



## **THE EGG INDUSTRY CENTER**

CONTRIBUTING TO A SUSTAINABLE EGG SUPPLY

2019

# EIC IMPACT REPORT



**SUSAN LAMONT**

Of all the lessons I have learned as Interim Director at EIC, one of the most satisfying was that the Center can not only survive a change in leadership, but grow through the transition.

**I WAS NAMED THE EGG INDUSTRY CENTER'S INTERIM DIRECTOR IN APRIL, AT A PIVOTAL MOMENT FOR EIC.**

The Center had just celebrated 10 successful years of progress under a founding director who had become synonymous with the organization. EIC had enthusiastically grown into its mission to add value to the egg industry by facilitating practical, issues-focused research, and then disseminating those results to the egg industry in this country and around the world.

Times of change and transition can bring uneasiness to partners and supporters of an organization like ours. It has the potential to ripple across the community, growing into waves of anxiety and alarm. However, that is not what happened. I am very pleased to report that the Egg Industry Center remains steadfast and strong, while our research and outreach efforts continue to enlighten and inform the industry.

Of all the lessons I have learned as Interim Director at EIC, one of the most satisfying was that the Center can not only survive a change in leadership, but grow through the transition. To me, that is a sign that EIC has found not only a mission that many believe in, but also the key to organizational longevity.

The research we facilitate continues to be strong and meaningful. Our funding is present and solid, due to the confidence our donors continue to place in us. The significance of the Egg Industry Center multiplies with every report published, because the mission remains the same year after year — to add value to the egg industry by facilitating research and education for egg producers, processors, and consumers through national and international collaboration.

It is the commitment of our donors, our researchers, and our partners that is the strength of EIC. With our new permanent Director on the horizon, the best days of the Center still lie ahead of us.

**SUSAN J. LAMONT**

*Susan J. Lamont, a C.F. Curtiss Distinguished Professor of Agriculture and Life Sciences and animal science professor, is the Egg Industry Center's interim director. Her career began in 1975, and she is now a fellow of the Poultry Science Association. Her career accomplishments include grant awards totaling over \$20 million, training of more than 40 students, and authoring/co-authoring over 400 publications.*

Top cover photo courtesy: Big Dutchman, Inc.

WE'VE DONE SO MUCH;  
**A CHALLENGE TO DO MORE**

The authority and reach of the Egg Industry Center (EIC) is only as robust as the generosity of our donors. We deeply appreciate the unwavering support of our past donors, and the interest of new partners. EIC hopes this 2019 Impact Report inspires you to continue your patronage, or start anew with us.

The need for ongoing research in the egg industry has surely not diminished in the past year! The industry is blessed with researchers who are committed to seeking answers to disease, ways to help producers meet and adapt to new regulations, anticipate issues of housing and handling, and many other situations facing egg producers today.

The industry is fortunate that EIC's endowment has helped underwrite over \$1 M in egg-related research. The needs of both active and proposed work continue to surge as we look to incorporating food security and animal welfare challenges into sustainable best management practices for the future. Of the last two EIC calls for proposals, EIC had sufficient funding to support only 10-12% of the submitted research proposals. We have made progress, but there is more to work to do!

Consider this your challenge, and an invitation; to join our work and the vision to advance the U.S. egg industry through dissemination of sound science-based information gathered from collaborative research efforts.

The Iowa State University Foundation manages the Egg Industry Center's endowment funds. For more information call 515-294-3303.



As Egg Industry Center Advisory Board members have witnessed the growing number of deserving research funding requests (and knowing the Center's limited fiscal ability to facilitate this work toward successful solutions) it was determined an endowment growth campaign was needed. Mr. Jeff Henning, a founding advisory board member of the Egg Industry Center has taken the lead in guiding the group as it plans its next steps.

"I have been impressed with the value that EIC adds to the poultry industry. The work they facilitate has contributed to better husbandry, nutrition, welfare, and environment for hens. It has helped our allied industries better understand producer needs and helped producers in a number of areas like nutrition, equipment, housing, depopulation, transportation, lighting, ventilation, and more.

