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1-888-248-4893
PUBLISHER & EDITORIAL DIRECTOR
PAUL NOLAN ext 202
Paul.Nolan@BetterFarming.com

MANAGING EDITOR
ANDREA M. GAL, PhD ext 201
Andrea.Gal@Farms.com

OFFICE ADDRESS
52 Royal Rd., Unit A,
Guelph, Ontario
N1H 1G3

EDITORIAL TEAM

ASSOCIATE EDITOR
JAN KERTESZ

CONTRIBUTING EDITOR
FRANKLIN CARTER

STAFF WRITER
KATE AYERS

STAFF WRITER
JACKIE CLARK

CONTRIBUTORS TO THIS EDITION
MOE AGOSTINO
ABHINESH GOPAL
LEE-ANNE HUBER
RICHARD SMELSKI
GEOFF GEDDES
LAUREN HANSEN
HOLLYN MALONEY

ADVERTISING TEAM
GLENN RUEGG
JENNY LONGSTREET

DESIGN & PRODUCTION TEAM
TANYA MYERS
SHAUN CLARK
GREG MARLOW
ANDREA WILLIAMS

COVER
HRM Photography; National Pork Board and the Pork Checkoff, Des Moines, Iowa photo

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LETTERS FROM A FAMILY FARM

THE POWER OF KNOWLEDGE

In the ag industry – and particularly the swine sector – we're familiar with the significant ramifications the development or resurgence of a disease can pose.

We know what steps to take to help prevent or address an outbreak of porcine epidemic diarrhea or porcine reproductive and respiratory syndrome, for example.

Since the first outbreak of African swine fever in China in August 2018, North American pork sector stakeholders have worked diligently to prevent the disease's entry into herds here. Researchers are working on potential vaccines, too.

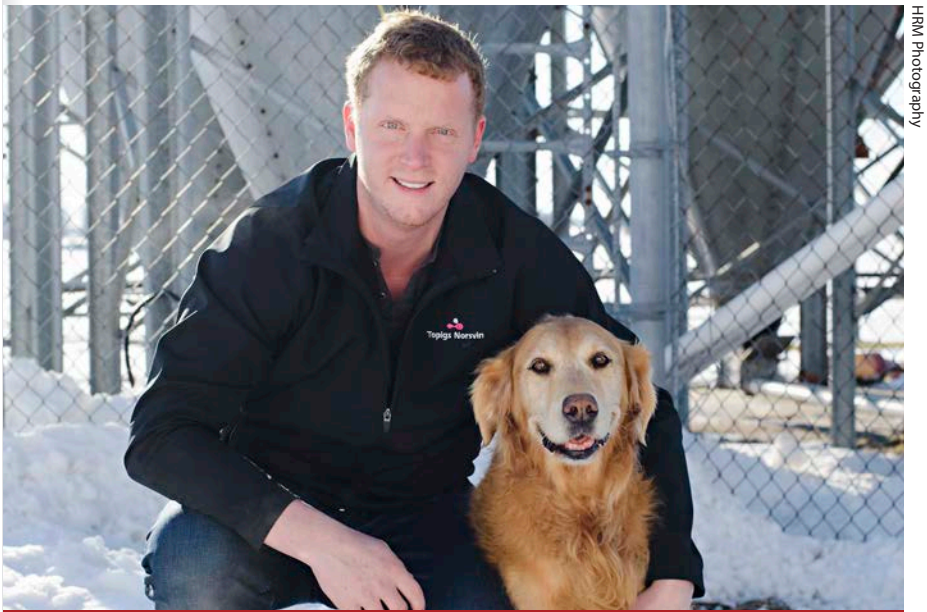
A key element of biosecurity efforts is education. All members of the swine community must learn about potential threats and biosecurity measures to protect the health of our herds. And, of course, all industry stakeholders must understand the level of risk associated with any disease.

This month, staff writer Jackie Clark investigates a new strain of *Strep zoo* which officials have reported in some areas of North America. Clark outlines the affects of the disease on pigs. She discusses what we know about *Strep zoo* so far, how we can stop the disease and what researchers are still trying to learn. To date, outbreaks are localized but education is always useful.

Importantly, I also wanted to acknowledge the growing global tensions and uncertainty resulting from the COVID-19 pandemic. One of the core strengths of the ag industry is our sense of community. These ties will help to sustain us as health care workers and officials work tirelessly to contain the disease.

In the meantime, let's keep connected through social media and other technologies. And, as always, let's think of other people who may need some extra support during this worrisome time.

Andrea



HRM Photography

Joe Dekroon and his pal Bubba head out to the barn. She is an integral part of the family. See the "Up Close" interview with Dekroon on page 26.

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THE PORK SECTOR'S BEEF WITH PROTEIN LABELLING

A company that produces alternative plant-based protein products is in hot water with a farm organization after violating American labelling laws.

Impossible Foods' new Impossible Pork product is designed to mimic real pork but the American **National Pork Producers Council** (NPPC) is not pleased with the company's naming choice.

"There is an incredible body of precedence that says pork can only come from a pig. Anything that is soybean-based is in no way, shape or form a pork product," **Dr. Dan Kovich**, director of science and technology for the NPPC, said to *Better Pork*.

The NPPC strives to protect the integrity of traditionally produced pork products, a recent report from the organization said.

Alternative plant-based protein "products are not nutritionally equivalent to pork," Kovich said. "This (naming) goes against decades of food labelling laws in terms of what pork means. People know what pork is and they enjoy eating it, so we need to protect this term for meat products that come from pigs."

Companies that create alternative protein products should be truthful when labelling their products, he added in the interview.

"It's not that we don't think they should be making these products and selling them. (Companies) just have to be clear and honest about what" the products are when marketing. **BP**

GUT CHECK: HOW TO IMPROVE PIG HEALTH

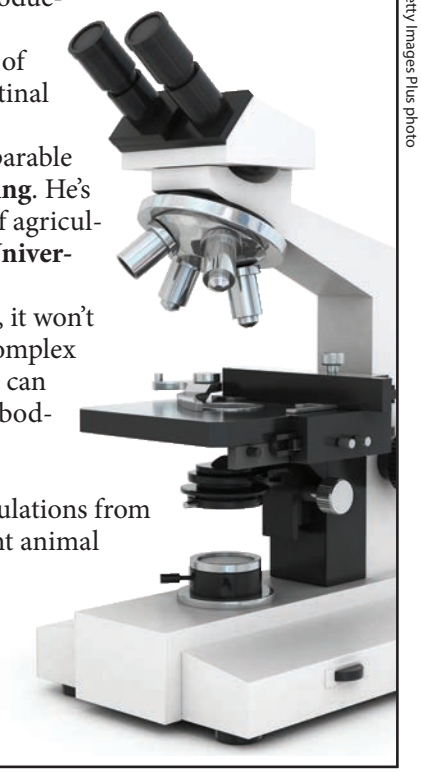
Given the cost of disease to the pork industry, anything that can boost resistance is priceless for producers. So, researchers are focusing on the pig gut's microbiome, which is the population of bacteria, yeast and fungi in the gastrointestinal (GI) tract.

"The microbiome is an ecosystem comparable to a tropical rainforest," said **Dr. Ben Willing**. He's an associate professor in the department of agricultural, food and nutritional science at the **University of Alberta**.

"If you plant a dandelion in a rainforest, it won't go far because it can't compete with that complex community. Similarly, the gut microbiome can act as a defence mechanism, secreting antibodies to keep pathogens at bay."

In experimenting with the microbiome, scientists have transplanted microbial populations from one mouse to another, making the recipient animal more resistant to infection in the process.

"The results of those experiments suggest we can do the same thing for pigs by finding those microbes that help resist infection and increasing their levels," Willing said. **BP**



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ONT. TEAM WINS INNOVATION AWARD

A team from **South West Ontario Veterinary Services** in Stratford, Ont. took home the Dr. F.X. Aherne Prize for Innovative Pork Production at the 2020 Banff Pork Seminar in January for their swine restraint device.

Tess Faulkner photo

Tess Faulkner and **Gillian Greaves** are research associates who had some difficulties early in their careers restraining pigs in commercial swine facilities.

"Although nursery pigs are small, when you are learning new techniques … it can be difficult to restrain the (animals) comfortably," Greaves told *Better Pork*.

Faulkner agreed, explaining "Our physical ability and lesser experience led us to try and find a new way to complete the same task – and thus we developed the Hammock."

Faulkner and Greaves came up with a design that allows the operator to place the pig in the suspended surface of the device. The pig's legs fit through holes in this surface.

"Once you do this, the pig should be secure and safely restrained. This (setup) leaves your hands free to swab or operate any sort of equipment or tools safely and comfortably," Faulkner explained.

The result is improved safety and well-being for both the pig and handler, Greaves added.

Other individuals in the swine industry facing similar challenges can easily recreate the Hammock at a low cost, Faulkner said. **BP**

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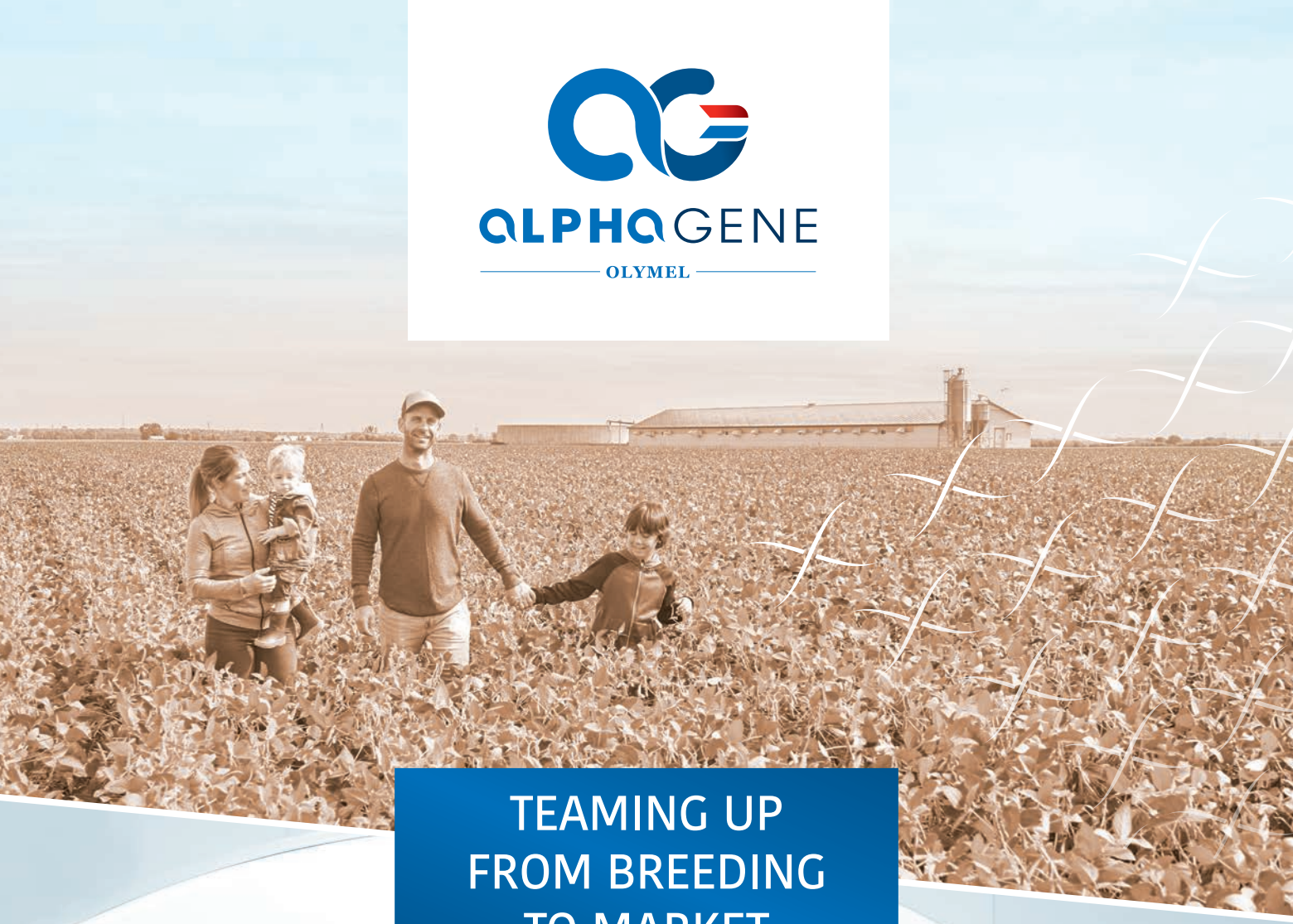

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THE QUEST FOR A 'MADE-IN-

by KATE AYERS

Pork producers are lobbying for a fair pricing r

When an automobile manufacturer dedicates extra time and effort to ensure its vehicles are safe and of high quality, customers are often willing to pay a little more for this attention to detail. Shouldn't a similar premium pricing model apply to the Canadian pork production marketplace?

