Contributing to a sustainable egg supply
Scientific research provides the factual base for sound decision-making, which is absolutely essential in changing times.

Hongwei Xin

Riding the river of change

An ancient Greek philosopher once said, “You can never step in the same river twice.” His observation reminds us that life, like a river, is continually changing in speed and complexity.

This quote came to mind as I thought about the many challenges the egg industry faced during the past year, as well as those that will surely confront us in the years to come.

I believe the work of the Egg Industry Center — more specifically, its commitment to practical, issues-focused, need-driven research — provides the means by which our industry can successfully navigate the churning waters of constant change. And you — our donors, partners and other friends — are the engine that powers us forward.

Scientific research provides the factual basis for sound decision-making, which is absolutely essential in changing times. And yet, precisely because change is rapid and constant, the egg industry is under increasing pressure to react before all the facts are at hand. That’s why the EIC’s mission is so important, and why we are so grateful for your ongoing generosity.

After several years of investment, EIC-sponsored research is showing solid results, with completed research projects in critical areas of concern, from avian influenza to the implications of cage-free production. You’ll read about this harvest of knowledge in the pages of this year’s impact report.

Rivers rise and fall, as do markets and countless other factors affecting our industry. But the support of EIC donors, partners and other friends has remained steadfast, allowing the center to broaden and deepen its impact. Pulling together, I’m confident that EIC will continue to play a central role in helping the industry ride the oncoming waves of change and opportunity.

Thank you.

Hongwei Xin

Director, Egg Industry Center
Assistant Dean for Research, College of Agriculture and Life Sciences
C.F. Curtiss Distinguished Professor of Agricultural & Biosystems Engineering and Animal Science, Iowa State University

Investing in Vision,
Adding Value

The egg industry, its producers and related academics who came together to establish the Egg Industry Center in 2008 were well aware of the constancy of change.

In fact, it was in response to changes in federal research funding that gave rise to the Egg Industry Center. Its founders and donors envisioned a center whose endowment would provide steady and long-term support for scientific research, research dissemination and collaborative partnerships, thus adding value to the industry and contributing to its sustainable success.

Today, your investment in the Egg Industry Center is paying dividends beyond our founders’ vision. In less than a decade, EIC has become a truly global resource, not only funding research around the world, but providing the research-based knowledge and solutions that help producers at home and abroad thrive in changing times.

In addition, many EIC research grants are awarded to young scientists at the start of their careers, enabling these researchers to compile an early track record that increases their chances of success when applying for larger grants. In turn, those larger grants amplify the scope of industry-related research sparked by EIC’s initial investment.

It’s a “virtuous circle” that will continue to expand, adding value, enhancing impact and advancing our industry for years to come. And it all begins with you.

Thank you for your vision, your investment and your partnership. As the Egg Industry Center nears its 10th anniversary in 2018, we look forward to celebrating the many successes your support has made possible — past, present and future.

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“Scientific research provides the factual base for sound decision-making, which is absolutely essential in changing times.”

HONGWEI XIN
The devastating avian influenza virus (AIV) outbreak in 2015 occurred despite the use of strict biosecurity controls in animal care facilities. This suggests that an alternative route or vector for the virus may have existed at the time, or may still exist today.

The Egg Industry Center funded co-principal investigators at Iowa State University, Dr. Kyoung-Jin Yoon, professor in Department of Veterinary Diagnostic and Production Animal Medicine and Dr. James Adelman, assistant professor in the Department of Natural Resource Ecology and Management, who have teams working hard to discover the virus’s unknown transmission vectors.

The team’s most recent AIV research project, which concluded earlier this year, aimed to determine whether small terrestrial wild birds (e.g., sparrows, starlings, and finches) or rodents can transmit avian influenza viruses, including H5N2, between traditional wildlife reservoirs (i.e., waterfowl, shorebirds) and commercial layer operations.

The project included sampling 564 small birds, such as songbirds and woodpeckers, as well as rodents found at four Iowa wetlands. Three wetlands were located within six miles of farms that were positive for Highly Pathogenic Avian Influenza (HPAI). Internal and external swabs were collected and tested during spring migration.