Unfortunately, every year EIC's board has to turn down worthwhile research proposals due to limited funding. Ultimately, I would like to see EIC be able to support more of these requests. To do so, I encourage anyone and everyone who has benefited from this vibrant industry to consider contributing extra funds specifically for additional research grants."

**JEFF HENNING, CHAIRMAN  
HENNING HOLDINGS**



**FOR MORE  
INFORMATION,  
PLEASE  
CONTACT:**

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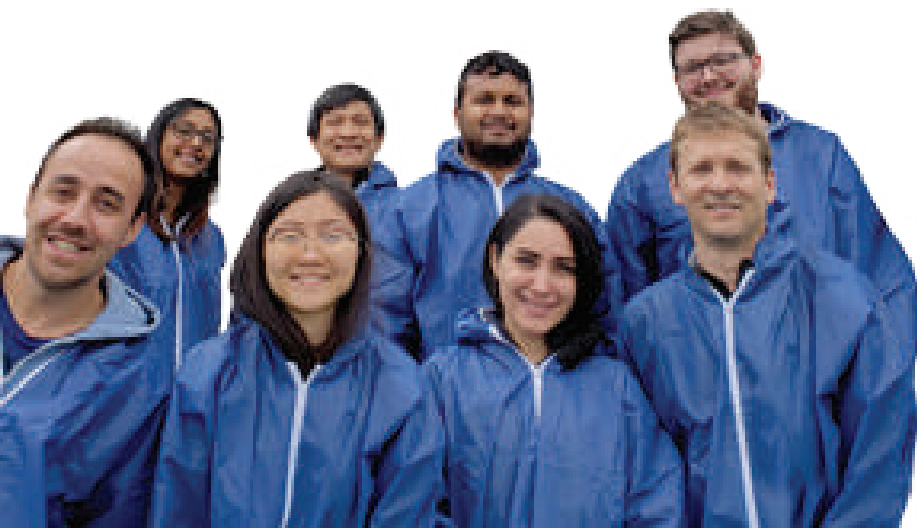
**JEFF HENNING**  
Member, EIC Advisory Board  
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# TAKING SUSTAINABILITY AND ANIMAL WELFARE FROM ABSTRACT TO APPLICATION

**J**oint Data Envelopment Analysis and Integration of Animal Welfare Indicators for Identification of Life Cycle Sustainability Best Management Practices and Technologies in the Egg Industry is a lot of title for a project. But the principal investigator (PI) is one of the latest EIC grant recipients and a heavy-hitter in the world of sustainability as it applies to the future of the egg industry.

Dr. Nathan Pelletier, located at the University of British Columbia in Canada, currently holds the Natural Sciences and Engineering Research Council of Canada (NSERC)/Egg Farmers of Canada Industrial Research Chair in Sustainability. His work advances the research and tools necessary to enable effective sustainability management in agri-food supply chains — particularly in the egg industry.

His connection to EIC began in collaboration with Dr. Hongwei Xin and Maro Ibarburu in an initial study of the carbon footprint of the egg supply chain in the U.S. Midwest. That first project led to a larger-scale 50-year study looking at changes in the environmental footprint of egg production in the United States over time. The success of these two studies created excitement in helping Pelletier as he focuses on finding answers in his most recent research endeavor — the intersection of animal welfare and environmental sustainability issues.



Pelletier has observed that livestock production systems are often key drivers of environmental change. He utilizes life cycle assessment (LCA) — a systems-level modeling tool for systematically evaluating the inputs, outputs, and potential environmental impacts associated with the life cycle of products. This helps to determine the distribution and magnitude of environmental burdens in industrial livestock systems, and to identify mitigation strategies. Much of his current research focuses on green technologies and practices for egg supply chains.

The specific objectives of Pelletier’s new study are to: **(1) develop methods** and indicators for the consideration of hen welfare outcomes in LCA; **(2) employ these methods** in conjunction with environmental LCA models of egg production (specific to housing system type) to identify sustainability best management practices for the egg industry; and **(3) compare** the environmental footprint and hen welfare impacts of egg production for different housing systems, technologies, and management strategies. To gather the data necessary for the study a master’s student in Pelletier’s lab, Ian Turner, is currently visiting egg farms from coast to coast.

