## Frank's Note

There are many lessons that I learned through my years growing up and raising hogs with my father and siblings. One is that people who spend time in the barns caring for animals really do care about the animals, as well as the long-term outcome of providing wholesome, nutritious pork for people to enjoy. Of course, that makes this year's events especially hard to absorb.

Another element about pork producers that I have found to be true throughout *Farmweld*'s 41-year history is that pork producers are serious and committed business people. U.S. pork producers are still the best in the world at raising pigs efficiently, ensuring a consistent, quality supply, all while keeping the animal's well-being at heart. That has not and will not change.

As we all face this unusual period, first, take time to reflect on some of the positive experiences you've had over the years. I bet you can recall some people and events that will make you smile.

Next, address what you can control. You may not be able to control COVID-19 or the markets or exports, among other things; so, focus your energy on your farm, your family and your pigs' well-being. Evaluate the pain points, both for the business and yourself. Set a course of action and initiate the changes necessary. Reach out to others for ideas, comfort and guidance, including *Farmweld*.

We've been on some rocky roads in the past and have pulled through, coming out even stronger on the other side.

Rest assured, you are not in this alone. As always, *Farmweld* is here to help you identify short- and long-term solutions. Don't hesitate to call us at 1-800-EAT-PORK (328-7675) or visit farmweld.com.

Frank Brummer
President
*Farmweld, Inc.*

# Connecting the Post-weaning Mortality Dots for the Future

**Research continues to develop long-term strategies to maximize pig survivability, quality and well-being.**



Courtesy of the National Pork Board, Des Moines, Iowa

It's no exaggeration to say that 2020 may well be the U.S. pork industry's most challenging year ever. The unprecedented and unpredictable challenge that COVID-19 presented has upended pork production supplies and business plans.

The one thing that rings true, however, is that pork production will recover. This is a hardy industry made up of individuals that help each other find new and better solutions every day. Such is the case with the many research projects and experts that continuously search for answers for your business, your animals and your product.

One such example is the 5-year, Improving Pig Survivability project funded by the National Pork Board and the Foundation for Food and Agriculture Research, with the goal of reducing overall mortality in the U.S. swine industry by 1 percent or more per year of the project. The effort involves experts in animal science, veterinary medicine, economics and microbiology from Iowa State University (ISU), Kansas State University (KSU) and Purdue University.

Now well into its second year, the project is moving forward to identify factors contributing to post-weaning mortality and to develop strategies to maximize pig survivability.

"We know that one-third of all pigs die prematurely; two-thirds of those die at birth or prior to weaning," says Jordan Gebhardt, DVM, PhD, in the Department of Animal Sciences and Industry at KSU. "That means one-third die deeper into the growth phase."

Illustrated another way, Gebhardt notes that if the United States harvests 120 million pigs in a year, at an 8 percent post-weaning mortality rate it means that 10 million pigs were lost during the growing phase. "So, post-weaning mortality represents an area for significant improvement," he says.

**Jordan Gebhardt,** *DVM, PhD,*
*Department of Animal Sciences and Industry,*
*Kansas State University*

## Complex Factors

To better understand what is known about post-weaning mortality and what needs more study, Gebhardt conducted a massive scientific-literature review. He found that post-weaning mortality data is limited, in part because mortality research requires huge animal numbers and partly because studies have focused on pig growth and productivity, with mortality as an add-on.

"We've made big improvements in litter size and productivity gains, but we haven't made a lot of improvement in mortality over the past decade or more," Gebhardt notes. "Mortality is influenced by so many factors and there's significant overlap, which makes establishing causation extremely difficult."

To refine the focus, Gebhardt divided contributing factors into infectious and non-infectious categories. Non-infectious factors are dependent on the production setting and management, and he grouped them according to their magnitude of impact based on how common and how severe they are. The point was to identify which ones have the greatest impact on post-weaning mortality, and the data broke out as follows:

• **High magnitude:** Birthweight, weaning age and weight, pre-weaning management (such as colostrum access and cross fostering) and season.

• **Moderate magnitude:** Acute abdominal incidents, such as gastric torsions; scrotal hernias; rectal prolapse; gastric ulcers; genetics; dam parity; toxicities or nutritional inadequacies; barn-fill length and pig sources; resource availability; and sanitation.

• **Low magnitude:** Group size, transportation loss, sex, lameness, physical injury, umbilical hernias, facility and environmental factors.

"Most non-infectious factors that have the greatest impact on pre-weaning mortality happen prior to weaning," Gebhardt says. "These factors are set up early in the pig's life. This emphasizes the importance of the people working in the farrowing house and actions like day-one pig care."

A bit more surprising was the impact of infrequent hiccups such as toxicity. For example, if piglets are placed in a nursery and the waterlines aren't turned on or are frozen, the pigs won't have a sufficient water supply. Once access to water is regained, the pigs quickly develop an electrolyte imbalance, causing brain swelling and death. "It doesn't happen often, but it has a huge impact and shows that attention to detail is important," Gebhardt says. "That's why it's critical that barn workers get the training, resources and the prioritization necessary to manage piglets and reduce mortality."

For infectious factors, Gebhardt categorized them by their relative importance or the approach taken in response to the disease. So, infectious factors were sorted into:

• **Depopulation:** *Actinobacillus pleuropneumonia,* swine dysentery, pseudorabies, foreign animal diseases.