Researchers found that none of the swab samples tested positive for AIV. Blood samples also did not show any antibodies against influenza A virus, leading Yoon and his team to conclude that it is unlikely that small wild birds and rodents are major factors in the transmission and spread of AIV.

“My coinvestigators and I were surprised at first by these results, as we expected that we would see some positive birds, such as sparrows, based on literature,” Yoon says. “But we were also a little relieved to learn that these terrestrial wild birds may not be a major vector of the virus. I was less surprised by the observation that none of the wild rodents were positive, as we have had years of conflicting reports in the literature.”

As for other virus paths, Yoon explains that human-mediated transfer of the virus (i.e., via skin, hair, clothing) has been well documented and is taken into consideration for on-farm biosecurity practices. But other vectors exist, and Yoon has been involved in those inquiries as well, including a team at ISU looking at possible transmission of the virus via contaminated feed, a study that also was funded by the Egg Industry Center.

Yoon relies on and is deeply grateful for such external research funding. “Grants from commodity groups are very significant to my work, particularly from organizations whose missions are linked to applied research,” says Yoon. “Their funding can be very timely and flexible in answering questions that are highly applicable to producers and other stakeholders. Egg Industry Center grants are a good example of this.”

The cooperation of producers themselves is also key to the success of Yoon’s research. “I think many of the egg producers who worked with us really wanted to know for their own benefit whether wildlife play a role in spreading AIV. The virus was and still is of primary concern.”
Study Seeks to Decode Focal Duodenal Necrosis

FDN is found in all varieties of flocks, although clear signs and symptoms are not always present, suggesting that the disease may be underdiagnosed. The economic repercussions of the disease are easier to detect than its symptoms; FDN results in decreased egg production (ranging from 1 percent to 10 percent) and lowered egg weights (as much as 2.5 g per egg or 2 lb. per case).

With a grant from the Egg Industry Center, Dr. Monique S. Franca, assistant professor and Dr. Ana Maria Villegas, graduate student, in the Department of Population Health of the College of Veterinary Medicine at the University of Georgia, are pursuing a research project to more fully understand FDN’s pathogenesis. Their fellow researchers are Dr. Roy Berghaus, Dr. Charles L. Hofacre and Dr. Margie Lee of the University of Georgia Poultry Diagnostic and Research Center, and Dr. Guillermo Zavala of Avian Health International.

“Although FDN is about 20 years old, the predisposing factors of this disease are still not completely known,” Franca explains. “These research findings will provide much-needed information about possible factors and etiological agents that might be associated with FDN. A better understanding of this condition is needed to design control measures and intervention strategies to prevent FDN-associated egg production losses, and to improve the profitability of flocks affected with this disease.”

Franca’s research team designed a three-part study, beginning with questionnaires distributed among different U.S. layer operations to determine the epidemiological characteristics of flocks diagnosed with FDN. The survey also sought to develop a profile of affected flocks in terms of housing, rearing, management, nutrition, health status and methods used for disease prevention and control.

The second part of the study involved obtaining duodenal samples from FDN-affected hens to test for the presence of various bacterial strains, including *Clostridium perfringens*, which previous research has shown plays an important role in the development of FDN.

Lastly, the “challenge model” portion of the research project, which is now ongoing, seeks to reproduce FDN in replacement pullets and determine the role of *C. perfringens* in the development of FDN.

Pilot studies will be performed on 2- to 3-week old commercial chickens to evaluate the severity of the disease reproduced under different variables. The entire research project will be completed sometime in 2018, and Franca is eager to compile and share her team’s findings.

“I have always been intrigued by this condition, and as an avian pathologist I really enjoy problem-solving,” Franca explains. “I have been very motivated to better understand FDN in order to help the egg industry control this disease. Intestinal disease pathogenesis is one of my favorite research topics, and my goal is to continue to conduct applied research on FDN and other poultry enteric diseases.”