Pelletier’s work to date has provided highly detailed information about the sustainability attributes of egg production and related supply chain activities. It has also enabled him to document wide variation in the efficiencies achieved by different egg producers and other stakeholders that ultimately influence sustainability outcomes.

“If we could shift industry average efficiencies for the three most important [sustainability] criteria in line with the current top performing producers, this could potentially leverage a substantial further reduction in the environmental footprint of egg products.”

The benchmarks that his project will help define will play an important role in the industry’s ability to look at the sustainability trade-offs of cage-free and free-range systems, with potentially important implications for the egg industry and its growing focus on sustainability worldwide.

“If we could shift industry average efficiencies for the three most important [sustainability] criteria in line with the current top performing producers, this could potentially leverage a substantial further reduction in the environmental footprint of egg products.”

DR. NATHAN PELLETIER  
THE UNIVERSITY OF BRITISH COLUMBIA



Photo: Big Dutchman, Inc.

## UNDERSTANDING ARV TRANSMISSION: A GENOME-BASED APPROACH

Avian reoviruses (ARVs) are common in nature and associated with a wide range of diseases affecting a number of avian species. ARV infections have several economically significant effects, like increased mortality, a general lack of performance, diminished weight gain, poor feed conversion, uneven growth rate, reduced marketability, and more; particularly in broiler chickens, young layer chickens, and turkey poults. In addition, newly emerging ARV variants and/or novel strains have caused an increasing number of poultry disease outbreaks and economic losses in the US poultry industry in recent years. However, ARV's direct effects on laying hens and the hens' part (if any) in transmission of ARVs were relatively unknown.

That was before the Egg Industry Center awarded a grant to investigate infection parameters, transmission rates and the ARV reservoir status of laying hens, related especially to the newly emerged ARV variants.

Dr. Huaguang Lu is a Clinical Professor, Avian Virologist, and Section Head of Avian Virology at Pennsylvania State University. One of his areas of expertise is ARV genotyping and full genomic characterizations, which greatly helps his ongoing EIC-funded project, Studies on Effects of the Newly Emerging Avian Reovirus Variants on Egg-laying Hens and Efficacy of Non-Metallic Disinfectants on Reovirus.

He shared with us that he and his team recently completed trials studying ARV infectious parameters in egg-laying hens. By studying infectivity, transmission, immune response, length of infection, and effects on egg production of three newly emerged ARV variants in egg-laying hens (genotype 2, 3, and 5), Dr. Lu hopes to employ genome-based approaches to better understand the complexities of this disease. The intent is to investigate any crucial roles egg-laying hens have in ARV transmissions and ultimately lead to the design and implementation of methods reducing the disease through control and prevention strategies, or elimination of disease occurrence in laying hen flocks altogether.

The results of testing swab samples (used to monitor ARV infections) indicated that all ARV-infected hens started virus shedding through intestines/feces as early as 24-hours post inoculation. Heavy virus shedding occurred at two- to three-days post inoculation, and then light shedding occurred at five- to seven-days post inoculation. Rare occurrences of virus shedding occurred 12-14 days post inoculation. In contrast, oral pharyngeal swabs were weak ARV (+) for only a few birds during the first 1-3 days post inoculation, after that virus shedding was not detected from oral pharyngeal swabs.

In each ARV-infection experiment, a second challenge was presented at 3-5 weeks post inoculation. Research findings indicate that the egg-laying hens previously exposed to ARV, shed no virus during the second challenge. The hens' weekly serum samples and egg yolk samples tested positive to ARV antibodies after two weeks post inoculation. In the experiments, all of the experimentally ARV-infected hens maintained normal egg production, and showed no observable clinical signs.

"What we are learning is that in egg-laying hens an ARV infection can be present but without clinical symptoms," said Lu. "Therefore, adult layer flocks with ARV infections can be virus reservoirs and carriers causing not only horizontal transmission, but also vertical transmission in progeny or young chicks while showing no obvious signs of disease."