While Canadian pig farmers produce safe, nutritious and even premium pork, stakeholders argue the current pricing system doesn't reflect the quality of the product. Margins are tight – or even negative – for producers, and premiums aren't evenly distributed across the value chain.

The creation of "a price tailored specifically for a Canadian product could see profitability return to producers and would result in renewed optimism and investment in the Canadian pork industry," says Stan Vanessen, a partner-owner of AVE Farms Ltd. in Picture Butte, Alta., and a member of Alberta Pork's board of directors.

As a result, industry stakeholders are examining the possibility of a new pricing system that enables the sharing of losses and profits across the value chain.

Better Pork speaks with farmers,

-CANADA' PRICE

model that reflects the quality of their products.

an economic consultant, an agribusiness professor and other industry representatives to learn about the current system's limitations and how the sector aims to develop a new formula. Industry stakeholders must update Canada's pork pricing system to reflect our stringent animal welfare standards and production practices that result in high-quality pork, supporters of the project say.

System limitations

The current system has existed since 2003, says Ken McEwan, a production economics and agribusiness professor at the University of Guelph's Ridgetown campus in Ontario.

Within the pricing formula, "all prices for live hogs in Canada are based on a U.S. reference price," says Bertrand Montel, a consultant in economic studies at Groupe Agéco in Montreal. This consulting firm specializes in economic studies and sustainability in the agri-food sector, and its team conducts environmental life cycle analyses.

Along with the U.S. base price, the formula includes "a conversion factor and the currency exchange," says Vanessen.

"The U.S. base price varies depending on the slaughter plant but will

be a purchased hog price or slaughtered hog price.

"The conversion factor considers that Canadian plants include the head of the hog in their total carcass weights and lowers the Canadian value. This factor then converts weights from American imperial to Canadian metric numbers," Vanessen adds.

"The last part of the formula, the currency exchange, has played the most significant role in reducing our ability to generate profits. The pricing model was created when the Canadian loonie was significantly lower than the U.S. dollar.

"Over the course of two decades, we have witnessed the Canadian dollar go above par for a while and settle at levels which make the formula unworkable," he explains.

Because of the mechanics of the model and the economic changes since it was introduced, this pricing system has benefits and drawbacks.

One benefit: the ease of access to the American pricing infrastructure makes the pricing index simple.

"The U.S. price is publicly available and is representative of the U.S. market," McEwan says. Because the American pork sector must report to the U.S. Department of Agriculture (USDA), "the conditions for reporting and confidentiality are upheld."

In addition, the "North American hog markets are integrated, and the U.S. is our largest customer for pork and pigs," he says.

However, our close ties with our southern neighbours can present market challenges for Canadian swine producers.

"If something happens that impacts the U.S. price – positively or negatively – then Ontario's price changes," McEwan says.

Ironically, Canadian hog producers "need their largest threat and competitor to do well in order to be profitable," Vanessen says.

And using the U.S. price as a point of reference inhibits "Canada's hog industry from differentiating itself in the global market," says Brent Bushell, the general manager of the Western Hog Exchange Inc. in Edmonton.

"For example, Western Canada has a very strong connection with the Japanese market, and we get paid a premium because of barley-fed pork. But the problem is that, while Western Canadian packers receive the niche market premium, it is not shared in U.S.-based price formulas and therefore none of that premium comes back to producers."

The Western Hog Exchange is a non-profit organization. It is held by hog producer shareholders, the group's website says.

While Canadian pork exporters receive consistent premiums in the Japanese market, the "U.S. reference prices reflect the market conditions faced by U.S. stakeholders," Montel says.

But "the base price used in Canada should reflect, as closely as possible, the market conditions of Canadian market players."

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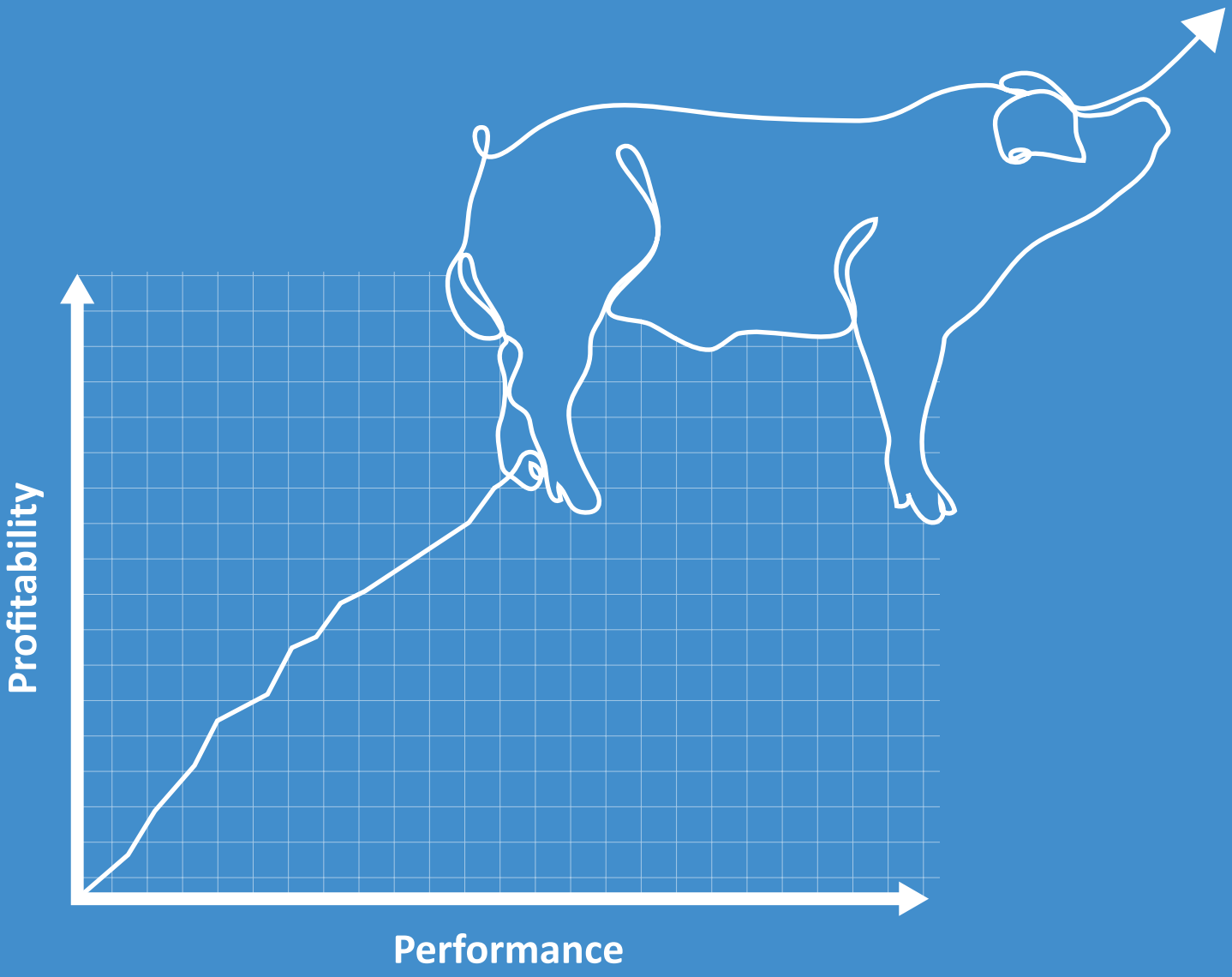

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mechanisms, farmers and packers across the country market their pigs and pork differently.

"In Quebec, hogs are sold and priced according to a collective bargaining agreement that is valid for three years within the framework of Quebec's Act respecting the marketing of agricultural, food and fish products. The agreement is negotiated between the producers and the packers," Montel says.

The Régie des marchés agricoles et alimentaires du Québec arbitrates, he adds. This group's mission is to promote efficient and orderly marketing of agricultural, food, fishing and private forest products, its website says. The regulatory body also helps develop relationships between stakeholders, and plays a role in production and marketing resolutions.

"In Ontario, until 2009, all hogs were sold through Ontario Pork, which acted as a sale agency for hog producers. Since then, hogs have been marketed directly by the producers, although some of them use the marketing services of Ontario Pork. Hog buyers in Ontario are mandated to report the price of live hogs paid to producers," Montel says.

"In Western Canada, hogs are sold directly by producers to the packers," he says. Packers "essentially use formula pricing or sell under contract through an integrator," he says.

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"If something happens that impacts the U.S. price – positively or negatively – then Ontario's price changes," Ken McEwan says.

So, even if a harmonized reference price appeared across Canada, the price paid to producers very likely would differ between provinces and between buyers (meat packers), Montel adds.

New formula considerations

In November 2019, the Canadian Pork Council (CPC) released its report on the made-in-Canada hog price. This document explores the feasibility of a domestic hog price indicator. The council seeks to determine the value of Canadian and major export competitors' pork and to identify and quantify factors that influence the value of Canadian pork in American, Mexican, Japanese and Chinese markets.

Industry members must consider many factors when developing a new formula.

For example, the formula must be "based on data that is accurate, timely, publicly available, reflective of market conditions and prices, representative of a large volume of hogs and the market, and easy to understand and calculate," says McEwan.

The industry also needs to determine the qualities of Canadian pork products that demand premiums and the value of these premiums.

To discern this information, industry members must compile data from international markets, Vanessen says.

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"For any system to work, there must be an incentive for producers to see the benefit of reinvesting in and expanding production," Stan Vanessen says.

Some production factors that could contribute to a premium price include the industry's use of "quality assurance programs and their associated costs to producers, reduced competitiveness by withdrawing growth promoters like ractopamine and abiding by specific dietary requirements," he says.

Pork product labelling is a factor "to consider, as there are stringent requirements for packers in some markets, and they incur additional costs to satisfy these demands," Vanessen adds.

Tyler Fulton points to the premiums that Canadian pork garners in the Japanese market.

Fulton is the director of risk management at Hams Marketing Services and a cattle producer in Birtle, Man. Hams Marketing Services is a producer-based cooperative which has offices in Manitoba and Saskatchewan, the company's website says.

In addition to market premiums, a realistic cost of production is also worth study.

"For any system to work, there must be an incentive for producers to see the benefit of reinvesting in and expanding production. Creating a pricing model which does not exceed the cost of production will not be of any more benefit than the current broken model," Vanessen says.

However, using a straight cost-of-production-based pricing would not be feasible in Canada's swine industry, Montel says.

"It would exacerbate the risk borne by packers because of the volatility of the cost of their hog supply and the asymmetrical price transmission along the value chain. These factors limit the ability of packers to manage any margin squeeze," he says.

"To avoid any hog marketing misalignment between the Canadian and U.S. pork industries, we would prefer not to use a price reference based only on hog cost of production. A cost of production reference, however, could be used as a floor price to protect against a surge in grain price."

Pricing challenges

While pork producers stress the need to improve the pricing system, creating and implementing new pricing indices will be no easy feat. It will take time for all industry stakeholders to reach an agreement.

