MSU RESEARCHERS STUDYING IMPLICATIONS OF NEW ANIMAL HOUSING STANDARDS

Juan Steibel   Janice Siegford

In 2009, the Michigan Legislature passed an amendment to the Animal Industry Act introducing a series of new standards for gestating sows, laying hens and veal calves. Juan Steibel and Janice Siegford, associate professors, and Cathy Ernst, professor, all within the Animal Science Department at Michigan State University (MSU), are working to understand the most efficient and safe methods for meeting these new requirements for swine and poultry.

By April 1, 2020, all producers will need to house pregnant pigs in stalls where they can turn about freely, something typically not found in most current operations.

The majority of agricultural producers don't have the physical capacity to give each sow an individual pen. And though pigs are social by nature, they don't always get along well in group settings. Researchers at MSU and Scotland's Rural College are looking for ways to place pigs so they are more likely to live in harmony together. The basis for the solution may be rooted in genetics.

"There is great potential for selecting animals that are better adapted to group housing, maximizing group performance

and reducing aggression," Steibel said. "But we have observed that better phenotype collection and modeling will be necessary to implement desirable selection objectives in the pig breeding industry."

Pigs naturally live in small groups that consist of their mothers and other close relatives. There is a social hierarchy within these groups, which normally works to reduce aggression and fights because they know the social order. When unrelated pigs are mixed in a shared space, fighting can become intense.

Breeding programs have traditionally focused on production traits and other relatively easy-to-measure physical characteristics, such as number of offspring, growth rate and depth of back fat. Though it's sometimes difficult to quantify, Siegford said that behavior should also be taken into consideration.

Steibel, Siegford and the rest of the team are characterizing social interactions, relating those behaviors to health and productivity, and identifying the genetic components that factor into certain behaviors.

Researchers hope that the work will help to answer a critical question: Can pigs be selected for heritable behavioral traits that lessen the severity of conflict among grouped animals?

MSU researchers are compiling behavioral and genomic data from more than 1,000 pigs at the MSU Swine Teaching and Research Center. The data will be combined with information from 3,000

pigs obtained by collaborators Simon Turner and Rick D'Eath of Scotland's Rural College, experts in analyzing aggression heritability in pigs.

Most previous research on heritability of aggressive behavior has been dedicated to the finishing stage of production when animals are being prepared for market. Siegford believes that monitoring interactions earlier could be useful.

With support from the Michigan Alliance for Animal Agriculture, Siegford and her students also study enclosures that allow hens more space to roost, eat and move, and the impacts on health, safety and well-being.
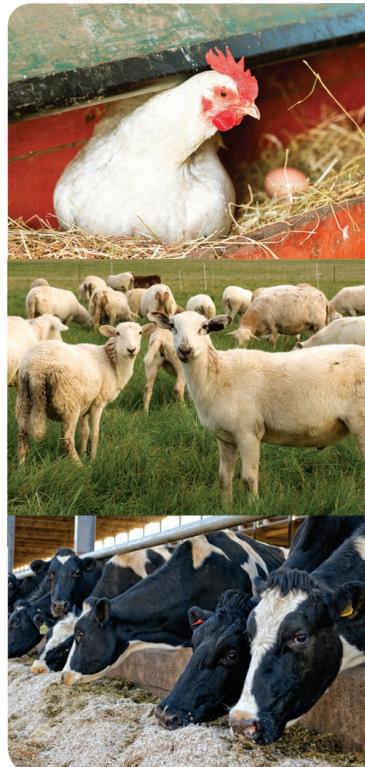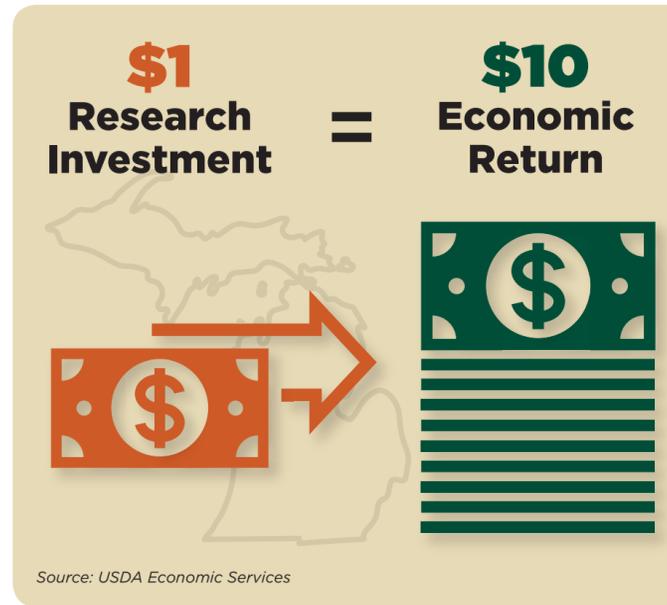
In the past, chicken enclosures were designed to optimize farm economics, food safety and chicken population management. This meant keeping chickens in small enclosures that protected them from some of their more dangerous behaviors such as panic attacks or establishing a literal, violent pecking order. It inhibited their ability to engage, however, in other beneficial behaviors. In exploring new enclosure types, Siegford hopes to balance the needs of the farm and the safety of the chickens with the chickens' own behavioral health.