A second objective of the project is testing the efficacy of "soft" disinfectants on the ARV variants and other avian intestinal viruses and bacteria in laying hen flocks. Two types of "soft" disinfectants were chosen due to their ability to be used around live birds. "Shield Plus" (by Timac Agro, USA) and "Assist NPS's solution" (by Assist Natural Products and Services, LLC) were tested. The test results indicated that both soft disinfectants effectively inactivated or killed ARV, fowl adenovirus (FAV) and *Aspergillus niger* in laboratory conditions. "Reliant Tabs," a solid pill form of the Assist NPS's solution and used in drinking water, was also provided and tested safe for live chickens by preliminary safety tests in bird trial conditions.

"We found that the adult layers' intestine system (not the respiratory system) is the ideal host organ for ARV rapid propagation. As a result, keeping adult layer flocks healthy and free of virus infections is essential for effective ARV control," said Lu. "When an environment is contaminated [through the feces of virus-shedding ARV-infected hens], the soft disinfectants may provide an answer to helping mitigate further transmission. Our next trials on these soft disinfectants, using ARV, may give us more insight."

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DR. HUAGUANG LU, CLINICAL PROFESSOR, AVIAN VIROLOGIST, AND SECTION HEAD, AVIAN VIROLOGY, PENNSYLVANIA STATE UNIVERSITY



## EIC FUNDING EASES THE TRANSITION FROM THE PULLET HOUSE TO THE PENTHOUSE

... there was not a large benefit to providing pullets with ramps during rearing in addition to providing hens with ramps at lay.

It's hard to say what sows the seed of an idea in a scientist's mind that grows and develops into the drive to study a situation and find answers. It could be natural curiosity; it could be a desire to improve quality of life, or maybe something else.

Dr. Janice Siegford is a professor in the department of animal science at Michigan State University. She and her team of Dr. Michael J. Toscano and Dr. Ariane Stratmann, of the division of animal welfare at VPH Institute (Switzerland) were interested in the transition pullets make when moving from their rearing environment to the laying house. Her Egg Industry Center-funded research study Improving the Transition Between Rear and Lay Environments to Improve Welfare and Productivity of Aviary-Housed Laying Hens was completed earlier this year.

During their research, this international team focused on how chickens adapt as the industry moves away from smaller, fairly bare conventional cages to more complicated aviary systems with perches, nest boxes, litter areas, and sometimes multiple levels that hens must learn to navigate. "The work was very much a team effort," Siegford said, "with data collection occurring in Switzerland where the birds were housed and planning, analysis and writing happening on both sides of the Atlantic."

The objective of their project was to investigate the impact of adding ramps to rearing and laying aviaries on the birds' occupancy and movement between levels, their physical health, and their productivity. The team compared the addition of ramps in different combinations: during rearing alone, during laying alone, and at both times, against a control group where ramps were never provided. They also collected data on keel bone fracture, foot health, feather condition, mortality, egg production, location of egg laying, hen movement among vertical levels, and numbers of hens occupying each level.

The results reinforce previous findings that providing ramps during the lay period improves keel bone health, hens' use of litter during the day, roosting at higher levels at night, and movement among vertical levels. Providing ramps at both rearing and lay resulted in consistently better foot health as well as better feather condition at 60 weeks of age, perhaps because these hens spent more time on litter as they aged.

However, new from this research was the finding that there was not a large benefit to providing pullets with ramps during rearing in addition to providing hens with ramps at lay. This may be because the vertical complexity already experienced by the pullets as part of being reared in an aviary led to development of bone, muscle and navigational skills that were not further enhanced by adding ramps.

The team's findings can improve the industry's understanding of the factors important to consider when working to reduce stress during the transfer between rearing and laying environments, help to facilitate adaptation of the birds by improving the general quality of life for laying hens in aviaries, and add to the scientific understanding of managing pullets and laying hens.

Moreover, these findings can be used by egg producers and housing manufacturers as they work to develop data-driven, objective solutions for improving the structural design of rearing and laying aviaries as well as the overall management of birds in these systems.



