

Summer 2020

IOWA

# Pork Producer

*Headlines*

A publication  
of the Iowa  
Pork Producers  
Association

[iowapork.org](http://iowapork.org)



## SWINE AND PORK RESEARCH ENHANCE CHECKOFF RETURN TO PIG FARMERS

*Whether research explores swine nutrition, disease mitigation, or enhanced eating qualities of pork, all are building to better pork production.*

# Research at Iowa State University Helping Pig Farmers

*The best way to measure progress is by discovering new ideas that can be applied to further our knowledge and efficiency. There are countless research studies being conducted every day at universities around the world.*

*Every year, the research committee at the Iowa Pork Producers Association (IPPA) supports using checkoff dollars for funding research undertaken by some of the brightest in the industry.*

*The Iowa State University research studies highlighted in this Headlines will provide information on various topics:*

- *how pigs utilize fiber*
- *a novel intramammary vaccine delivery system for porcine epidemic diarrhea virus (PEDv)*
- *pork loin quality and tenderness*

*The IPPA research committee is proud to fund this research to further benefit you.*



## Producer Inputs on Research

### **Dwight Mogler, Alvord, IA**

As a member of the board of directors and a 4-year member of the research committee, Dwight Mogler shares his perspective on why funding research is critical to the swine industry:



“I have a strong conviction that a percentage of checkoff dollars should go to research. It is an important pillar to the checkoff program. I am a firm believer in public research because it is public funds and public knowledge. It allows smaller producers to have a competitive stance in the industry.

“I am very supportive of public institutions, such as Iowa State University, and we have a great relationship with their extension program. Funding research is a great way to attract talented and bright people who want to further swine research.”

### **Gene Gourley, Webster City, IA**

Gene Gourley is a long-time member of the research committee. He and his three brothers operate Gourley Farms in Webster City, Iowa. Research is Gene’s passion; he shares why it is important to pork production:



“It’s critical for the industry to continually look at and investigate cutting edge discoveries. It is important to have both discovery research that will bring benefit down the road as well as applied research that is current. We are establishing the next leaders of the industry by promoting education and research in young talent. They will hopefully turn into the next animal health and animal meat and science leaders in Iowa’s industry.”

## From a Veterinarian

### Jason Hocker, DVM

Hocker is a veterinarian and partner at AMVC, and he has been on the IPPA research committee since 2015. He is serving as chairman of the committee, and knows the direct impact the research can have on Iowa pig farmers.

“I am honored to chair the IPPA research committee and have been active on the committee for several years. Research funded by IPPA provides our members and industry with information that is immediately impactful. From a veterinarian perspective, the IPPA research funding allows the committee to target proposals for pathogens of timely importance. This allows the advancement of knowledge on those diseases that are currently impacting farmers, herds and hopefully provides additional knowledge in treating, preventing, or diagnosing the industry’s most pressing diseases.”



## Impact of Fiber on Nutrient Utilization by the Pig

Nothing is more important than healthy pigs.

Dr. John Patience of Iowa State University Department of Animal Science specializes in applied swine nutrition, as well as fiber & fat utilization and metabolism. He has an interest in developing a better understanding of how fiber impacts pig growth, as the industry is increasingly using ingredients with higher fiber levels, which is believed to improve pig health.

He reported that the effect of insoluble dietary fiber (IDF) commonly found in corn and corn co-products is not fully predictable.

According to Dr. Patience, “Fiber is the carbohydrate portion of the diet which cannot be digested by enzymes secreted by the intestinal tract of the pig ... parts of it can be fermented by the microbes that live in the gut of the pig, primarily in the caecum and large intestine.”

Soluble fiber is the portion of fiber that was fermented well in the pig. Conversely, insoluble fiber is not properly fermented in pigs. Unfortunately, the fiber in corn is highly insoluble.

### FIRST EXPERIMENT

In the first experiment, 21 ileal-cannulated gilts were given 1 of 7 dietary treatments. This means that gilts were given a diet through a tube into the area where their small intestine connects with the large intestine, which also helps to further digest food and absorb nutrients. Four diets were made of corn-soy with varying ratios of 0, 15, 30, or 45% distillers dried grains with solubles (DDGS).

Patience states that “results from experiment one showed that the addition of IDF (in the form of added DDGS) decreased ileal digestibility of dry matter, energy, and the fiber components, except acid detergent fiber (ADF). It even lowered the digestibility of starch which is normally well used by the pig; fortunately, the impact on starch was small relative to other components of the diet.”

### SECOND EXPERIMENT

In the second experiment, 480 pigs housed between 48 pens were evaluated. They were fed one of eight diets. Diets were correlated to corn-soybean meal based with four levels of added phytase. (Phytase



is an enzyme that breaks down phytate, a source of phosphorus from plants in pig diets.) Given the results of the first experiment, the question was asked whether fiber would also impair the ability of phytase to do its job.

After experiment two, Patience says “Experiment 2 showed that fiber had no impact on the amount of phosphorus released by phytase. Irrespective of the quantity of fiber in the diet, phytase released the same amount of phosphorus and made it available to the pig.”