"Our needs and theirs aren't in perfect synchronicity," Siegford said. "If we can develop a system that allows chickens to engage in more chicken-like behaviors, like dust baths and freely perching and nesting, we can reduce stress on each individual and, therefore, boost the overall production of the farm."

ECONOMIC IMPACT OF RESEARCH

"The Michigan Alliance for Animal Agriculture is a valuable collaborative effort of the state's animal agriculture industries, Michigan State University and our partners in state government. The ability to have accurate, relevant research and programs is an essential component to growing and enhancing animal agriculture, while protecting natural resources and investing in our communities."

— Ernie Birchmeier
Michigan Farm Bureau

$1 Research Investment = **$10** Economic Return

Source: USDA Economic Services

THANK YOU, INDUSTRY PARTNERS!

Research through the Michigan Alliance for Animal Agriculture would not be possible without the support of the animal agriculture industry. This partnership is critical to making advancements that allow the industry to grow and flourish.

- Michigan Allied Poultry Industry
- Michigan Cattlemen's Association
- Michigan Farm Bureau
- Michigan Horse Industry
- Michigan Meat Association
- Michigan Milk Producers Association
- Michigan Pork Producers Association
- Michigan Sheep Producers Association
- Michigan Soybean Association (associate member)
- MSU AgBioResearch
- MSU College of Agriculture and Natural Resources
- MSU College of Veterinary Medicine
- MSU Extension

Michigan Alliance for Animal Agriculture

2017 Legislative Summary

- Developing research, outreach and educational programs.
- Ensuring and improving food safety.
- Protecting the environment.
- Improving workforce development.

MESSAGE FROM M-AAA LEADERSHIP

As we embark on the fourth year of the Michigan Alliance for Animal Agriculture (M-AAA), it has been a privilege to see support climb each year.

The partnership has evolved from roughly $600,000 in grant funding from Michigan State University (MSU) in the first two years to a combination of funding from MSU, commodity organizations and the state of Michigan, totaling more than $1.5 million last year.

In 2018, that commitment will grow even more, as the state has budgeted $2.5 million to M-AAA. With the MSU and commodity organization funding included, $3.1 million is available to enhance research and outreach efforts, which speaks to the value our partners have seen in our work thus far.

The increased funding is helping researchers confront some of animal agriculture's most pressing issues, such as protecting the environment, combatting antibiotic resistance, managing infectious diseases and improving animal welfare.

As support rises, so do expectations. We must continue to discover long-term, sustainable solutions. This is a challenge we readily accept. The grant process remains extremely competitive and rigorous, ensuring that the quality of our work is paramount. We know that agriculture producers, our commodity group partners and the people of Michigan are relying on our expertise and guidance to solve problems limiting growth and sustainability of animal agriculture in Michigan.

This report features a sample of research project summaries detailing work that MSU scientists have performed using M-AAA grant funding.

Phil Durst, an MSU senior Extension educator, examined the prevalence of bovine leukemia virus (BLV) in 38 dairy herds around Michigan in an effort to bolster awareness of the disease

and options for mitigating its effects. In Michigan alone, economic losses from BLV total roughly $14 million per year.

Alongside Durst, MSU researchers Paul Coussens and Paul Bartlett have used M-AAA funding to uncover how BLV negatively affects dairy cattle immune system function. The promising results have led to external grant funding, allowing us to continue to gain insight and develop innovative strategies on behalf of producers.