This is Franca’s first Egg Industry Center grant and also the first grant she has received as principal investigator. “EIC support is very important and necessary for applied research to help solve the egg industry’s challenges,” she says. “I believe it would not be possible to advance the knowledge on Focal Duodenal Necrosis without EIC funding.”

**PRELIMINARY FINDINGS INDICATE:**

- FDN can occur in different breeds of egg layers and in birds of different age groups, with highest incidence during the peak and post peak of egg production.
- A majority of FDN affected flocks had frequent changes in feed formulation and use of distiller’s dried grains with solubles.
- Disinfection alone of feeders, cages, walls and ceilings between flocks, without cleaning, may not be sufficient to prevent the persistency and transmission of FDN.
- *Clostridium perfringens* was the most abundant culture-isolated bacteria from lesions.
- Inoculation with *C. perfringens* isolated from FDN samples can cause mild gross and microscopic duodenal lesions suggestive of early FDN in experimentally infected chickens.

**ABOVE:** Macroscopic lesion of characteristic Focal Duodenal Necrosis lesion from a field trip to collect samples for the research project. Courtesy from Dr. Luke Nolte (AVMA candidate)

**BELOW, LEFT:** Histopathology of FDN lesion showing necrosis at the villus tip associated with numerous rod-shaped bacteria

**BELOW:** Immunohistochemistry showing Clostridium perfringens antibody positive bacteria at FDN lesions.

Dr. Monique S. Franca
Building Pathways to Healthier Hens

When Dr. Janice Siegford talks about the animals in her current research study on aviary environments for raising pullets and laying hens, the term “bird’s-eye view” comes to mind.

In fact, that’s precisely the perspective this Michigan State University associate professor and her Swiss colleagues are attempting to adopt in their research project. They hope to understand how chicks and hens perceive the aviary environment, and how aviary design can impact the birds’ health and productivity.

With the industry shift from cages toward alternatives such as cage-free, it’s vital for producers to know more about the costs and benefits of these various housing systems. Aviaries will become more prevalent, Siegford believes, but they are far from perfect.

“Aviaries can be more costly for the farmers simply because you often have fewer hens per unit of space and you don’t get as many eggs,” she explains. “Aviaries can also come with problems that make hens less productive. They will do things like cannibalize and feather-peck, leading to increased mortality. They can also get injured in complex, multi-tier systems; chickens are not agile fliers and crash about 20 percent of the time when they fly. We still have to work on the ideal synergy between what the birds need and are capable of, what customers and consumers see as being the right kind of life for a chicken, and of course, how to ensure farmers stay in business.”

Healthier and more productive aviary environments, Siegford and her colleagues suggest, are dependent on structural design and on helping baby chickens learn the ropes — or, in this case, the ramps — from their mothers.

“One of the things I like about working with industry and groups like the Egg Industry Center that are interested in solving problems is the willingness to try things that maybe seem a little far-fetched — like ramps for chickens,” Siegford adds.

“Chickens learn a lot when they are young," Siegford says. “They hatch precocially and are able to eat and walk on their own, but they typically have mom around to follow for the first month or so. We have a lot of evidence about what she teaches them about what is right to eat, and what is not right to eat. It can be difficult for them to figure out this stuff on their own, but we can make it even harder if we rear them in one environment and then completely change their world by moving them to someplace else. Physically, they are not prepared to adapt to that challenge well.”

Siegford’s research colleagues at the VPH Institute in Bern, Switzerland, have been working on related issues. Dr. Ariane Stratmann has looked at how using ramps with laying hens reduces falls and collisions, while Dr. Michael J. Toscano has been studying keel bone damage. “In this study, our various research interests have come together and we can look at the aviary environment in a much more comprehensive way,” Siegford says.

“One of the things I like about working with industry and groups like the Egg Industry Center that are interested in solving problems is the willingness to try things that maybe seem a little far-fetched — like ramps for chickens,” Siegford adds.