### PHYTASE

Patience was able to conclude that phytase will release phytate-bound phosphorus in both low and high fiber diets.



## RESULT

Through these experiments, Dr. Patience was able to conclude the following:

- Adding insoluble dietary fiber decreased the use of other dietary components in the intestinal tract. Adding insoluble dietary fiber did increase soluble fiber in the large intestine.
- Adding fiber did not change the affect that phytase has on growth performance and bone mineralization.

## Novel Vaccine Delivery System for PEDv

It is estimated that porcine epidemic diarrhea virus (PEDv) caused the death of 8 million pigs in its initial appearance on U.S. soil in 2013. Enteric diseases, caused by viruses like PEDv, can be fatal, particularly in young animals as they rely on passive immunity acquired from the sow through colostrum and milk. They can become quickly dehydrated and have a slower rate of recovery.

Dr. Bailey Arruda of Iowa State University College of Veterinary Medicine is developing a novel intramammary vaccine delivery system for PEDv, in hopes of significantly diminishing the losses incurred by sow farms that break with PEDv through the stimulation of both IgG and IgA, two types of antibodies.

**IgG:** IgG is found in the colostrum of sows and provides protection against viruses, such as PEDv, but only for the first 36 hours of life.

**IgA:** IgA, an antibody also found in the colostrum and milk of sows who were previously exposed to PEDv, will allow piglets to gain the protection from PEDv through lactogenic immunity, as long as there continues to be IgA in the intestinal tract from the IgA in milk.



## INTRAMAMMARY IMMUNIZATION

Based on research and published immunology studies, Arruda discovered that intramammary immunization may be the better option over the common intramuscular injections or gut exposure.

A similar experiment was done in 1995, where a live injection of transmissible gastroenteritis virus (TGEV) was put into pregnant sows and resulted in the production of IgA in their milk glands.

## TEST SUBJECTS AND TREATMENTS

Gilts split into 3 separate groups, for a total of 75 gilts in each group, were used in this research. All the gilts were tested starting day 75 of gestation.

Groups 1 and 2 were the negative and positive control groups, respectively; both were given the polymer-based vaccine and adjuvant. The adjuvant enhances the immune response to an antigen. Group 3, the vaccinated group, received the same vaccine and adjuvant in addition to inactivated PEDv.

Piglets from Group 1 received no treatment. Those in Groups 2 and 3 were inoculated with PEDv at 4 days of age. One day post-inoculation, Group 2 and 3 piglets had diarrhea and vomiting. At Day 7 post-inoculation, PEDv was detected in the feces of all piglets in the two groups. But, by Day 10 post-inoculation, two of three animals in Group 2 were still shedding virus, while the opposite result was seen in Group 3, in which 59% were negative for PEDv.



**This novel vaccine system evoked lactogenic IgG and IgA in 3 of 4 sows and protected 38-83% of piglets from those sows. Mortality of piglets in the positive control group (no vaccine and inoculated) was 100%. This study is encouraging for when the next PEDv threat arises. Arruda goes into the science behind the promising vaccine delivery system.**

**According to Arruda, "There is a need to develop an effective vaccine to prevent PEDv in nursing piglets through the stimulation of lactogenic immunity in PEDv-naïve sows without the need for acclimatization and this is a promising first step. What is potentially the most exciting finding about this platform is the ability for a single administration of vaccine that provides months to years of immune stimulation to a sow, decreasing the need for numerous injections that can be both costly and labor intensive. Additionally, multiple disease-causing agents could be added providing broad spectrum protection against both epidemic and endemic agents."**

**RESULT**



## Predicting Pork Quality: Pork Loin Tenderness

When consumers are purchasing pork, they are expecting that the cut is of good quality, meaning they will enjoy the texture, flavor, and juiciness. It is incredibly challenging to control pork quality, and probably more challenging to predict pork quality. Many components go into measuring the quality of the cut, including tenderness and water-holding capacity.

Dr. Steven Lonergan of Iowa State University Department of Animal Science conducted a research project in February 2020 to try and solve why controlling pork quality is so difficult. Lonergan specializes in meat science and muscle biology.

Through his research, his report takes a more in-depth look at fresh pork tenderness and the proteins that develop in the initial stages of postmortem pork loin chops.

### PRIMARY FACTORS

According to Lonergan, “the primary factors that influence the fresh pork loin quality are protein factors and these are influenced by postmortem metabolism (pH decline) and handling (postmortem aging).”

### OBJECTIVES

To learn more about why this is, Lonergan conducted two studies:

- the interaction between aging duration and post-aging freezing on pork loin quality attributes, and the relationship between two types of tenderness measurements - pork loin star probe (SP) and Warner-Bratzler shear force (WBS).
- a study to determine the extent to which the complete package of muscle fiber proteins (sarcolemmic proteome) explains the variation in the SP value of aged pork loin

### COLORING AND AGING

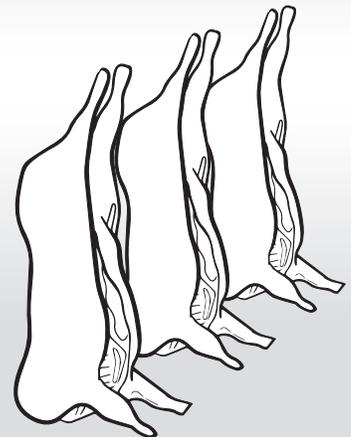
When looking at the first study, one of the key discoveries was with coloring. The chops became lighter colored and had decreased water-holding capacity as time progressed.