"The main limitation is the over-reliance on U.S. price references to establish live hog prices while Canadian meat packers negotiate their prices more directly with their customers," Montel says.

"Another limitation is the lack of transparency of market information about the cutout value of Canadian hogs. While the North American market is quite integrated, all market participants do not benefit from the same level of transparent market information," Montel says. This inequality "affects their bargaining power."

McEwan agrees.

"We are export dependent. We export pigs and pork to the U.S., and we compete with the U.S. in other markets such as Japan, China and Mexico," he says.

To develop a Canadian price for pork products, our industry needs to set up a mandatory price reporting system, Montel says.

Ken McEwan

"Such a system must ensure that data collected meets a set of requirements for adequate coverage," he says. "Enough players must report prices for enough products over a

Continued on page 14

WHAT HOG PRICING INDEX IS RIGHT FOR THE CDN. SECTOR?

While the industry endeavours to create a made-in-Canada hog pricing index, the Canadian Pork Council (CPC) is doing its part by examining three price reference options.

In a **cutout only reference price**, the value share corresponds to the percentage of the cutout paid to the producer, the CPC's website says. While this percentage needs to be determined, this pricing option aligns the price of live hogs in Canada with the American cutout and reduces market volatility.

A **composite reference price** (weighted average) consists of a live hog reference and a cutout reference, the CPC's website says. Industry members would need to determine the weight that is attributed to each component of the price.

A **composite reference price** (live hog price with cutout window) is based on a live hog reference; floor and ceiling prices are based on a share of the cutout reference. This reference price option corresponds to the one in the new Quebec formula, the CPC's website says. Members would need to determine the value share for the floor and ceiling prices.

Ideally, a combination of live hog prices and cutout values would benefit producers. They would share some value and see reduced volatility in the marketplace, says

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Stan Vanessen, a partner-owner of AVE Farms Ltd. in Picture Butte, Alta., and a member of Alberta Pork's board of directors.

However, using the cutout value to determine a reference price could have consequences.

"The shift toward cutout price referencing in formula pricing for hogs means that price discovery for live hogs occurs downstream and may not involve hog producers" as much as people usually think, says Bertrand Montel, a consultant in economic studies at Groupe Agéco in Montreal.

"The price paid to hog producers is usually based on a reference price that is adjusted to reflect local market conditions and the business strategy of the buyer," he says. **BP**

Continued from page 12

long enough period without compromising the confidentiality of the data."

"Considering the very small number of players in Canada, I think meeting all these requirements consistently could be a major issue and would require consultation between stakeholders," Montel adds.

Indeed, collaboration and discussions between industry stakeholders have been challenging across the value chain.

"That is the disconnect within the system. You can come up with a plan to share the value of pork or create a made-in-Canada price, but the biggest challenge is getting producers and processors to work together collaboratively and share in the value of pork rather than a price for a hog," Bushell says.

"As producers, we would be prepared to lose $10 a head if packers would be also prepared to lose $10 per head in December, for example. But when summer comes and there is a profit of $60, then we each get $30," he says to *Better Pork*.

IP Galanternik DU/E+ photo

"The main limitation is the overreliance on U.S. price references to establish live hog prices while Canadian meat packers negotiate their prices more directly with their customers," Bertrand Montel says.

"Processors say they want to work with producers, but what jurisdiction is there to get processors to pay for a fair share of the pork? In Quebec, law created that equality," he says.

Vanessen agrees.

"There is enormous potential for growth, but year after year of net losses on producers' balance sheets has decimated the number of hog operations still in business.

"For the better part of a decade, packers have been able to take advantage of the current pricing model by

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"We need to look at the actual value of the pork, and then we must share the value of profits and losses between producers and processors," Brent Bushell says.

purchasing hogs at or below the cost of production," he says.

"Packers have been reluctant to engage in discussions that potentially would increase their payment value for hogs to producers and reduce slaughter margins. It has proven difficult for producers to unite and lobby together for better value. The lack of communication and planning is contributing to an increasingly adversarial relationship between packers and producers," Vanessen says.

But Quebec's new model could be a good starting point for negotiations that will come over the next few months and years, Fulton says.

Bushell agrees.

"As of last April, Quebec's pork sector decided that producers and processors should share the value that the pork is worth rather than use a pricing formula. They still use USDA numbers, but they use the pork cutout value rather than the value when live hogs are sold. This (value) has averaged an extra $20 to $45 per head, which is the difference between producers staying in the industry or leaving," he says.

"Processors in Quebec are not closing their doors because they are paying producers too much. We need to look at the actual value of the pork, and then we must share the value of profits and losses between producers and processors. That is how we build a vibrant and progressive industry," he adds. **BP**

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STREP ZOO : A NEW

Researchers have identified a new strain mortalities in Canada and the United States

A pathogen that is familiar in the horse world now seems to have entered swine herds in North America, with deadly consequences. The bacterial strain is called *Streptococcus equi subspecies zooepidemicus*, or *Strep zoo* for short.

Starting in April 2019, officials reported localized outbreaks of *Strep zoo* as the cause of pig mortalities in Manitoba. Since the fall, officials have reported cases in some American states too, including Tennessee and Pennsylvania.

Better Pork spoke with swine industry veterinarians and a Manitoba hog farmer to learn about the disease. We explain what *Strep zoo* is and how it affects pigs. We also explore how the industry can combat the disease and what we still don't understand about the bacteria.

What is *Strep zoo*?

Strep zoo bacteria can be present in many healthy animals without having negative health effects.

Streptococcus equi is "a normal inhabitant of horses. When it gets systemic in horses, it causes an infection called strangles," says Dr. Paul Sundberg, the executive director of the Swine Health Information Center, in Ames, Iowa.

W THREAT FOR THE SWINE INDUSTRY

by JACKIE CLARK

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n of *Strep zoo* as the cause of sudden sow s, but many questions remain unanswered.

"Strangles is a reportable disease, potentially lethal to horses, and it's been detected everywhere across the globe, including Canada," explains Dr. Matheus Costa. He's a resident and an adjunct professor at the University of Saskatchewan's Western College of Veterinary Medicine.

The subspecies *zooepidemicus* "will colonize and infect a range of hosts," he adds. Colonization means that the bacteria are present and can occur without illness. Infection, however, leads to disease.

"The literature has reported over 20 species being diseased from *Strep zoo* infection. That (list) includes birds, mammals and reptiles," Costa says.

Until recently, scientists were not concerned about *Strep zoo* in swine. "Over the last 20 or 30 years, you find sporadic references to (*Strep zoo*) from various lab reports and veterinary case studies on it affecting pigs, but the (reports) have always been really sporadic," says Dr. Egan Brockhoff, the veterinary counsellor of the Canadian Pork Council (CPC).

Costa agrees. The bacterial strain "has never really been a problem for the swine industry. We know pigs are colonized, so *Strep zoo* is nothing but

another part of the tonsil microbiota, that community of bacteria that live in the throats of pigs," he says.

It appears that, in some herds, the situation has changed.

"Now, there seems to be something different with the *Strep zoo* that makes it more aggressive toward pigs," Costa says.

Dr. Jette Christensen, the manager of the Winnipeg-based Canada West Swine Health Intelligence Network (CWSHIN), agrees.

CWSHIN connects swine industry stakeholders across Western Canada who share information about swine health concerns.

"Apparently this new strain is more serious for pigs," she says. "It's been detected on a couple of farms in Manitoba. … It's causing problems in sows and gilts – reproductive problems and mortality."

Because *Strep zoo* is part of the normal biome, tracking where this new strain emerged from is difficult, Costa explains.

"Although Canada was the first (country) to report, there were cases of mortality" elsewhere he says. Mortality events occurred in Tennessee and Pennsylvania, according to a U.S. Department of Agriculture (USDA) emerging risk notice from November 2019 and the Pennsylvania Department of Agriculture.

National Pork Board and the Pork Checkoff, Des Moines, Iowa photo

"Now, there seems to be something different with the *Strep zoo* that makes it more aggressive toward pigs," Dr. Matheus Costa says.

Effects on pigs

Officials faced challenges when they tried to better understand how *Strep zoo* infections progressed in pigs because "one of the biggest clinical presentations was sudden death," Sundberg says.

"A veterinarian reported … that

Martin Schwalbe photo

***Strep zoo* can cause death so quickly because it is septicemic, meaning the disease invades the blood stream, Dr. Paul Sundberg explains.**

you could look at a pig that was up and moving and looked normal. Thirty minutes later, it was down on its side, gasping and ready to die," he says.

In fact, deaths were so sudden that veterinarians initially suspected poison, Sundberg says. The disease can cause death so quickly because it is septicemic, meaning the disease invades the blood stream, he explains.

The *Strep zoo* infection then progresses without many observable symptoms.

"Once (*Strep zoo*) has invaded the host and gains access to the blood stream … the pig goes into shock. Essentially, it's a very strong response to invasion," Costa explains.

In cases where death isn't sudden, a range of symptoms can occur, Sundberg says.

Those symptoms include lethargy, vomiting and fever, Costa explains. *Strep zoo* may also cause symptoms which present like pneumonia or lung disease, Christensen adds.

The diverse symptoms, as well as sudden deaths, make *Strep zoo* a difficult disease to diagnose.

Dr. Paul Sundberg

"This strep infection can look like a lot of other things," says

Sundberg. "The only way to identify (the disease) as a cause of mortality (in pigs) is to culture it. There's no way you can look at a pig, even with an autopsy, and say definitively that (the disease) is *Strep zoo*."

In Canada, the infection has been associated with pigs in various stressful situations.

"Once culled sows (are sent) to slaughter and the transport is long or they're (held) for a couple of days at assembly yards … the disease seems to flare up and kill off sows," Christensen says.


Dr. Matheus Costa

Costa agrees. *Strep zoo* mortalities "were associated with stressful events … usually following transportation. That's when the sows would present with sudden death," he says.

Movement and the mixing of pigs contributed to the spread of the disease, Brockhoff adds.

"It just moved through natural pig flow," he says.

Nose-to-nose contact of pigs could be the method of transmission.

"What we believe so far is that the main way these bacteria gain access to the pig is through the nose," Costa says. "It's probably being swallowed as well through nasal secretions."

Stopping *Strep zoo*

There is good news.

"If you can get to the pigs (in time), it is a treatable condition," Sundberg says. "My understanding is that this isn't bacteria that has a lot of resistance to antibiotics."

Rapid identification will be central to combatting *Strep zoo*.

"Our veterinary diagnostic labs in Canada are very capable of isolating the (bacterium), growing it and identifying it," Brockhoff says.

"Antimicrobials are an effective way to treat the disease, like all bacterial infections, once it's taken hold. Biosecurity is still the key to prevent" infection and spread, he adds.

For farms that have had mortalities caused by *Strep zoo*, the controlled and restricted access zones will be a renewed focus, says Rick Bergmann, a Manitoba hog farmer and chair of the CPC.

And biosecurity isn't restricted to individual farms. It includes acute, industry-wide emergency measures if officials detect *Strep zoo*.

"If there is a case of sudden death somewhere in the system, stop pig movement," Costa says.

"As long as we identify the pathogen quickly, we can treat those animals. We can isolate them and stop this (disease) from spreading," he adds.

Communication between relevant stakeholders is an industry strength, Bergmann says.

The CPC focuses on communication "to ensure that we can notify producers if there are potential risks that they should be aware of," he says

"Maybe the biggest (issue) would be to better understand what risk pathway allowed (the disease) to get into a barn," Dr. Egan Brockhoff says.

to *Better Pork*.

Connections between the CPC, provincial pork councils, swine veterinarian networks and pork producers help focus the entire industry on swine health.

"There's a strong link between all of those entities. That's what has given us really good success (in preventing disease) here in Canada to date," Bergmann explains.

"We have that good relationship here, and we (extend) that good relationship beyond our borders" to include counterparts in the United States, he adds.

This collective responsibility prevented *Strep zoo* from spreading further in Canada during the 2019 outbreak, which was isolated on several farms in Manitoba.