## EIC UPDATES OLD COST FIGURES FOR U.S. EGG INDUSTRY

The Egg Industry Center (EIC) kicked off the year with an anonymous survey to egg producer/processor companies, seeking cost information on their processing, packaging, and transportation costs for the last half of 2018. This was done to update data from a similar study undertaken in 2000 by the late Dr. Don Bell of the University of California – Davis. The survey's responses represented approximately 150 million layers, or about 45% of the U.S. laying hen inventory and 65% of the laying hens dedicated to shell egg production.

This study was the first attempt in 18 years to provide updated cost estimates to benchmark industry standards for processing, cartoning, and transportation (PCT) costs.

"We called it the PCT study," said Maro Ibarburu, associate scientist and business analyst for EIC. "The results tell us that egg farmers typically spend 43-49 cents on PCT for every dozen eggs produced." That range includes delivery to the store door, but does not include loss from store returns. Ibarburu indicated those findings are in line with inflation-adjusted cost estimates based on the 2000 study.

"The data we collected from late 2018 shows that these costs have increased 80% during the last 18 years," Ibarburu said. "While that may seem like a lot, given the changes in regulations and regular inflation (a cumulative 3.3% per year is not unreasonable) it's to be expected."

The motivation for the study was to help egg farmers analyze their costs of washing, weighing, packaging, and transporting their eggs and was launched in part due to interest from industry organizations. "EIC was developed to provide value to the egg industry. I'm always happy when I'm able to analyze data and write reports that help accomplish that mission," Ibarburu said.

"Most everyone knows I enjoy doing the monthly market reports for the industry; however, it is also really fulfilling to do projects like this study and the special reports." Ibarburu said, "They are challenging and their importance resides in filling the gap of specific information that it is needed at a certain time."

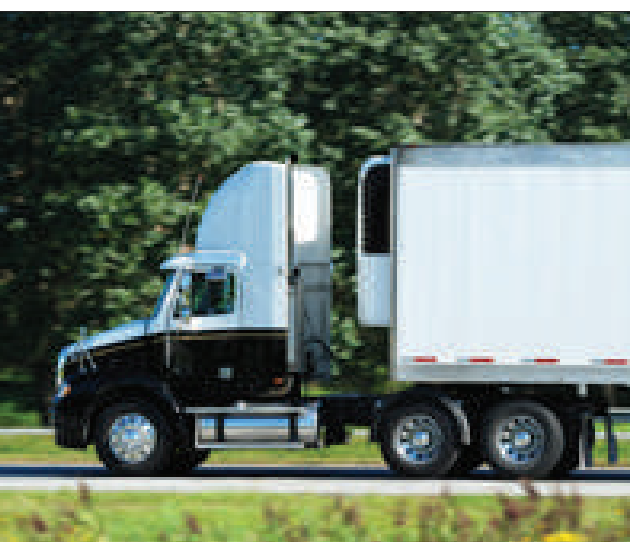
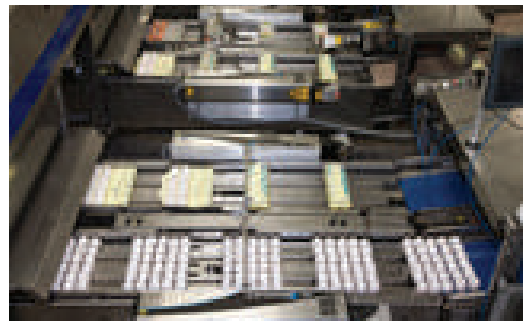
This report is the only known updated source of information about PCT costs. It is the intent of EIC to continue updating these estimates on a more regular basis. Some methodological modifications are recommended for future surveys to improve the accuracy, consistency, and representativeness of the answers.

The study done in 2000 covered only California egg farmers and their costs. Because those were the only data available, the entire U.S. industry has used it ever since. This EIC survey was based on processors across the U.S. "EIC is happy to help arm today's egg farmers with current, science-based information to help them advance their operations," Ibarburu said.