Management techniques now recommended include implementing single-use hypodermic needles for vaccinations, cleaning and disinfecting equipment that comes in contact with blood or other fluids, using new or cleaned reproductive examination sleeves, and segregating BLV-positive cattle.

This is just one example of the powerful research shared around the state, preparing our stakeholders to meet the challenges of today and tomorrow.

It is important to acknowledge that we could not accomplish these goals without our partners in M-AAA, who update priorities annually so the most current and pressing issues confronting animal agriculture are addressed. On behalf of the entire M-AAA leadership team, thank you for your support.

Sincerely,

George W. Smith
Associate Director, MSU AgBioResearch
Associate Dean for Research, MSU College of Agriculture and Natural Resources

George Smith

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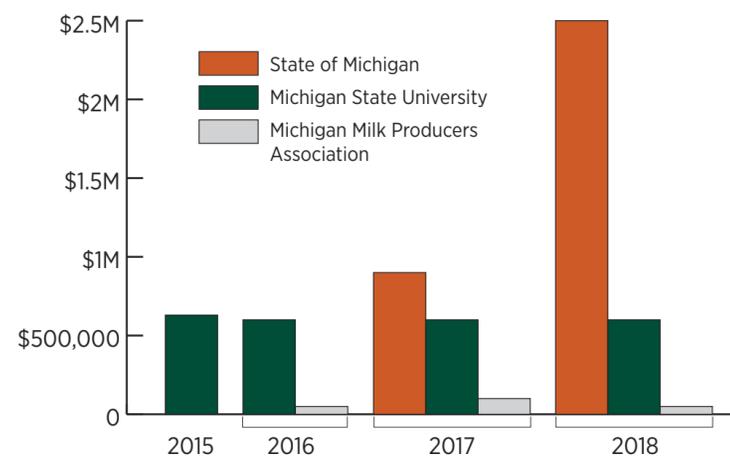
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Michigan Pork Producers Association

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Michigan Horse Industry

Ken Nobis
Michigan Milk Producers Association

George Quackenbush
Michigan Cattlemen's Association

George Smith
Michigan State University

Each year since 2015, funding for the Michigan Alliance for Animal Agriculture has increased. In 2018, nearly $3.1 million is committed to support research and extension programs for Michigan's agriculture industry.

Bar chart legend:
- State of Michigan
- Michigan State University
- Michigan Milk Producers Association

Y-axis: $2.5M, $2M, $1.5M, $1M, $500,000, 0
X-axis: 2015, 2016, 2017, 2018

PROJECT SUMMARIES

Impacts of extended pullet housing on production, behavior and welfare: Can laying hens adapt to aviaries if they have already begun to lay in a pullet housing facility?
Janice Siegford

As the 2020 deadline approaches for Michigan's laying hen industry to transition away from conventional cages, aviary systems are becoming more common. Aviaries provide hens with more complex environments where hens can use perches to roost at night, dust bathe in litter and lay eggs in nests. Nests are designed to facilitate efficient, automated egg collection, prevent damage to eggs (and subsequent loss), and minimize risks of eggs becoming dirty or contaminated (enabling eggs to receive high grades). However, birds must learn to use resources such as

nests, and pullets (young hens) are typically moved from rearing to laying housing when they begin to lay eggs to encourage nest use. Yet, there may be situations, such as disease outbreaks, that could force producers to keep pullets in rearing facilities after they begin to lay while waiting for infected hen houses to be declared safe for bird re-entry. The research team collected production, welfare and behavior data from hens that will help determine if delaying entry of pullets into aviaries is a feasible alternative to euthanizing pullet flocks in response to outbreaks of disease such as highly pathogenic avian influenza. In 2018, the research group will continue to analyze data related to individual hen responses, egg production and laying location, and the impact of closing hens into the system toward the end of the flock cycle to mitigate floor laying.