"It's a good news story that we were able to raise (*Strep zoo*) as an issue and discuss it, so it wasn't a massive problem in Canada before anybody heard about it," Christensen says in an interview.

The limited spread of the disease is an accomplishment.

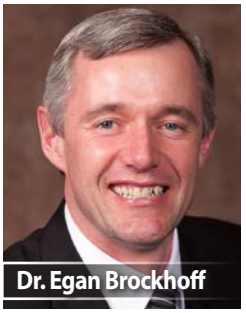
Dr. Jette Christensen

Research underway

So far, the swine mortalities all seem to be related to one specific strain, but "we don't know

where it came from," Christensen says to *Better Pork*.

The USDA has initiated research to better understand how the disease affects sows, and Iowa State University is studying the effects on younger pigs to better understand transmission and the mortality rate, Sundberg explains.


Dr. Egan Brockhoff

Currently, most of what we know is "based on observations from clinical outbreaks," says Costa.

"We learned that it's somewhat easy to stop (*Strep zoo*) from moving if pigs are not being mixed or moving from room to room and if proper internal biosecurity is followed," Costa adds.

By determining where the disease came from, industry stakeholders will be able to create more effective disease-prevention strategies.

Because animal scientists are familiar with Strep bacteria in general, "I don't expect there to be big surprises," says Brockhoff. But "there are probably going to be some lessons learned in swine.

"Maybe the biggest (issue) would be to better understand what risk pathway allowed (the disease) to get into a barn," he says.

The veterinarians don't expect *Strep zoo* to pose a major risk to the health of humans or other animal species.

This strain "is different from *Strep zoo* that will infect other species," Costa says. "There isn't really a major zoonotic concern."

Brockhoff agrees. It's "not likely that this (bacterial strain) will continue to make any significant changes," he says.

Farmers' efforts

Producers should be aware – but not necessarily afraid – of *Strep zoo*.

"The most important thing that any famer can do is pay attention to the health of his or her pigs," Sundberg says.

"If someone observes sudden death in sows, alert the veterinarian. Make sure he or she can collect the proper samples," Costa adds.


Rick Bergmann

Biosecurity is important "no matter the size" of the swine operation, he says.

Bergmann expands on this point. Pig farmers face "some significant risks," even from producers who have a small "backyard or outside production," he says.

"A $500 operation could pose a risk to a $5-million operation. So, somehow, we have to ensure that (smaller operations) will not be the weak link in the chain," he explains.

Canadian farmers can rely on their veterinarians to learn about emerging disease risks that could

National Pork Board and the Pork Checkoff, Des Moines, Iowa photo

"Producers in Canada spend a lot of time on biosecurity," Rick Bergmann says.

affect their operations.

"On my farm, if there are emerging diseases, we have a veterinarian whom we work with. We would expect that they would be very close to the situation," Bergmann says.

Producers are also doing their part to ensure *Strep zoo* doesn't become a bigger threat in Canadian swine herds.

"Producers in Canada spend a lot of time on biosecurity," Bergmann says.

They shower in and out of restricted and controlled access zones, change clothing and footwear, and put "a tremendous amount of effort into washing and disinfecting trailers," he explains.

That dedication has likely contributed to the containment of *Strep zoo*.

"I think, through diligence and good biosecurity, we'll slow this bug down for sure," says Brockhoff. "There doesn't appear to be any more significant spread."

But farmers should pay close attention to new pigs coming onto their farms, he says.

"If you're bringing in breeding stock, it's absolutely critical that you do a vet-to-vet (consultation). … Talk about the history of the herd," he says.

Producers should "direct single-source pigs," he adds.

"Don't buy any of your pigs from an assembly yard and auction barns (or through) any kind of community share program."

A lot of unanswered questions still surround *Strep zoo*, Bergmann says. However, for producers, the principles of disease prevention remain the same.

"Our world is biosecurity for our animals. That's the best focus, and that would be the best solution to keep our animals healthy," Bergmann says. **BP**

by KATE AYERS

THE FUTURE'S BRIGHT FOR THIS FARM FAMILY

This second-generation farmer looks forward to optimizing production and diversifying the operation.

HRM Photography

Andre Gras (left), Joe Dekroon, Maksym Shevchuk (right) and two other staff members work hard to maintain animal health and welfare.

Joe Dekroon, a Dublin, Ont. pork producer, focuses on starting each day on the right foot.

This mindset has shaped his approach to farming since he began working in the family operation after high school. Joe's parents, John and Cindy, established Dekroon Farms about 45 years ago.

Initially, Joe ran his dad's sow barn. Then, in 2009, a nearby sow barn came up for sale and Joe seized the opportunity to branch out on his own.

So, just over a decade ago, he started MJD Farms Ltd. Joe, along with four employees, runs a 1,000-sow farrow-to-finish operation. He also has a nursery barn that houses 4,800 piglets.

Joe also farms with his brothers Tony and Cory and his father John in his parent's cash crop operation. The family grow 4,000 acres of corn, soybeans, wheat and edible beans. The Dekroons use all the crops, except the edible beans, to feed the pigs. John and Tony run the farm's feed mill to mix rations for their herd and neighbouring operations.

Joe's mother Cindy plays a key role in keeping the farm running smoothly, too. She works hard to make sure her family is well fed and completes payroll and paperwork for Dekroon Farms.

And the Dekroon family is growing. In 2017, Joe married Brittany, who grew up in a small town about 10 minutes from Dublin. Brittany works full-time as a nurse at Victoria Hospital in London. Recently, the couple welcomed their daughter Vivian to the family.

While his sow operation is achieving great production success, Joe sees opportunities for improvement. He's excited about the future for his farm and young family.

What are your roles on your farm?

As the owner, I manage everything, keep everything in order and do general maintenance.

I oversee shipping, finishing pigs in the finishing barn, and moving pigs from the nursery barn.

I do weekend chores when everyone is off.

Low acid binding capacity in feed reduces diarrhea – and increases growth when combined with high protein administration

The acid binding capacity of feed is a pivotal factor for optimum conversion of feed in the piglets stomach in the days after weaning.
The pH value in the stomach should be around 4, which eliminates all growth of pathogenic bacteria – they typically need pH values over 6 to multiply. This is true of E. coli bacteria, for example (figure 1). The low pH value is also optimum for pepsin, which is the most important digestive enzyme in the stomach (figure 2). "Pepsin is activated by the acid in the stomach," says Gilles Langeoire, swine nutrition specialist and consultant for the Danish company TripleA.

Increased productivity, but something is wrong …
Forty years ago, a sow produced approximately 15 piglets per year. Today a sow produces 35-40 piglets. Back then, the piglets were weaned at 16-20 kg, while today they are already weaned at 6-7 kg.
The piglets used to be given feed containing 12% crude protein. Today they are fed with 21% crude protein. At 12 weeks old, the piglets weighed 20 kg. Today they weigh 30 kg.
This is an incredible improvement in productivity in just a few decades, but something is still wrong. In the piglets' critical transition period from the sow's liquid milk to dry feed, many of them develop diarrhea.

The critical period
Diarrhea is a particularly common problem in the first 14 days after weaning, as it breaks down the intestinal villi. This leads to the excretion of more fluid in the small intestine than what is absorbed in the small and large intestines, causing dehydration and enabling coli bacteria to form toxins. This hazardous cocktail reduces the piglet's well-being, which in turn leads to reduced growth and poor feed efficiency. In extreme cases, it can cause death.
In the 1980s, producers began adding zinc oxide to the feed, which reduced the problem of diarrhea treatments by approximately 50%. New regulations permitted the addition of therapeutic zinc during the first 14 days after weaning. However, the EU has now decided that therapeutic zinc must be phased out by June 2022.

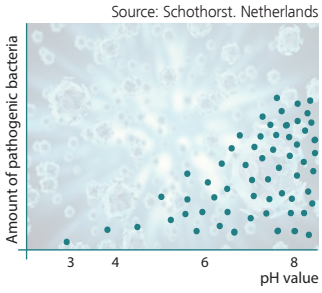
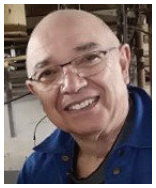


Figure 1: Low pH of 4 in the stomach prevents the multiplication of pathogenic bacteria such as E. coli. E. coli multiplies best in the pH range of 6-8.

Piglet feed must have a low acid binding capacity.

It is not enough to simply add acid to the feed. This can demineralize the piglet's bones over time. Therefore, the feed itself must have a low acid binding capacity.
To reduce the acid binding capacity of the feed to ABC4 (pH 4), the protein source must be refined so that only pure protein is left. TripleA achieves this by means of a refining process developed and patented by the University of Copenhagen that "purifies" the protein source. The refined protein, Ax3®, has an acid binding capacity of -30 mEq/kg. Ax3® has a pH of 4.1, contains zero minerals and has a digestion coefficient of 95%.
Administering Ax3® in the period from 6-10 kg increases feed intake and the daily growth of the piglet by 20 to 25 g. With the same number of growth days, piglets weigh 1 to 1.5 kg more when leaving the nursery at 7-8 weeks.

What to do without zinc?
So what now? Many producers have discovered that they can reduce the incidence of diarrhea by lowering the protein ratio, for example from 20% to 16%, during the first 14 days. "Restrictive feeding does in fact reduce the incidence of diarrhea, but it also reduces the piglets' growth by up to 20-25 g per day," says Langeoire. Restrictive feeding immediately after weaning can also prevent the piglets from obtaining a sufficient supply of essential amino acids. Therefore, it is extremely important that the piglets have a high intake of protein immediately after weaning to ensure optimum development of the intestinal wall.



Gilles Langeoire, Swine Nutrition Specialist

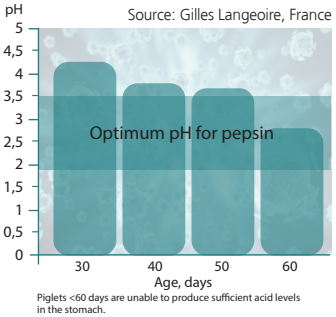


Figure 2: The enzyme pepsin, which converts protein into amino acids, is most active at low pH values, therefore, it is important to maintain a low pH value in the stomach.

Acid binding capacity is important
This is where acid binding capacity comes into the picture.
If the feed does not have a low acid binding capacity, the pH will be too high – and at this stage of development, the piglet is unable to produce sufficient hydrochloric acid to reduce the pH value in the stomach. Furthermore, in the period right after weaning the piglet has a low ability to produce enzymes that break down protein in the feed. We therefore operate with the term "Acid Binding Capacity," which is defined as the maximum amount of either strong acid or strong base that must be added to 1 kg of feed to achieve pH 3 (ABC3), or pH 4 (ABC4) in 1 hour at 37° C. ABC is measured in units of mEq/kg.
"In the case of piglets, ABC4 is preferred because the activity of the enzyme pepsin peaks at approximately pH 4 until the age of 40-50 days," says research director Francesc Molist from Scothorst Feed Research in The Netherlands.

1:5

Increased growth without zinc

It is important to focus on what happens in the piglet's stomach during the critical weaning period. This fact has been overlooked as the industry made huge advances in productivity over the past decades.
In this and the following four issues of Better Pork magazine, we will examine how low acid binding capacity in feed can eliminate the need for zinc, prevent diarrhea, and even provide higher growth when combined with high protein content in the feed.

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How many people does your farm employ?
Myself and four full-time people.

Hours you work per week?
Probably 60 hours per week in the winter and 70 to 80 hours in the spring, summer and fall.

Hours in the office per day?
Not nearly enough. (Laughs.)

Probably an hour.

What items are on your desk?
My laptop, a printer and a calculator.

Email or text?
Texting is handy for day-to-day stuff.

Email is also good because you can return to it at night and stay organized that way. But I think I prefer text over email.

Any favourite apps?
I use Twitter quite a bit and Snapchat.

I also have a remote PC app that allows me to monitor my feed system for the barns.

What role does social media play in your daily life?
I like Twitter because knowledgeable people are on there and you can learn from other farmers.