During the conversion of muscle to meat, metabolism within the muscle controls the development of those quality features. Postmortem protein degradation plays a prominent role in tenderness and water holding capacity, major factors in the quality of meat. Those with a lower ultimate pH at 24 hours post-slaughter were a less saleable product due to drip loss. Pork with a higher ultimate pH will retain more meat juice and result in a more succulent and tender eating experience.

Aging the pork loin for 8 days before freezing showed a 22% and 32% improvement in the SP and WBS values, respectively (improved tenderness). Aging pork 14 or 21 days did not improve the SP or WBS values past the 8-day level. And, freezing pork at 1 day postmortem did not improve SP and WBS values, so a recommended best practice is aging pork prior to freezing.



**AGING PORK FOR  
8 DAYS  
BEFORE FREEZING IMPROVES  
TENDERNESS**

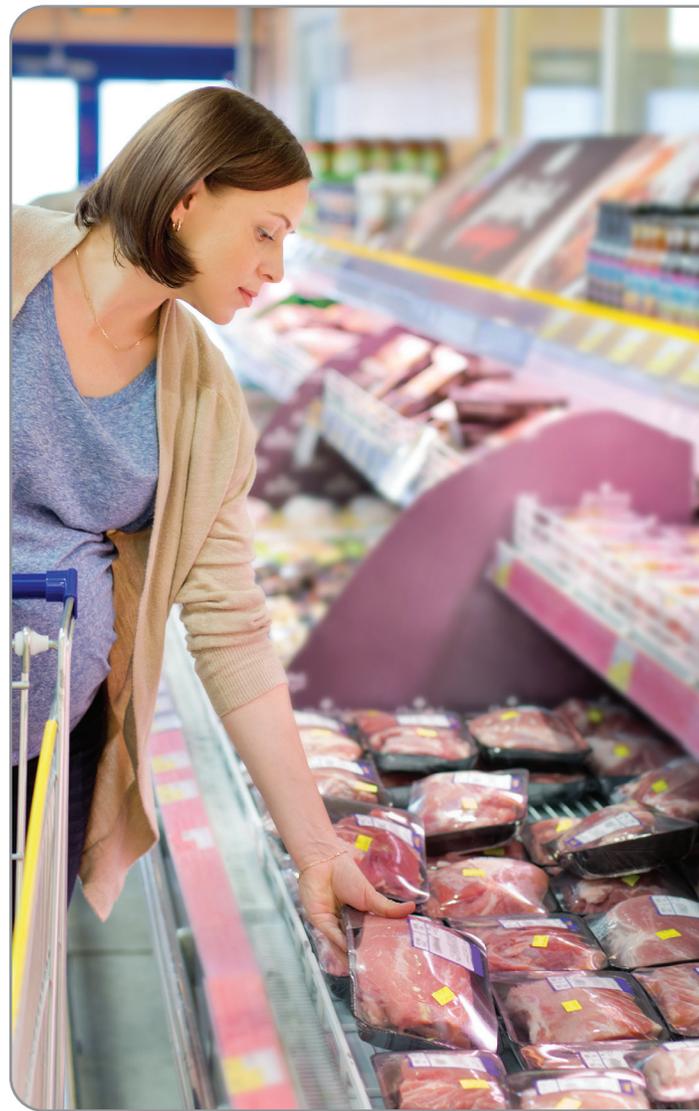


# RESULT

To be able to predict pork quality better, Lonergan looked at stress response proteins. He found that three proteins were connected to stress response: peroxiredoxin-2, Hsc 70 interacting protein, and heat shock cognate.

By being able to understand the stress proteins in pork, we will be able to understand better how they play a part in the postmortem process of pork tenderness. Based on these findings, we can begin to build more informed data to predict pork quality according to these biochemical features observed, even before the aging process begins.

These early findings demonstrate a need to investigate more deeply the role of metabolic and regulatory proteins in the development and predictability of pork tenderness.



This *Headlines* issue was written by Eleanor Korum, the 2020 IPPA Checkoff Intern. Eleanor grew up in Hudson, Wisc., a river town just east of St. Paul, Minn. Although she did not grow up on a farm, her passion for agriculture started at a young age. She has greatly enjoyed learning about the swine industry this summer at IPPA. This fall, she is a senior at Iowa State University majoring in Agricultural Business and minoring in Technical Communications. Upon graduation in May 2021, Eleanor plans on starting her career in the ag industry.

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#### Mission Statement

The Iowa Pork Producers Association promotes, educates and provides a leading voice for a sustainable, socially responsible, and globally competitive pork industry.

 **IOWA PORK**  
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*Successful farmers. Enriched lives.*



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