment Stations, and the Hatch Multistate Research Fund provided by the USDA NIFA.
Learn more: mrfimpacts.org

Multistate Research Fund IMPACTS

agInnovation science that feeds the world ® LAND-GRANT UNIVERSITY RESEARCH



Research on the distribution and biology of arthropod pests helps producers target surveillance approaches and select the best pest control tactics and tools. For example scientists:

- Identified key wildlife species that serve as hosts for the invasive Asian longhorned tick and improve their survival and dispersal. *University of Tennessee*
- Showed that the order in which animals are exposed to different tick species affects how the animals respond. *Pennsylvania State University*
- Revealed the distribution patterns of small biting midges in southeastern California and showed how different species respond to various trapping systems. Studies also shed light on the potential role these species play in transmitting pathogens such as vesicular stomatitis virus, which has emerged in California and affected both domestic animals and captive wildlife in several zoo facilities. *University of California, Riverside*

Traditional pest surveillance methods are difficult, so many producers apply pesticides without knowing whether pest thresholds have actually been exceeded. Using pesticides unnecessarily can increase costs for producers and cause non-target effects. To help producers make data-driven decisions, researchers:

- Developed sensors to monitor cattle behaviors and diagnose the need for targeted fly treatments. *University of California, Riverside*
- Are developing an automated surveillance system that incorporates computer vision and artificial intelligence to detect flies and ticks on animals and the animal's behavioral responses. When used with sampling plans, this system could help producers determine when interventions are needed and tailor treatments for animals with different tolerance levels. *Kansas State University, Oklahoma State University, and University of Tennessee*

Many arthropod pests have developed resistance to available chemical pesticides. Project members are working to understand resistance mechanisms and monitor the spread of resistance. For example, scientists:

- Produced a new tool to detect molecular markers of insecticide resistance mechanisms in arthropods. *University of Florida and USDA-ARS*
- Determined the genetic basis of house fly behavioral resistance to imidacloprid, a commonly used insecticide. *University of California, Riverside*
- Made discoveries that suggest high levels of house fly resistance to fluralaner, a relatively new insecticide, could develop rapidly if it is not used judiciously. These findings could influence fluralaner registration for house fly control in the U.S. *Cornell University and University of Florida*
- Discovered genetic bases for acaricide resistance and for sex determination in cattle ticks. These discoveries could enhance tick suppression tactics. *Texas A&M AgriLife Research and USDA-ARS*

Breeding resistant livestock is a promising way to mitigate pest impacts.

- Researchers are identifying traits related to fly resistance in cattle. These traits can be selected for during breeding to develop fly-resistant lineages for commercial herds. *University of Georgi*a

Project members tested new pest management tactics and tools, including:

- A passive walk-through trap and a vacuum-assisted trap, which both significantly reduced horn fly counts on cattle. *North Carolina State University*
- Coconut fatty acids, which repel stable flies and ticks better than DEET. *USDA-ARS*
- Fly attractants, which a commercial partner may incorporate in adhesive used in traps. *USDA-ARS*
- Boots, masks, and other wearable barriers to keep ticks off horses. *Pennsylvania State University*
- A head-to-toe fly sheet to protect horses from fly bites—in studies the sheet was more effective than two fly repellent sprays. *Kansas State University*
- Alternatives like garlic, fatty acids, and essential oils to repel flies. *University of Nebraska-Lincoln*
- Botanical oils that can be used to control of insects and mites in organic cattle and poultry production. *University of California, Riverside*
- Aerosol sprays and ear tags to control and potentially eradicate ear ticks from cattle on large commercial dairy operations. *University of California, Riverside*
- Ways to enhance the effectiveness of the *Beauveria bassiana* fungus as a biological control option for house flies—the fungus is particularly lethal to house flies feeding on low quality diets. *USDA-ARS*

New World screwworm flies lay eggs in animal tissues, causing serious wounds and often death. Though it was eradicated in the U.S. in the 1960s, a recent outbreak in Central America and Mexico poses renewed threat. Project members are working to manage the pest and minimize its impact.

- A common method of screwworm control involves using radiation to sterilize male flies, which are released to mate with wild female flies, preventing them from producing viable offspring. This reduces the screwworm population over time. Because of national security concerns about cobalt irradiators, researchers are exploring alternative ways to sterilize flies, including electron beam and X-ray technology and molecular/genetic approaches. *Texas A&M AgriLife Research*
- Researchers improved production of the parasitoid *Tachinaephagus zealandicus* and evaluated its potential for screwworm control. *USDA-ARS*

Project members developed science-based educational materials and outreach programs, including:

- veterinaryentomology.org, which shares information and resources with producers, veterinarians, Extension personnel, and others. In 2020, project members updated the website information and format. Since then, website visits are up 122%, with especially high traffic to VetPestX, a database that lists registered pesticides for veterinary pests.
- An open-access special collection of articles that highlighted the latest insights into fly biology and behavior and new approaches to control fly populations and mitigate their impact. The collection has been widely viewed and cited, indicating significant impact. The collection also provided a roadmap for future research and Extension, which will help attract funding and resources and ensure efforts focus on relevant issues.