“It’s kind of a crazy problem, and it’s hard to see how the chicken herself sees it. It’s nice to be part of something where people are willing to look at things from different angles. I’ve found that attitude all the way from the producers up to the most senior people in industry and researchers and students in between.”

In this study, which is set for completion in 2019, Dr. Siegford and her colleagues are seeking data-driven answers to these questions:
1. During the rearing period, does encouraging greater and earlier locomotion among vertical tiers through the use of ramps lead to specific, short-term change that results in long-term improvements in the laying period?
2. What is the benefit of overall structural similarities between rearing and laying environments in how hens adapt to the latter in the period immediately following population?
Finding Answers in the Midst of Regulatory Uncertainty

For commercial egg producers, the questions surrounding ammonia emissions reporting under CERCLA (the Comprehensive Emergency Response Compensation and Liability Act) and EPCRA (the Emergency Planning and Community Right to Know Act) could hardly be more confusing or worrisome.

Will egg producers be required to report emissions, and if so, when and at what emission levels? How are those levels to be measured and assessed? Will producers be vulnerable to environmental litigation, regardless of reporting results? Given the current administration’s commitment to deregulation, are emissions reporting requirements likely to disappear altogether?

Chad Gregory, President and CEO of United Egg Producers (UEP), knows these issues well. UEP’s Chad Gregory, President and CEO of United Egg Producers, is a very long relationship with and deep respect for Hongwei Xin and the work he’s done through the years. He’s chairman of UEP’s environmental scientific panel and a great partner to industry. And then, of course, there’s the research and information-sharing mission of the Egg Industry Center itself. When you add in Hongwei’s expertise and knowledge, there’s no one else we’d consider working with on a project like this.

Assuming that the reporting requirements will apply to egg production facilities generating ammonia emissions in excess of 100 pounds per day, the first step in this project was to help producers know if the parameters of their facility will cause them to have to report. To gauge emissions based on the different types of operations, the center developed several ammonia estimator tools:

- **Pullet Ammonia Emissions Estimator Tool for Weekly Site Removal of Manure**: Can be customized by pullet age and manure removal schedule.
- **Pullet Ammonia Emissions Estimator Tool for Long-Term or No Manure Storage**: Can be customized by pullet age and manure removal schedule.

These tools, and any subsequent updates, are housed in the EIC Research Library as well as under Regulations on the center’s website (under Environment).

Gregory expresses hope that the emissions reporting requirements will be rescinded, although the outcome was unknown at the time this report went to press. Nevertheless, as UEP proudly states on its website, egg farmers embrace preserving and protecting the environment because it is the right thing to do, despite unanswered questions. Working together, UEP and the Egg Industry Center are committed to providing industry with reliable answers in uncertain times.

Find these free estimator tools at www.eggindustrycenter.org. Click on the “Research Library” tab under “Research,” and then click on the “Environment” folder.
Keeping Tabs

On the Economics of Eggs

The U.S. egg industry has been a poster-child for change over the last decade, and more changes are on the horizon. Thankfully, the individual who understands the industry’s past, and can offer insight into its future, is part of the team at the Egg Industry Center at Iowa State University.

Maro Ibarburu (’05 MS agricultural economics) works as the center’s associate scientist and business analyst. He wasn’t born with a fascination for eggs or chickens, though his family raised some on their farm in Uruguay. He was drawn to Iowa State by the opportunity to learn and an interest and passion for economics. Following graduation Ibarburu was hired as a poultry economist, and is now the go-to expert nationwide for historical egg industry information, insight on the future flock size, and egg prices.

He continually analyzes data coming from the United States Department of Agriculture and other private sources to project what the future may hold for the industry. His efforts increase the accuracy of models used for reporting, even though forecasting markets is particularly challenging in the egg industry.

“The correlation between egg price and egg consumption is weak,” Ibarburu says. “In only nine out of the last 17 years the consumption and the price moved in opposite directions, whereas in the remaining eight years, the consumption and the price moved in the same direction.”

This complicated dynamic means the industry relies on the information he provides.