Otherwise, I am not very involved with social media.

What do you like best about farming?
I like the variation in day-to-day tasks.

I like being my own boss because it gives me a bit of freedom to do things throughout the day and I'm not being told what to do.

I also like organizing the workloads of our employees.

What do you like least?
The headaches of barn maintenance and dealing with disease challenges in the pigs.

What does your family think of farming?
We've been involved in farming for a long time.

All my brothers work on the farm. My sisters aren't too involved with the farm anymore, but they helped over the years.

Everybody enjoys farming around here.

What's your top tip about farm transition planning?
Start early.

We just started that process over the last couple years and it's definitely taking a lot longer than any of us would have thought.

What's the most important lesson you've learned?
Don't get too high on the highs or too low on the lows.

Farming is always sort of a roller-coaster in terms of crop and pig prices. Farming is a good way to make a living but there are always ups and downs.

What's your guiding management principle?
When dealing with employees, treat them with respect and appreciate the work they do.

If there is a problem, take the employee aside to have a one-on-one discussion. This approach seems to be the best management tool I've used.

What's your top goal?
To diversify the farm a little bit.

I would like to get into some other livestock sectors.

I'm also working closely with my feed sales rep, trying to push the envelope on how quickly and efficiently I can turn my hogs through the finishing barn.

How do you define success?
At the end of the day, if you are happy with what you accomplished in the time you've been working.

As long as your family is happy and healthy and you're taking care of them, I'd say that is success.

If you could send a message to non-farmers, what would you say about the industry?
I would say get to know your information before putting your opinion

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on social media.

Every day you see something on Twitter that's incorrect and people are just jumping on the bandwagon. Know the facts.

What are the biggest challenges you face in the industry and how have you addressed them?

Our biggest challenge was dealing with PED (porcine epidemic diarrhea) seven or eight years ago on our farm.

We had a lot of deadstock in the barns and we put in a lot of work to get rid of the disease pressure in the barn.

That was a very stressful time.

We got the vet out to the farm. We made a plan and we worked hard to stick to it.

We went above and beyond with cleaning and implementing strict biosecurity protocols.

If you weren't a farmer, what do you think you'd do for a living?

I'd probably be in real estate or be a car salesman.

I'm a pretty smooth talker sometimes. (Laughs.)

How do you support your mental health during the busy times of the year?

When we're not so busy, I try to get away for a weekend or take the odd trip.

I also enjoy soccer and snowmobiling. Time away from the farm is pretty important.

What was the last book you read?

I haven't read a book in years.

But I read *Better Farming* and *Better Pork*!

How often do you travel?

I do a couple of day trips throughout the year, either with friends or family.

And we do big trips every couple of years.

Where did you last travel to?

Iceland for our honeymoon.

Is your farm vehicle messy or neat?

It's mostly neat but it smells pretty bad.

What was the last piece of equipment you bought for your shop?

I bought a heavy-duty impact gun.

What's the best time of day?

I like the morning because you have the whole day ahead of you and nothing has really gone wrong yet.

It's always a good day at the start of the day.

What was your most memorable production year? Why?

Probably 2019, because it was such a struggle.

It was a battle to get the crops planted and it was a battle to get the crops off. It wasn't the highest-yielding year, but it was definitely memorable from start to finish. **BP**

HOW TO IDENTIFY AND MANAGE ILEITIS

by
DR. HOLLYN MALONEY

To reduce the economic effects of this disease, we must aim to prevent it and identify it quickly.

Ileitis or proliferative enteritis (PE) is caused by the bacteria *Lawsonia intracellularis*.

Depending on the symptoms seen, this disease can also be called proliferative hemorrhagic enteritis (PHE), necrotic enteritis (NE), or porcine intestinal adenomatosis (PIA).

Ileitis can have a significant economic effect on a swine operation due to increased mortality, decreased growth rate, and lower feed efficiency. This disease does not transmit to humans.

Dr. Kelsey Gray photo

The manure from this pig is very watery and dark from blood. This form of manure is commonly seen with proliferative hemorrhagic enteritis.

Transmission

L. intracellularis is spread through consumption of contaminated fecal material.

Infected animals will begin to shed the bacteria in their feces about seven days after infection but will not begin to show signs of illness until around ten days post-infection. This gap between infection and signs of illness means affected animals can infect other pigs before you know they are ill.

Without treatment, signs of illness in affected animals usually peak around 21 days post-infection and recovery normally occurs between 28 and 35 days after infection.

Exposure to a very small amount of the bacteria can cause infection. As a result, the bacteria can easily be spread on contaminated boots, clothing, or other items used on farm. Mice and insects can also move the bacteria. It can remain infective in fecal material in the environment for two weeks.

Symptoms and diagnosis

Ileitis can present with a wide range of symptoms.

The disease usually affects growers, finishers, and adults. PHE is mostly seen in young adults around four to 12 months of age and is associated with sudden death. Bleeding in the gut can cause black, tarry feces. Pigs may appear pale due to blood loss. Not all affected pigs will have abnormal manure but may still be pale due to internal bleeding.

Approximately half of animals affected with PHE may die if they don't receive appropriate treatment in a timely manner.

Younger pigs, around six to 20 weeks of age, may be less obviously affected. These pigs more commonly exhibit PIA.

This presentation of the disease causes a slow thickening of the intestinal wall without the bleeding seen with PHE. Animals affected with PIA may have watery grey-green scours and fail to grow despite normal feed intake. Poor growth is caused by decreased absorption of nutrients through the thickened gut wall.

PIA can result in significant economic loss because the disease may only cause slow growth, making it difficult to identify.

Severe cases may be complicated by other bacteria that take advantage of the compromised gut and cause secondary infections leading to NE. These animals often have persistent, watery feces and experience severe weight loss. NE is predominantly seen in barns with straw bedding or poor sanitation.

On post-mortem for all presentations of ileitis, portions of the intestinal wall may appear thickened. The degree of thickening depends on the severity of the infection and the length of time the pig was affected.

In cases of PIA, the gut wall becomes extremely thick and develops a corrugated appearance. With PHE, the intestinal wall may appear dark red from bleeding, and feces in the large intestine may be black. With NE, pale, fibrous material is often stuck to the inside of the intestinal wall.

To make a diagnosis, your veterinarian may collect fecal, intestinal, or blood samples. Fecal or intestinal samples from affected pigs can be used to find the bacteria if it is currently being shed by the pig. Blood samples can be used to test if an animal has been previously exposed to the bacteria but cannot determine if the pig is currently shedding the bacteria.

Multiple blood tests conducted throughout the pigs' lives can help determine at what age your animals are likely exposed to the bacteria. Determining the age of exposure can help you and your veterinarian choose the best time for vaccination to ensure pigs have time to develop immunity prior to exposure.

Treatment and prevention

If you see signs of ileitis on your farm, contact your veterinarian immediately because mortality can occur rapidly.

Your veterinarian will help to choose an appropriate antibiotic for treatment. If many animals are affected, then your veterinarian may recommend mass treatment through water lines. If only a few animals are affected, then your veterinarian may recommend individual treatment with an injectable antibiotic.

Scouring animals should be separated from the herd to reduce the exposure of other animals to the disease.

Vaccination is essential to prevent ileitis. Currently, a water vaccine and an injectable vaccine are available in Canada. Your veterinarian can help you decide which option is best for your farm.

If you use the water vaccine, you must remove any water or feed antibiotics for at least three days before and after administration of the vaccine. Otherwise, these oral antibiotics will deactivate the vaccine. Ensure that your water lines and your stock tank are clean.

The entire water vaccine should be consumed within four to six hours after mixing. If the group of pigs has consumed the water vaccine in less than four hours, then all the pigs may not have received the vaccination. All the pigs may not have gone to the drinkers in that short amount of time, so these animals wouldn't have received the vaccine.

Dr. Jessica Law photo

This water vaccine stock tank contains visible contamination and dirt. This contamination will decrease the efficacy of the vaccine and can result in vaccine failure.

If the time to vaccinate is too long, then the vaccine will become less effective after six hours.

The age at which the vaccine is given is important to ensure the pig has time to develop immunity prior to exposure. Ideally, the vaccine is given at least six to eight weeks prior to the onset of clinical signs. This timeframe may vary slightly between farms, but vaccination usually occurs early in the nursery.

It is also important to vaccinate all replacement breeding stock.

Proper sanitation and internal biosecurity are also essential to prevent ileitis. To reduce the amount of bacteria in the barn, remove all manure from the pens between each batch. This manure removal will reduce the level of exposure for the next batch. As well, cleaning boots between rooms or between barns on multi-barn sites, and good rodent and insect control will help to reduce movement of the bacteria around the farm.

If you continue to experience an ileitis challenge on your farm despite proper vaccination and sanitation protocols, then your veterinarian may recommend the use of preventative feed antibiotics.

Veterinarians usually recommend starting the administration of medication about two to four weeks prior to the age at which illness was seen in previous batches. If feed medications are not timed properly, they may only delay the onset of the disease rather than prevent it.

Due to the potential negative economic effects of ileitis, it is important to implement preventative measures, rather than waiting to treat the animals when the disease becomes apparent. **BP**

Dr. Hollyn Maloney is a veterinarian with Prairie Swine Health Services in Red Deer, Alta.

REMEMBER BEST BIOSECURITY PRACTICES

by LILIAN SCHAER

To protect our herds and industry, we must adhere to best practices for biosecurity on our farms.

Healthy pigs have always been a priority but, as challenges mount, it has never been more important to keep barns and herds disease-free. It is critical to pay attention to biosecurity – not just for trade-limiting outbreaks like African swine fever, but also economically important diseases like porcine reproductive and respiratory syndrome (PRRS) and porcine epidemic diarrhea.

"Biosecurity is more important than it has ever been and everybody must do everything they can to keep every pig and every herd healthy," said Quincy Buis, a swine nutritionist with Ontario-based Wallenstein Feed and Supply Ltd.

For example, PRRS, which is often linked to biosecurity breaks, is estimated to cost Canadian hog producers over $200 million annually.

"Biosecurity protects the pig population we manage, but it also benefits the state of the whole industry," said John Otten, the production manager with Professional Pork Alliance in Stratford, Ont.

An often-missed benefit of high herd health is the human impact, added Dr. Ryan Tenbergen of Demeter Veterinary Services. He is based in Tavistock, Ont.

"I think we also underestimate the benefits towards manager and employee morale as disease is hard on both the animals and the people caring for them," Tenbergen said.

Below, we outline some of the most important components of good biosecurity.

National Pork Board and the Pork Checkoff, Des Moines, Iowa photo

"Biosecurity is more important than it has ever been and everybody must do everything they can to keep every pig and every herd healthy," said Quincy Buis.

Controlled barn entry

The most effective tool is a well-designed Danish entry system that separates the "clean" inside environment from the "dirty" outside, when someone enters or leaves a barn.

This type of system can be installed in virtually any facility for a relatively low cost and is proven to keep diseases out of herds. Provide barn boots and coveralls, and a handwashing or sanitation station. Clearly display protocols around entry. Keep the area clean and uncluttered so people are not hesitant to remove their footwear.

Transport biosecurity and gilt acclimation

Transportation is a risk, from drivers keeping their boots clean and knowing how to enter a trailer without contamination to ensuring trucks are properly washed, disinfected and dried.

Some animal movements are more high risk than others. So, a full cleaning and disinfecting may be appropriate when receiving replacement gilts, but a back-end wash could suffice when shipping market hogs. A separate facility where replacement gilts can be acclimated or tested for disease before they enter a sow herd is very beneficial.

Controlled movement

This biosecurity measure involves visitors, workers, suppliers and service providers, their vehicle traffic and the items they bring on farm.

For any routine delivery to the farm, like semen, supplies or medications, try to plan a receiving location that is off-site or away from the main entrance and major people traffic. If possible, remove the outer packaging

of these supplies before bringing them into the barn. If not, make sure boxes are clean, wiped down and set aside or disinfected and dried.