**"The data we collected from late 2018 shows that these costs have increased 80% during the last 18 years. While that may seem like a lot, given the changes in regulations and regular inflation (a cumulative 3.3% per year is not unreasonable) it's to be expected."**

MARO IBARBURU, ASSOCIATE SCIENTIST AND BUSINESS ANALYST FOR EIC

EGG FARMERS TYPICALLY SPEND  
**43–49¢**  
 ON PROCESSING, CARTONING,  
 AND TRANSPORTATION COSTS  
 FOR EVERY DOZEN EGGS PRODUCED



# FORUM ILLUSTRATES ITS PURPOSE IN FULFILLING EIC MISSION



MONIQUE FRANCA

Each year since 2009, the Egg Industry Center has planned and executed the Egg Industry Issues Forum. The Forum is an ideal opportunity to educate, update, and raise the awareness of producers and allied-industry partners about the latest advances and priority issues of the U.S. egg industry.

The 2019 Forum was held in Kansas City, Missouri, where it again fulfilled its mandate to disseminate the findings of relevant research to industry stakeholders.

One of the many research presentations at the 2019 Forum aptly illustrated how EIC works together for the good of all. This is because the industry-identified research challenge, the research funding, and the research educational outreach delivery were all tied to Forum in some capacity. This illustrates the vital role Forum plays in helping fulfill each of EIC's mission components and in helping optimize EIC's effect, yielding a win-win for the egg industry.

## THE CHALLENGE

At the 2014 Egg Industry Issues Forum, Dr. Bernie Beckman highlighted a growing and somewhat mysterious problem in the industry. The problem: Focal Duodenal Necrosis (FDN), which is an intestinal disease syndrome found in all strains of layers, in all types of flocks and operations, at all stages of production. The only observable sign is a "pale" comb on compromised birds. While there is no increased mortality with FDN, drops of up to 10% in production are common.

## THE FUNDING

With science-based solutions needed, the EIC Board acted immediately at its post-Forum meeting. The decision was made to encourage researchers with the expertise to work on FDN to help provide the industry some solutions and the Center's grant program could be used to help move the research interest forward. By the conclusion of the EIC grant proposal cycle in October 2014, Dr. Monique Franca was funded to study the FDN issue more closely.

Franca is an assistant professor in the Department of Population Health at the University of Georgia's College of Veterinary Medicine. She considers herself a diagnostician, teacher and researcher, and is involved in multiple investigations of avian diseases.

## THE OUTREACH

Franca presented her research findings (see sidebar) at the 2019 Egg Industry Issues Forum. This presentation resulted in one producer's ability to sum up the benefit of not only the research, but the dissemination of the results of such work. "I have a better appreciation of what the research is trying to do now than I did before her presentation," said Steve George, President and CEO of Fremont Farms of Iowa. "She showed us that there are numerous types of bacteria in the lesions, and one of [the bacteria] hasn't been identified yet, so although progress has been made, they still don't know the root cause of the disease."

Because research is still needed to provide the industry with answers, EIC funded Franca to continue her FDN work. This project is expected to conclude in 2021. "EIC support is very important and necessary for applied research to help solve egg industry challenges," Franca said. "I believe it would not be possible to advance the knowledge of Focal Duodenal Necrosis without EIC funding."

EIC is excited to see stakeholders begin to understand the importance of the research, and its dissemination, that is so key to the successful future of the industry. "Egg farmers and researchers in the same room at Forum is a good thing," said Susan J. Lamont, interim director of the Egg Industry Center and Distinguished Professor of Animal Science at Iowa State University. "It is one of the added values that EIC can bring to the industry to help enhance everyone's knowledge of needs and what it takes to obtain scientific solutions."

The EIC-hosted Egg Forum occurs each April and is focused on communicating science-based solutions to the egg farmers who are hands-on at the front-end of the industry. EIC is excited to see how this full-circle approach of hearing industry's challenges, funding research and communicating science-based information continues to help the egg industry advance.