“The knowledge that Maro has, and the information that he generates, is invaluable and critical to us as producers and to our industry partners because we have to make important investment decisions that have long-term impact,” says Steve George, president and CEO of Fremont Farms of Iowa. “Maro is a key asset to the entire U.S. egg industry and we are lucky to have him.”

Ibarburu also works as a collaborator on research projects and develops special reports on issues like the market reaction to the High Pathogenic Avian Influenza outbreak in 2015, but ultimately he likes helping others the most.

“It is a fun job because sometimes I am helping a producer who has a question about the market reports, and other times I am helping a new allied industry person who is unfamiliar with egg production,” Ibarburu says.

In response to industry needs and trends, he currently spends considerable time talking with those in the consumer food chain about the economic trade-offs of moving the industry to a cage-free production system.

“While we don’t know the future, we do know some of the trade-offs that exist, including a bigger environmental footprint, increased disease pressure for the birds and increased cost of production, which will increase prices on the grocery store shelf,” Ibarburu says. “One thing is certain—this industry is always changing and that means there is always something to learn.”

“Maro is a key asset to the entire U.S. egg industry and we are lucky to have him.”

STEVE GEORGE
President and CEO
Fremont Farms of Iowa

Photo by Chris Gannon
Changes facing the industry were the focal point of the 2017 Egg Industry Issues Forum. Approximately 200 egg industry producers, allied industry members and stakeholders learned about new research, new programs and new management techniques in Columbus, Ohio, on April 19–20.

To address much-needed information regarding the pledged transition to cage-free production, the Egg Industry Center organized a panel of experts to share their knowledge. EIC had an overwhelming response from attendees regarding the success of the panel. One evaluation provided the best summary: “[The] panel was excellent with the short presentation and question and answer period.”

Other industry changes were highlighted through discussions regarding commodity markets and the need for producers to engage on social media.

For the second year in a row, Egg Forum shared research resulting from EIC’s grant award program, funded from the EIC endowment. Dr. Maja Makagon, University of California-Davis (pictured left), reviewed her research findings regarding the risk factors for laying hen keel bone damage. Dr. Kyong-Jin Hoon, Iowa State University, discussed his findings on the roles of wild birds, rodents and insects in the spread of HPAI.

“This type of new, cutting-edge research information is what makes Egg Forum different,” says Egg Industry Center Director Dr. Hongwei Xin. “We are truly excited to be able to bring the research and other relevant issues directly to producers, so they can apply it to their operations.”

The Egg Industry Center will celebrate its 10th anniversary at Egg Forum in 2018. Mark your calendars for sunshine, golf and education on April 16–18, in Scottsdale, Arizona.

For more information on the status of each research project led or funded by the Egg Industry Center, or past presentations from Egg Forum, see the EIC website at www.eggindustrycenter.org.

**VOTING MEMBERS**

- Don Bowermann
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- Bill Northey
- Kevin Stiles
- Ruth MacDonald
- Angela Laury-Shaw
- Hongwei Xin

**PLEASE WELCOME STEVE GEORGE**

EIC is extremely excited to have Steve George, President and CEO of Fremont Farms of Iowa, LLP joining the Advisory Board. Steve’s extensive industry knowledge and innovative ideas are a fantastic addition to a wonderfully talented group. Welcome aboard, Steve!

**THANK YOU DAVE RETTIG**

Dave Retting has stepped down after six years of service on the Egg Industry Center Advisory Board. Dave is a great leader in the egg industry and EIC wishes him a heartfelt thank you and continued success in the future.
ADVANCING THE EGG INDUSTRY

The Egg Industry Center’s core belief is that the practical, problem-solving research funded by the center is absolutely essential to the industry’s ability to thrive in today’s environment of constant change. What completes this equation is the generous support of donors, partners and friends like you.

During 2017, center-funded research projects have yielded a harvest of new knowledge and insights, helping to advance individual egg producers and the industry as a whole.

To learn more about how you can further the mission and goals of the Egg Industry Center, and promote a vital and resilient industry, contact the center today!

www.eggindustrycenter.org