Bacteria can build up on door handles, steering wheels and floor mats, so regularly clean and detail farm trucks and use wipes to frequently spot clean high-use areas.

Deadstock

The best scenario for biosecurity is on-site composting to avoid any outside traffic. If this disposal method is not possible, select a spot that avoids cross-contamination between farm vehicles and deadstock pick-up.

Pest and bug control

Rodents, insects and other pests can carry disease into a barn, so good pest-control programs are an important part of biosecurity.

Documentation and buy-in

A good biosecurity plan is only as strong as the weakest link, such as someone stepping over a barrier or forgetting to shower in, said Buis. Post signs to remind people, ensure staff and service providers are aware of the plan, and ensure everyone buys in, he said. Poor follow-through is one of the biggest threats to on-farm biosecurity.

"It has to be thought about every day, but people can get lackadaisical when nothing happens for a while," Buis said.

Displaying written protocols and providing proper training, as well as regularly revisiting the plan with staff to ensure compliance and full understanding, can play a big role in ensuring diligence towards biosecurity practices, said Tenbergen.

"Don't forget to explain why we have these protocols and how important they are to health, welfare and profitability of the farm," he said. "Include all farm personnel in the discussion – listen to their inputs, try to identify any deterrents and talk to them about alternative suggestions to help improve compliance." **BP**

National Pork Board and the Pork Checkoff, Des Moines, Iowa photo

Transportation is a risk, from drivers keeping their boots clean and knowing how to enter a trailer without contamination to ensuring trucks are properly washed, disinfected and dried.

Swine Health Ontario is a leadership team focused on improving and coordinating the industry's ability to prevent, prepare for and respond to serious swine health threats in Ontario.

HOW TO ENHANCE PIG ROBUSTNESS

by
LUCAS RODRIGUES & DR. DANIEL COLUMBUS

PRAIRIE SWINE CENTRE

Extra functional amino acids in feed programs may benefit pigs exposed to an enteric pathogen.

National Pork Board and the Pork Checkoff, Des Moines, Iowa photo

In addition to the effects on performance, the supplemental amino acid profile attenuated the immune response through modulation of acute-phase protein levels in *Salmonella*-challenged animals.

Researchers at the Prairie Swine Centre and the University of Saskatchewan investigated the interaction between functional amino acid (AA) supplementation and dietary protein during disease challenge in growing pigs.

Technicians either inoculated growing pigs with an enteric pathogen (*Salmonella typhimurium, ST*) or saline (Control, CT). They had ad libitum access to diets differing in crude protein content – either low (16 per cent, LP) or high (20 per cent, HP). These diets contained either basal supplementation of amino acids at requirements according to the National Research Council (2012) (AA-) or supplemented with a functional amino acid profile in which threonine, methionine, and tryptophan were provided at 20 per cent above requirements (AA+). Diets contained no animal products or antibiotics.

Clinical signs of infection

The post-weaning period is a stressful time for growing pigs.

They have increased susceptibility to several enteric pathogens, including *Salmonella*. Pigs infected with *Salmonella* experience a pronounced inflammatory reaction in the gut, consequently showing compromised performance.

Researchers monitored body temperature, fecal score and demeanour daily for each pig over seven days (day -1, 1, 2, 3, 4, 5 and 6 relative to inoculation). Technicians then rated fecal score and demeanour from zero to three according to severity, with zero meaning normal fecal consistency or behaviour. (See Table 1 below.)

Inoculation with *Salmonella typhimurium* increased pigs' body temperature within 24 hours and it remained elevated for the duration of the study. (See Figure 1 on page 37.) Pigs' demeanour and fecal scores were negatively affected by *ST* inoculation during the first three and five days after challenge, respectively. There were no diet effects on any clinical signs.

Table 1. Scoring of clinical signs

Clinical sign	Score	Classification
Fecal score	0	Normal consistency
	1	Semisolid, no blood
	2	Watery, no blood
	3	Blood-tinged feces
Demeanour	0	Normal behaviour
	1	Listless, will stand
	2	Recumbent, will not stand
	3	Moderately depressed

High-protein diets: are they harmful?

More susceptible post-weaned pigs also experience an abrupt change from a milk-based to a cereal-based diet. Also, highly digestible nutrient sources are not always available and pigs are commonly fed diets high in protein sources potentially harmful for gut health.

As a result, the current dietary recommendation in the post-weaning period is to provide lower protein diets that are supplemented with necessary essential amino acids to meet requirements.

This diet reduces the amount of undigested protein available for fermentation in the gut, decreasing the inflammatory response.

Therefore, researchers hypothesized that the severity and incidence of diarrhea in *Salmonella*-challenged pigs would be aggravated by high protein diets. However, dietary protein content did not affect fecal score.

On the other hand, *Salmonella*

Table 2: Performance parameters of growing pigs challenged or not with *Salmonella typhimurium* and fed diets differing in protein content and functional AA supplementation.

Item	CT[1]				ST[1]				SEM[4]
	LP[2]		HP[2]		LP		HP		
	AA-[3]	AA+[3]	AA-	AA+	AA-	AA+	AA-	AA+	
Average daily gain, kg/d									
Pre-inoculation	0.423	0.486	0.450	0.463	0.451	0.456	0.460	0.474	0.051
Post-inoculation	0.571A	0.576A	0.586A	0.580A	0.297Bb	0.458Ba	0.300Bb	0.456Ba	0.063
Average daily feed intake, kg/d									
Pre-inoculation	0.580	0.602	0.563	0.636	0.614	0.646	0.632	0.648	0.054
Post-inoculation	0.880A	0.906A	0.916A	0.936A	0.738B	0.673B	0.744B	0.686B	0.086
Feed efficiency (gain:feed), kg/kg									
Pre-inoculation	0.73	0.81	0.80	0.73	0.73	0.71	0.73	0.73	0.109
Post-inoculation	0.65	0.64	0.64	0.60	0.40†	0.68*	0.40†	0.66*	0.104

[1] CT = control group; ST = Salmonella-challenged group.
[2] LP = low protein diet; HP = high protein diet.
[3] AA- = basal dietary amino acid profile; AA+ = supplemented dietary amino acid profile containing 120 per cent of NRC (2012) requirements for threonine, methionine, and tryptophan.
[4] SEM = pooled SEM. Means are presented as least squares means.
AB = means lacking the same letter are significantly different (CT vs ST) ($P \leq 0.05$)
ab = means lacking the same letter are significantly different (STAA- vs STAA+) ($P \leq 0.05$)
**† = means lacking the same sign showed a trend towards significance (STAA- vs STAA+) ($P < 0.10$)*

counts in cecal digesta were increased in HP pigs compared to LP pigs. Thus, lowering dietary protein levels may be useful to suppress the proliferation of microbial metabolites and minimize intestinal disturbances in barns with enteric problems.

Feeding the immune system of pigs with functional amino acids

Protein and AA, which are utilized for growth in healthy animals, are redirected towards immune support in diseased animals. In this sense, there is a disproportionate use of specific amino acids from body reserves during immune challenge, decreasing the AA's availability for protein deposition.

Thus, supplementing functional AA may be necessary to support both immune response and growth performance, reducing the negative effects of disease on animal performance.

As expected, inoculation with *ST* resulted in reduced average daily gain (ADG) and average daily feed intake in the post-inoculation period compared to inoculation with CT regardless of dietary treatment. (See Table 2 on page 36.)

However, *ST* pigs fed the AA+ diet had increased ADG and a tendency for improved feed efficiency (gain:feed) in the post-inoculation period, regardless of dietary protein level.

While this performance was still reduced compared to healthy pigs, this finding shows that functional AA supplementation may provide an additional strategy for reducing the negative effects of disease challenge on animal performance.

In addition to the effects on performance, the supplemental AA profile attenuated the immune response through modulation of acute-phase protein levels in *Salmonella*-challenged animals. Disease-challenged animals showed increased serum concentration of haptoglobin and decreased concentration of albumin.

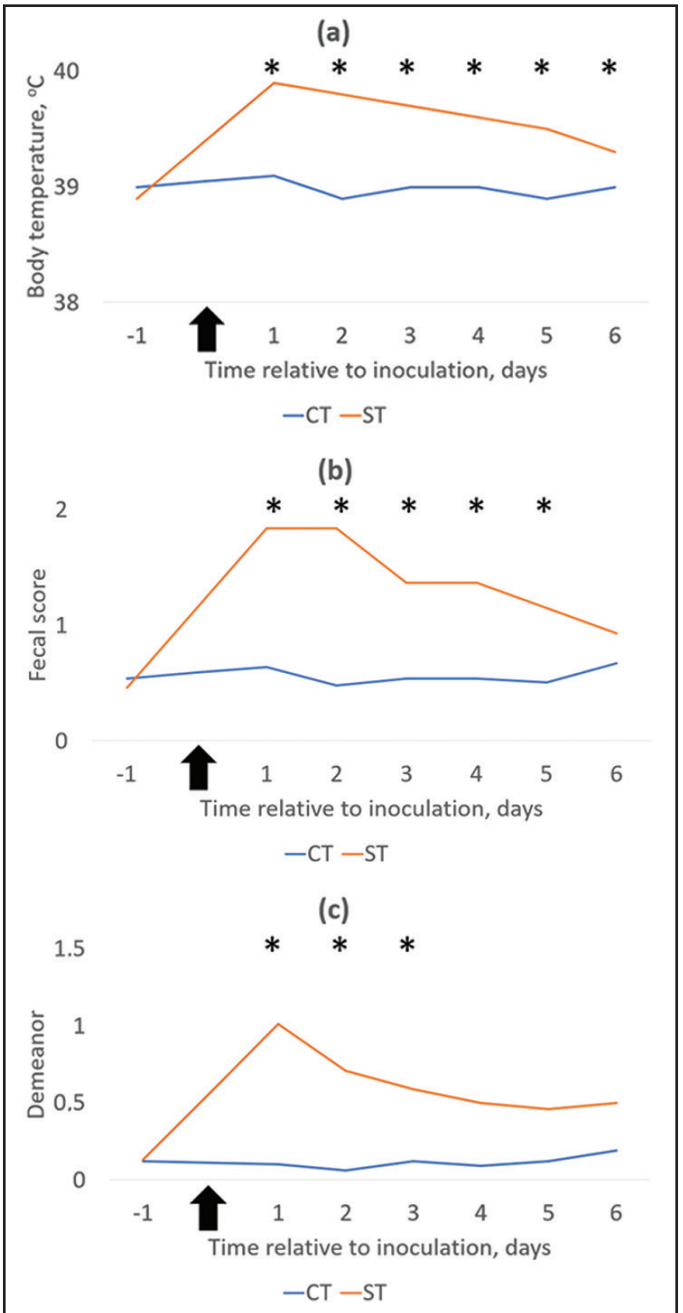

Figure 1: Body temperature (BT [a]), fecal score (FS [b]) and demeanour (DM [c]) of pigs prior to saline (CT) or *Salmonella typhimurium (ST)* inoculation and monitored for six days post-inoculation. The arrow indicates time point of inoculation and asterisks indicate statistical difference between CT and ST at each time point.

National Pork Board and the Pork Checkoff, Des Moines, Iowa photo

Researchers hypothesized that the severity and incidence of diarrhea in *Salmonella*-challenged pigs would be aggravated by high protein diets.

Haptoglobin is an acute phase protein and elevated levels of it indicate inflammatory diseases.

Albumin is produced by the liver; albumin concentrations decrease with inflammation.

However, when fed the AA+ profile, challenged pigs showed reduced overall levels of haptoglobin and increased levels of albumin compared to those fed the AA- profile. These findings corroborate the role of functional AA as regulators of metabolic pathways during inflammation, particularly through the regulation of immune response.

Functional AA supplementation also decreased overall shedding of *Salmonella* compared to pigs fed AA- diets and *Salmonella* counts in the colon were reduced in AA+ pigs compared to AA- pigs. Pathogen shedding is important as infected feces are a major source for cross-infection between pigs and, in a commercial setting, reduced shedding could reflect in decreased incidence of natural exposure.