## RESULTS DR. FRANCA HIGHLIGHTED AT THE FORUM INCLUDED:

- **Most FDN-affected layer flocks:**
  - Had more than 12 feed formulations
  - Included DDGs in the diet
  - Had problems with fly and rodent control
  - Did NOT wash feeders, cages, or houses before disinfection
- **Analysis of duodenal samples with FDN found:**
  - *C. perfringens* is the most frequent (Pathogenic netB-positive strains)
  - Long Gram-negative bacilli exist in all FDN samples (Invasive bacteria)
  - Abundance of *Tyzzarella* bacteria in FDN lesions
- **Experimental infection of egg laying chickens showed:**
  - *C. perfringens*, alone or combine with intestinal contents, causes inflammation in the duodenum
  - Significantly higher microscopic lesion scores in challenged groups
  - netB-positive *C. perfringens* isolated from duodenum after challenge plays a role in disease development

The development of duodenal necrosis as seen in field cases may require the presence of other infectious agents and predisposing factors that remain unidentified. Additional studies are needed to try to reproduce the characteristic FDN lesions like those seen in field cases.



The 2019 Egg Industry Issues Forum continued the tradition of an issues-focused panel discussion. This year the panel discussed outcome-based vs. resource-based animal welfare standards. Speakers included (left to right): **Dr. Don Hoenig**, Senior Veterinarian Advisor for the American Humane Association's Farm Program; **Dr. Michael David**, Director of International Animal Health Standards for USDA-APHIS Veterinary Services; **Dr. Janice Swanson**, Professor and Director of Animal Welfare in the Department of Animal Science and Large Animal Clinical Sciences at Michigan State University; **Mr. Matt Jones**, Vice President of Operations for Validus; and **Dr. Larry Sadler**, Vice President of Animal Welfare for the United Egg Producers.

SAVE THE DATES | APRIL 14 & 15, 2020 | 2020 EGG INDUSTRY ISSUES FORUM, DES MOINES, IOWA

OVER  
**135**  
REQUESTS  
SUBMITTED FOR  
EGG RESEARCH  
FUNDING

RESEARCH FUNDED:  
OVER  
**\$1.25**  
MILLION

TEN  
RESEARCHER CAREER PROFILES  
COMPLETED BY EIC

7 MARKET REPORT  
TABLES OR FIGURES  
WITH NEW INFORMATION  
SINCE 2014

OVER **150**  
MILLION  
LAYERS REPRESENTED AT FORUM



MEMBERS OF THE EGG INDUSTRY CENTER ADVISORY BOARD GUIDE THE STRATEGIC DECISIONS THAT ENABLE THE CENTER TO MEET INDUSTRY'S IMMEDIATE NEEDS WHILE ALSO WORKING TO ENSURE ITS FUTURE. THIS DEDICATED GROUP OF LEADERS FROM INDUSTRY AND ACADEMIA VOLUNTEER THEIR VALUABLE TIME, TALENT AND EXPERTISE.

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**SUSAN J. LAMONT**



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PLEASE  
**WELCOME NEW  
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**DANIEL ROBISON**  
Iowa State University,  
College of Agriculture and  
Life Sciences, Endowed  
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**MIKE SENCER**  
Senior Vice President, Hidden  
Villa Ranch dba Nest Fresh

THANK YOU



Dr. Joe Colletti was secretary of the EIC Board while Interim Endowed Dean of the College of Agriculture and Life Sciences at Iowa State University. We appreciate his engagement and commitment to EIC.



Mr. Roger Deffner has served on the EIC Advisory Board since 2013. His experience with northwest egg processing and marketing has been crucial to the success of EIC during his tenure.

EIC thanks both Joe and Roger and wishes them all the best in their future endeavors.



## STANDING STRONG THROUGH CHALLENGES AND CHANGE

Challenges and change are hallmarks of the egg industry. Weather challenges, health challenges, changing consumer demand, and changing regulations keep us pushing forward. What doesn't change? The ongoing support of the donors, partners, and friends of the Egg Industry Center.

**THANKS TO YOUR SUPPORT, YOUR GENEROSITY, AND YOUR FAITH IN OUR MISSION, EIC STRETCHES ITS ENDOWMENT TO FIND SOLUTIONS TO INDUSTRY CHALLENGES AND METHODS TO COPE WITH THE CHANGE.**

THANK YOU for making the work of EIC a sustained force in the egg industry!

**To learn how you can advance the work of the Egg Industry Center, please contact the center today. [eggindustrycenter.org](http://eggindustrycenter.org)**

## IOWA STATE UNIVERSITY

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