Janice Siegford

Targeted extension program to control bovine leukemia virus in Michigan dairy farms
Phil Durst

In 2010, a Michigan State University (MSU) research and extension group found an 88 percent herd-level prevalence of bovine leukemia virus (BLV) — a retrovirus that causes infection in dairy and beef cattle that can lead to more devastating diseases — in a survey of 113 Michigan dairy herds. Of these operations, the average within-herd cow prevalence was 33 percent. This represents a substantial increase since the 1960s, when the U.S. and Canada reported BLV cow prevalence rates of about 10 percent. Evidence is mounting that BLV infection negatively affects milk production and longevity. In this project, the team wanted to educate producers about BLV and its potential effects on their operations. Producers could

then identify BLV in their herds and develop control strategies with the help of veterinarians and MSU experts. The group also sought to determine if dairy herds with a lower average cow age would indicate a higher likelihood of BLV infection. In total, 38 herds were tested and 92 percent were BLV-positive. The average prevalence within the herds was 41 percent. To educate producers, members of the team visited 35 of the 38 enrolled farms and spoke via telephone with the remaining three. This education provided the basis for making informed decisions for their herd and involved the veterinarian in the development of the herd plan. While the team did not find a way to predict BLV status of herds using average age, it served as a reminder that the prevalence of this disease is not easily predicted. Producers need to do systematic monitoring such as the BLV Herd Profile Test to stay on top of their operations.

Phil Durst

Attitudes toward animal agriculture: Understanding and influencing attitudes using experiential learning
Paul Thompson

The public's perception of production systems can strongly influence the decision making of processors, retailers and regulatory officials. Yet, the understanding of what elements in a production system influence attitude formation is weak. The research team sought to develop collaborative, multi-disciplinary tools and coding approaches for analyzing data that help to better understand the role personal experiences, experiential educational methods and specific messaging have for enriching understanding of animal welfare and livestock production. Students from Michigan

State University (MSU) were provided faculty-sponsored tours of production systems. The research team found that the students provided more substantive and actionable criteria in their judgments about sustainability and quality of husbandry after the farm visits. Additionally, the team created curriculum for use in undergraduate education courses to advance critical thinking related to animal agriculture. This development of curriculum has been in conjunction with undergraduates participating in the MSU Student Organic Farm and a food ethics project conducted by MSU faculty. Producers were also contacted to gauge their reactions on initial findings and to discuss how this information may be effectively disseminated for greatest impact. A report on the interactions with producers is forthcoming in 2018.

Paul Thompson

Increasing the efficiency of fertility programs to allow for greater pregnancies in lactating dairy cows
J. Richard Pursley

Infertility of lactating dairy cows continues to be a critical problem limiting profitability and sustainability of U.S. dairy farms. Funding from the Michigan Alliance for Animal Agriculture led to studies that enhanced our understanding of the relationship between body condition of cows and fertility. Cows that lost the least amount of body weight in the first month following calving had greater fertility following a fertility program and fewer cows with metabolic and uterine problems. Utilizing these programs over time can reduce the number of cows in a herd with excessive body condition loss. These new findings may improve farm profit on an 800-cow dairy by $120,000 per year and may revolutionize reproductive management of dairy cattle.

Maternal fertility, defined as the mother's ability to ovulate a competent egg and provide a maternal environment capable of fertilization and fetal development, continues to be the key limiting factor for profitable reproductive performance in lactating dairy cows. Conception rates of dairy cows are approximately 30 percent, compared to 60 percent in virgin dairy heifers when inseminated following a detected estrus. In response to this problem, researchers developed fertility programs to control ovarian development. These programs allow well-managed dairy farms to increase fertility of their cows to that of virgin heifers. Additionally, these programs decrease pregnancy loss and twinning, both of which are detrimental to profit of dairy farms. Our research team, including a number of MSU undergraduate students, shared its findings with producers across Michigan and the U.S. over the past year.

J. Richard Pursley

Developing and delivering an online introduction to horse management course
Christine Skelly

This project harnessed the public's affinity for horses to offer an online introductory horse management course that can be delivered to a variety of learners, including an extension audience and postsecondary students. My Horse University — Michigan State University (MSU) Extension's online horse management program, the MSU Department of Animal Science equine faculty, MSU's Institute of Agricultural Technology (IAT) and HorseQuest collaborated to develop the online curriculum. The project team developed lessons that contain student learning objectives, peer-reviewed content and self-test questions. The lessons have been developed to stand alone, enabling educators to use them in different teaching and extension programs. To date, the course curriculum has been used to instruct both two- and four-year MSU students in IAT and animal science courses. Using an online platform for rating, students were asked to judge the course's content. The evaluations showed that students felt they improved their competency in horse management as a result. In fact, a professor from the University of Nebraska is using the curriculum to teach an introductory horse management course at the institution. There are also plans to repurpose units from the online curriculum to develop courses that can be used for workforce development in many aspects of the equine industry.

Christine Skelly

For a list of 2018 funded projects, visit **maaa.msu.edu**