Overall, supplementation of key functional amino acids (methionine, threonine and tryptophan) above requirements appears to be a potential strategy for improving the growth performance and the health status of pigs exposed to an enteric pathogen.

Acknowledgments

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Lucas A. Rodrigues is a PhD candidate in the department of animal and poultry science at the University of Saskatchewan (USask) and a graduate research assistant at Prairie Swine Centre (PSC). Dr. Daniel A. Columbus is a research scientist in nutrition at PSC and an adjunct professor in the department of animal and poultry science at USask.

HIGHLIGHTS

- Average daily gain and feed efficiency in diseased pigs may be improved by a combination of functional amino acids supplemented above requirements for growth.
- Functional amino acids improved the immune response associated with *Salmonella* infection.
- Bacterial shedding and intestinal colonization can be reduced by functional amino acid supplementation.
- Dietary protein level had a limited effect on pig response. **BP**

THE RIPPLE EFFECTS OF PRECISION FEEDING

by
LAUREN HANSEN
& DR. LEE-ANNE HUBER

UNIVERSITY of GUELPH

Such feed programs during gestation improve offspring performance during nursery and finisher phases.

Martin Schwalbe photo

Greater growth rates will allow pigs to reach market weight more quickly, which will elicit feed cost and yardage savings.

The nutrient and energy requirements of sows are dynamic between the first and last days of gestation and across parities.

Depending on the stage of fetal development, the sow's balance of required lysine and energy will change. Feeding a single diet throughout the gestation period will likely oversupply sows with nutrients and energy in early gestation and undersupply sows with nutrients and energy in late gestation. The mismatch between nutrient supply and nutrient requirements during gestation can alter the quality of fetal development and have long-term consequences for postnatal growth.

At the University of Guelph, we are investigating the effects of precision feeding, which means closely matching nutrient and energy requirements during gestation and across parities, on offspring growth performance between birth and market weight.

In the study, we randomly assigned first-parity sows to either a precision (PF) or control (CON) feeding program during gestation. We housed the sows in group pens equipped with electronic sow feeders that could blend two basal diets.

The first diet was high in protein and the second was low in protein; the two basal diets contained the same energy content (2,518 kcal/kg net energy; 0.80 and 0.20 per cent standardized ileal digestible lysine, respectively).

The CON sows received a constant blend of the basal diets totalling 2.2 kilograms (4.84 pounds) of feed on each day of gestation to mimic standard industry feeding programs. In contrast, individual PF sows received a unique blend of the basal diets each day to meet estimated energy and nutrient requirements.

Sows remained on the study for three consecutive pregnancies and returned to the same feeding program in each gestation cycle. In the previous

Continued on page 41

Table 1: Offspring growth performance and carcass quality from sows that received either a precision or control feeding program during gestation.

	Control		Precision		*P*-value1	
	Parity 1	Parity 2	Parity 1	Parity 2	SEM[2]	Feeding program
No.[3]	12	8	12	13		
Body weight (kg)						
Day 0	1.35	1.50	1.31	1.50	0.06	0.733
Day 21	6.5	7.2	6.8	7.0	0.3	0.776
Day 66	29.9[a]	29.2	31.8[b]	29.9	0.9	0.117
Day 105	70.3	75.6	71.7	77.0	2.2	0.460
Day 140	101.4	102.3	105.0	107.5	2.5	0.048
Average daily gain (kg)						
Birth-wean	0.254	0.286	0.258	0.270	0.014	0.607
Nursery	0.53[a]	0.49	0.56[b]	0.52	0.03	0.037
Grower	1.02	0.98	1.01	1.00	0.02	0.606
Finisher	1.01	1.11[x]	1.02	1.22[y]	0.04	0.048
Average daily feed intake (kg)						
Nursery	0.79	0.77	0.82	0.77	0.04	0.575
Grower	2.40	2.37	2.43	2.45	0.08	0.426
Finisher	3.05	3.56	3.22	3.70	0.15	0.223
Gain:Feed						
Nursery	0.76	0.70	0.79	0.76	0.06	0.280
Grower	0.43	0.41	0.42	0.41	0.01	0.634
Finisher	0.36	0.31	0.32	0.33	0.03	0.666
Carcass quality						
Slaughter weight (kg)	126.5	129.2	127.1	129.9	1.0	0.269
Hot carcass weight (kg)	103.7	105.0	104.2	105.3	1.3	0.464
Fat probe (mm)	19	21	21	22	1	0.242
Lean probe (mm)	56	58	56	57	2	0.858
Lean yield (%)	59.9	55.9	59.3	54.4	0.6	0.160

[a, b] Means without a common superscript letter within a row and pregnancy differ (P<0.05).
[x, y] Means without a common superscript letter within a row and pregnancy tend to differ (0.05<P<0.10).
[1] P-values for the main effect of maternal feeding program in gestation.
[2] Maximum value of the standard error of the means.
[3] Number of litters evaluated.

Precision feeding during gestation improved the post-weaning growth performance of offspring. Pigs from precision-fed sows were 4 kilograms (8.8 pounds) heavier by 140 days of age than pigs from sows fed the control program.

Continued from page 39

edition of *Better Pork*, we discussed the effect of precision feeding during gestation on changes in sow body weight, body composition, and litter characteristics at birth.

We used a subset of 46 sows and their litters from this study to determine the effects of precision feeding during gestation on the growth performance of offspring from birth until slaughter.

We weighed piglets individually at birth and at weaning (day 21) and randomly selected six pigs per litter after weaning and placed them in pens (one litter per pen).

We gave the pigs ad libitum access to commercial diets in the nursery (four phases), grower, and finisher phases. We recorded individual body weights and per pen feed intakes weekly during the nursery and finishing phases and biweekly during the growing phase.

As part of the study, we slaughtered four pigs per pen at approximately 125 kg (275 lbs.) body weight to evaluate carcass quality.

During the suckling phase, the pigs exhibited no effect of the maternal feeding program during gestation on piglet average daily gain or body weight at weaning.

After weaning, however, pigs from sows that received the PF feeding program grew more quickly and were heavier at the end of the nursery period (day 66 of age) than those pigs from sows that received the CON feeding program. This finding was especially true for offspring from first-parity sows that were precision fed during gestation.

No differences in growth performance occurred during the grower phase.

During the finisher phase, offspring from sows that received the PF feeding program again grew more quickly and were heavier by day 140 of age than those pigs from sows that received the CON feeding program. On average, at day 140 of age, offspring from PF sows were 4 kg (8.8 lbs.) heavier than offspring from CON sows.

Post-weaning feed intake and feed efficiency were not affected by maternal feeding program in gestation, nor was the offspring's carcass quality at slaughter.

Closely meeting daily energy and lysine requirements through precision feeding for first- and second-parity sows during gestation improved offspring growth after weaning.

Greater growth rates will allow pigs to reach market weight more quickly, which will elicit feed cost and yardage savings. For example, if yardage plus feed cost equals $1.20 per pig per day, reducing the number of days to mar-

Martin Schwalbe photo

Closely meeting daily energy and lysine requirements for first- and second-parity sows during gestation improved offspring growth after weaning.

Martin Schwalbe photo

We gave the pigs ad libitum access to commercial diets in the nursery (four phases), grower, and finisher phases.

ket by four will result in a $4.80 cost savings per pig.

This study is ongoing, and we will include growth performance and carcass quality for offspring from third-parity sows in the final report.

Together, these findings will allow for an overall assessment of how implementing precision feeding programs during gestation affects the pork production cycle.

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Dr. Lee-Anne Huber is an assistant professor in the department of animal biosciences at the University of Guelph in Ontario. Her research focuses on swine nutrition.

Lauren Hansen is a master's student working with Huber.

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Walking Your Barn – Paying Attention to the Details!

Walking through the barn to observe pigs and the environment is an important part of managing a swine farm. The details gathered during these routine walk-throughs are important indicators of animal health, welfare and performance. They also provide information on barn facilities and equipment, which need to be in proper working condition to ensure optimal animal performance, health and welfare, which translates into improved profitability and success of the operation.

In any routine task we perform, we are at risk of becoming progressively familiar with what we do, to the point of no longer paying as much attention to detail as we should. We have all experienced this in many aspects of our lives. In the barns, over time we get used to the smells, noise, dust and sights. It is natural to become habituated, acclimatized, familiarized, and accustomed over time, and we need to ensure that we are staying vigilant as we walk through our barns, and that we are attentive to detail and use a keen eye in our day to day routines. If we lose vigilance when conducting routine checks, we may be compromising pig performance, animal and worker safety, and potentially health. Stock-people need to develop keen observation skills and need to have a standard operating procedure/ checklist on what to look for during their routine checks in order to continue to be attentive to details. (see the article "Best Practice Sheets for the Barn" for an idea on how to help with this).

Pigs must be observed a minimum of once a day for sickness and/or injury. Pigs that are sick or injured must be monitored on a more frequent basis, according to their condition. When we walk through a room, we should rely on all of our senses:

- Hearing – before you even enter a room of pigs, stop outside the door and listen.
- Sight – if the door to a room has a window, take some time to observe pigs through the window before disrupting them. You will gain a lot of useful information by observing them from a distance. Then move into the room for closer evaluation.
- Touch – this can be an extremely useful tool, especially in a sow barn. Palpating udders for signs of inflammation or mastitis for example.
- Taste – Ok, well maybe we shouldn't be using taste for in barn observations…
- Common Sense - trust your instincts. Take time to think things through and assess a situation. If your gut tells you something isn't right, trust that feeling and take the time to figure it out.

In addition to observing the animals, each of the following should be monitored and checked during the barn walk-through:

- Feed – fresh feed is available, and feeders are not bridged. Optimal feeder pan coverage (Figure 1)
- Water – pigs have access to sufficient amount of clean water (Table 1)
- Air – thermal environment is conducive to optimal growth, and there is no significant build up of noxious gasses
- Space – stocking density is correct for the size of pigs in the pens
- Manure – no excessive accumulation on pen surfaces, underfloor pits are not full

Information on water volumes and flow rates as well as feeder space, temperature requirements and stocking densities can be found in the National Farm Animal Care Council's Code of Practice for the Care and Handling of Pigs (2014). This can be found online at nfacc.ca/codes-of-practice.

The majority of parameters discussed should be checked daily; however, some items pertaining to equipment and facilities are more appropriately assessed at different timeframes. The following indicates the minimum frequency at which different parameters should be observed and checked:

- Daily – animals, feed, water, air, manure
- Weekly – feed inventory, barn repairs, load-out, mortalities disposal
- Monthly - space allocation,

Figure 1: Optimal feeder pan coverage of about 50% to maximize intakes and reduce wastage (Predicala, 2019)

controller/sensor calibration, water heater, washer/dryer, office/kitchen equipment (computers, fridge, microwave), utilities meter reading (water, electricity, gas), pest control, emergency devices and alarms, stand-by generator
- Room cycle – cleaning and disinfection, equipment repairs
- Seasonal – ventilation settings, fan covers, supplemental heaters, sensors/controllers/actuators calibration, equipment winterization, insulation inspection

The herdsperson doing the barn walk-through needs conduct a systematic assessment at various levels:
- Animal level – health status, behaviour and welfare of individual pigs, mortalities
- Pen level – items within the pen such as feeder and drinkers, as well as pen floors
- Room level – parameters that are controlled at the room level such as temperature, humidity, airflow, inlets, fans, static pressure, gases and dust levels, manure pits, lights
- Barn level – items that impact multiple rooms or the entire barn such as controllers and sensors, feed bins and feed delivery system, manure transfer pump, stand-by generator, power washer, biosecurity (shower, pest control)

It has been suggested that two seconds per pig should be allowed for the daily walkthrough.