• **Elimination:** Diseases driven by their high economic impact, such as enzootic pneumonia, porcine reproductive and respiratory syndrome (PRRS), coronaviruses (PEDV, TGEV, PDCoV), swine influenza virus, non-dysentery *Brachyspira* spp.

• **Management:** This includes a long list of diseases that are generally managed within pork production through vaccination, medication and/or management, including bacterial etiologies such as *Hemophilus parasuis*, *Pasteurella multocida* and *Lawsonia intracellularis*; *Streptococcus suis*; porcine circovirus; rotavirus; hemorrhagic bowel syndrome; and more.

Diseases that require depopulation are important, but those that align with elimination warrant further investigation to maximize herd health and reduce pre-weaning mortality, Gebhardt says.

"We all want something clean and easy to point to, but post-weaning mortality doesn't work that way," he adds. "There's no one number or goal to achieve; rather it's a mindset of always trying to move lower."

## A Model Opportunity

Helping to advance that mindset and break down some of the complexity is an ISU research team that also works within the Improving Pig Survivability project. They have developed a new data-driven approach for farms to address post-weaning mortality called Predictors of Swine Performance or PROSPER.

"We saw the opportunity to take the data streams that production systems already collect but that they don't integrate — productivity, health, management, infrastructure, environment — from service (the sow) to the groups going to market," says Edison Magalhaes, DVM, graduate research assistant, Veterinary Diagnostic and Production Animal Medicine, ISU. Having worked as a swine practitioner in Brazil, he's familiar with the mounds of data collected and the challenges of following pigs through the production maze.

The first goal was to develop an automated statistical model (algorithm) to capture and merge multiple data streams into a single cohort report. He then uses that report to measure

the whole-herd drivers associated with wean-to-finish mortality, measuring multiple factors as well as specific parameters. A second goal was to forecast downstream performance and mortality based on multiple variables for specific pig groups.

Iowa Select Farms participated in the model's development, which involved collecting 1,300 closeouts from nursery to finishing from July 2018 to June 2019. "These closeouts account for a wide range of pig flows that typically occur within a production system — single source, commingled nurseries, double stocked and so on," Magalhaes says. "We have all the variables that are common in the U.S. industry."

Sow productivity and health parameters are highly associated with growing-pig performance and mortality, so the model zeroed in on 14 sow variables such as total born, farrowing rate, annualized sow-death rate, PRRS and *Mycoplasma* status.

Among its benefits, PROSPER will provide insight into the downstream performance of challenged flows. For example, you could track and compare

**Edison Magalhaes,** *DVM, graduate research assistant, Veterinary Diagnostic and Production Animal Medicine, Iowa State University*

performance between PRRS-negative, PRRS-stable and PRRS-unstable flows, and then identify actions to improve the outcome. "If I know that my PRRS-unstable groups have a wean-to-finish mortality of 11 percent, I could focus on treating those pigs early," Magalhaes says.

While the model provides a retrospective look at pig groups, it also offers a prospective view, as it's able to forecast closeout mortality based on the aggregated information to a 71 percent predictive rate. While 71 percent isn't bad, he suspects that it will increase with more data and experience.

The real benefit comes in knowing how to manage pig groups to the best outcome. "Let's say you have 50 groups weaned into the growing phase

this week; we run the analysis and predict which groups will have mortality higher than 10 percent," he says. "The producer can tag those groups, follow them and change interventions to improve the outcome."

## Next Steps

It's important to note that the results presented through PROSPER are specific to a production system. As more production systems get involved, Magalhaes anticipates providing broader insights for the industry and benchmarking mortality drivers.

The program is now available to breed-to-finish systems that have data in a digital format for sow-farm and growing-pig productivity, animal movements and sow-farm health status. Future directions for analysis will depend on the data and questions generated by the farm.

"You could look at specific vaccination protocols or compare medications and their impact on the growing pigs," he adds, "or a specific boar line or management protocols within your gilt-development unit."



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Iowa Select wanted to know about the impact of tissue submissions and diagnostics. So, the PROSPER team worked with the Veterinary Diagnostic Laboratory (VDL) personnel, which assigned a code to each pathogen identified and automated them into the data stream. Variations in how and why tissue samples are submitted, as well as differences in how VDLs report results limit this option for now. However, the American Association of Swine Veterinarians Foundation has awarded the team a grant to work on standardizing the VDL data-collection process and diagnostic codes for potential future application.

"We are excited by the preliminary results that showed groups with any tissue submitted to the VDL had greater wean-to-finish mortality compared to those that had no tissue submissions," Magalhaes says. "Now, we will investigate the differences of pathogens and lesions diagnosed. We'll also look deeper into the interaction of tissue submission with sow-farm productivity data, such as the sow's health status at weaning and the impact on post-weaning mortality."

Longer term, the prospects for PROSPER are even broader, such as incorporating precision livestock-farming technologies as they come on board. These might include automated, daily recordings of pig coughs, feed and water use, or environmental and animal temperature readings to produce daily reports for even more predictive abilities.

"Imagine all the data collected on farms; this model proved that we can integrate it and make it more useable," he adds. "We're just scratching the surface."

Learn more about the Improving Pig Survivability project at piglivability.org. For more information about PROSPER, go to fieldepi.org. F