Table 1: Water intake, recommended flow rate and height of nipple drinkers (NFACC Code of Practice, 2014)

Water Intake, Recommended Flow Rate and Height of Nipple Drinkers (40)					
Phase	Weight (kg)	Intake (L/day)*	Nipple Drinkers**		
			Flow (L/min)	Height [cm,(inches), 45°]	Height [cm,(inches), 45°]
Gestation		Variable	0.5 to 1.0	90 (35)	75 (30)
Lactation		12 to 20	1.0 to 2.0	90 (35)	75 (30)
Piglets		Variable	0.5 to 0.7	15 (6)	10 (4)
Weanling	5	1.0 to 2.0	0.5 to 1.0	30 (12)	25 (10)
Weanling	7	1.5 to 2.5	0.5 to 1.0	35 (14)	30 (12)
Grow/Finish	15	2.5 to 3.5	0.5 to 1.0	45 (18)	35 (14)
Grow/Finish	20	3 to 4	0.5 to 1.0	50 (20)	40 (16)
Grow/Finish	25	3 to 4	0.5 to 1.0	55 (22)	45 (18)
Grow/Finish	50	5 to 7	0.5 to 1.0	65 (26)	55 (22)

**Water disappearance may exceed consumption by as much as 100% (average is 35%) if traditional nipple drinkers are employed. Consumtion will increase 15 to 50% if barn temperatures ae above the temperature comfort zone.*

***Waste will increase if drinkers are poorly positioned, if flow rates are excessive or if feed intake is restricted*

Every time you walk into the barn, or a room within the barn, take the time to ask yourself "can I see, smell or hear anything unusual?" Keen observation is key to ensuring your animals are healthy and your workplace is safe. If your barn does not have set protocols for observations, take some time to develop them, and ensure all staff are trained properly to be vigilant in their observations. Discuss techniques on a regular basis, reminding staff to not fall into the trap of habituation. Perhaps have stockpeople from different areas walk through on occasion to ensure nothing is being overlooked. Sometimes it takes a fresh set of eyes to see something isn't quite right.

Laura Eastwood, Ph.D
Swine Specialist, OMAFRA
laura.eastwood@ontario.ca
226-921-5819

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Best Practice Sheets for the Barn

On a farm it's often the case that most people will have their main areas of responsibility, but there are times when certain tasks are carried out by people that don't do that task routinely. It may also be that people are rotated through different jobs for training, or to make sure everyone knows how to do multiple jobs in case of an absence, and so on.

In any case it can be challenging to make sure everyone involved is trained to do the job correctly, and that it is done consistently from one time to the next. It's also true that even though someone has been taught how to do a task, with the passage of time some key things can come to be forgotten or some steps might be overlooked.

For example, how should a piece of equipment be cleaned and stored after use? How should a pen look after being cleaned and prepared for its next occupants? How should feeders look when they are adjusted properly?

One way to help keep everyone aware of what is expected is the use of what I'll call Best Practices Sheets. This is a sheet of paper that has been laminated and posted close to the relevant area of the barn. On this sheet of paper are two photos; one is a picture of how things look when everything has been done right, and the second is a picture of how things might look when something has been missed or done incorrectly. One could have a big checkmark in the corner, and the other a big X. To the side of the photos should be a few very short bullet points about what should, or shouldn't, be done and a brief description of the consequences of not doing things right.

On the back side of the page you could expand on the best practices that are expected, provide more detail on how they should be carried out, and maybe some more information on the costs and repercussions of not doing things properly.

A Best Practices Sheet posted near every important area of the facility would provide a reminder of what is expected when tasks or procedures are done right.

Review the sheets with anyone who may need to do a particular task or procedure. This will help ensure that when it comes to how things should be done on your farm, everyone is on the same page.

Jaydee Smith
OMAFRA Swine Specialist
jaydee.smith@ontario.ca
519-358-5829

Identifying active Salmonella infections in nursery barns using serology and bacterial culture and evaluating risk factors

Salmonella is commonly recovered on Ontario swine farms, representing a public health and food safety concern. To reduce the risk of the farm-to-fork transmission of Salmonella, a better understanding of the on-farm prevalence is necessary, specifically in the nursery, where pigs are mixed and often pick up common diseases that persist in the post-weaned pig population. Identifying *Salmonella* status, using serological and bacteriological methods, in the nursery barn and assessing associated risk factors can be beneficial in preventing the circulation and maintenance of Salmonella on the farm.

To explore this, between 2014 to 2019, twenty pigs from 46 batches of weaned pigs in Ontario were sampled at weaning and at the end of the nursery stage. Information regarding farm management and biosecurity practices were collected using a questionnaire. Blood samples and rectal swabs were collected at both visits. An enzyme-linked immunosorbent assay (ELISA) was used to test sera for *Salmonella* antibodies. A pig's exposure to Salmonella, using serology, was measured by the presence of *Salmonella* antibodies, resulting in seropositivity, at weaning and at the end of the nursery stage.

For bacteriology, pig fecal samples were cultured for *Salmonella*. A nursery barn with either one or more pigs having an increase in antibody titers resulting in *Salmonella* seropositivity at the end of nursery and/or one or more pigs positive in bacterial culture for *Salmonella* at the end of nursery were identified as having an active *Salmonella* infection. Using statistical analysis, the association between risk factors (farm management/biosecurity) and nursery barns with an active Salmonella infection was also evaluated.

Approximately 20% (9) of nurseries produced *Salmonella*-free pigs, based on both serological and bacteriological methods. These results suggest that it is possible to have negative pigs introduced to the grower-finisher barn. The remaining

Doug Richards (for illustration only) photo

Table 1: Active *Salmonella* infection on 46 Ontario nursery barns identified using bacteriological (at the end of nursery) and serological (based on antibody response at weaning and at the end of the nursery) testing methods.

Active *Salmonella* Infection on Nursery Barns			
Bacteriology	Serology		
	+	-	Total
+	22 (48%)	8 (17%)	30
-	7 (15%)	9 (20%)	16
Total	29	17	46

80% (37) of nurseries were found positive either using serological or bacteriological methods or both. Specifically, 48% (22) of nurseries were identified with an active Salmonella infection using both identification methods, while 17% (8) and 15% (7) were only positive for serology and bacteriology, respectively.

These findings highlight the strengths and weaknesses of these testing methods. Bacteriological testing methods are likely to detect a current infection while serological testing methods have a greater likelihood of capturing a historical exposure where the animal is no longer shedding the bacteria. It was necessary to take into account that on some nurseries, the newly weaned pigs carry Salmonella antibodies that had been passively obtained from colostrum provided from sows. Over time, this passive immunity diminishes and the formation of acquired immunity may take one or two weeks, depending on exposure. If Salmonella exposure occurred late in the nursery phase, it is possible that serological testing may have been missed in recently infected pigs. However, serological testing is advantageous in that it allows for the detection of intermittent shedders and is a more inexpensive method with better sensitivity in comparison to bacteriological testing. Due to the relatively small amount of fecal matter on rectal swabs, there is a likelihood that Salmonella was being shed in small quantities but the culture technique was not able to detect it in the eight nurseries identified positive with serology. Thus, by combining the two techniques, it may allow researchers to better monitor Salmonella active infections in herds. Examination of risk factors (i.e. all-in/all-out or continuous flow, use of disinfection, etc.) didn't identify why the negative farms were different from the others, but this warrants further study.

Saranya Nair, PhD Student, Population Medicine, University of Guelph, nairs@uoguelph.ca

Dr. Vahab Farzan and Dr. Robert Friendship, Ontario Veterinary College, University of Guelph

Notes for the 2020 Swine Budget

This information sheet provides the assumptions that are used to calculate the monthly OMAFRA Swine Budget. The monthly Swine Budget provides a guide and format to estimate the cost of production for a swine enterprise. The cost estimates and assumptions are based on information from a variety of industry sources. The cost figures are not obtained from an actual survey; therefore, adjustments and interpretations are necessary when applying these figures to a particular business enterprise. Individual farm figures will vary depending on the resources, management, production, health status, size, market conditions, risk, and financial arrangements.

Farrow to Finish – To arrive at an estimated cost of production for farrow to finish, the estimated production costs are split into three production phases, Farrow to Wean, Nursery, and Grow-Finish. The Farrow to Finish Budget is the accumulated cost of the three phases and is based on 23.25 market pigs sold per sow per year. The various costs from the three phases are totalled on a per sow basis and divided by 23.25 to arrive at the per pig cost for the farrow to finish budget. By doing this, a mortality and morbidity cost is built into budget estimates.

- The Farrow to Wean Phase is based on producing 25.5 weaned pigs per sow per year. Assuming a 12% pre-weaning death loss and 2.35 litters per sow per year; it would take 12.5 pigs born alive per litter to achieve this. To arrive at a cost per sow, multiply the per pig figures by 25.5.

- The Nursery Pig Phase is based on producing 96% of the weaned pigs placed as feeder pigs weighing 27 kilograms. The nursery pig space is assumed to be turned over 6.5 times per year or approximately 56 days per turn. To arrive at a cost per sow, multiply the per pig figures by 24.5.

- The Grow-Finish Phase is based on marketing 94% of the feeder pigs placed as market pigs (which includes mortality and pre-mar ket weight sales). Pigs are placed on feed at 27 kilograms for approximately 112 days and finished at the indicated average monthly market weight and index. It is assumed that each barn space is turned 2.89 times

per year. To arrive at a cost per sow, multiply the per pig figures by 23.25.

Assumptions:

1. **Income** –The market pig value ($/pig) is based on 101% of the monthly average Ontario base formula price, the monthly average dressed weight (kg), an index of 110 and a premium of $2.00 per hog.

   Market pig value ($/pig) =
   Monthly average Ontario base formula price
   X 101%
   X average monthly dressed weight(kg)
   X 110 index
   + $2.00 premium

2. **Feed** – The feed costs are estimated using corn, soybean meal and premix. The monthly corn value is based on the average of the daily Huron FOB Farm and the Western Ontario Feed corn prices. The monthly soybean meal value is based on the average daily Hamilton soybean meal prices plus $20 per tonne for trucking and handling. A feed processing charge of $20 per tonne is included for feed and storage equipment overhead costs (depreciation, interest, insurance), operating costs (labour, repairs, hydro), handling and preparation costs (invisible loss). No feed additive or medication cost is included in the feed cost since these are estimated on the health cost line.

   - Breeding Herd Feed – This is a combination of gestation and lactation feed assuming 1,100 kilograms of feed per sow per year. A five month rolling average feed cost based on the time of the gestation and lactation feed is used to produce the market pig (5 to 9 months prior).
   - Nursery Feed – This is based on a phase feeding feed budget using a total of 33.5 kilograms of feed per pig. A two month rolling average feed cost is used based on the nursery period of time to produce the market pig (3 to 4 months prior).
   - Grower-Finisher Feed – This is based on a phase feeding feed budget assuming a 2.75 feed conversion and on feed for an aver age of 112 days. A four month rolling average feed cost is used based on feed costs during the past four months.

3. **Net Replacement Cost for Gilts** – The value shown is the difference between the estimated cost of commercial replacement gilts and an estimated cull sow value. The gilt replacement value is the market hog value plus $140 and a cull sow value is calculated from the marketplace. The replacement rate is assumed at 42%, based on a 35% cull rate and a 7% sow death loss rate. The calculation is a five month rolling aver age based on the values during the time of gestation and lactation.

4. **Health (Vet and Supplies)** – These are the estimated costs for prevention and control of disease within a herd. They would include injectables, water and feed treatments. These figures will vary depending on the health status, protocols, and cost of supplies and services.

   - The farrow to wean cost is estimated at $58.00 per sow per year. This may include the cost of vaccines for PRRS, parvovirus, leptospira, swine influenza, and erysipelas, iron treatments for piglets, worming treatment for sows, supplies, veterinarian expenses, production and Canadian Quality Assurance (CQA®) records.
   - The nursery cost may include vaccinations for circovirus and others, water and/or feed treatment programs.
   - The grow-finish cost may include water and/or feed treatment programs and some treatment costs for minor health challenges.

5. **Breeding (A.I. & Supplies)** - 100% A.I. is assumed based on 2.35 litters per sow, an 85% farrowing rate and $17.00 per breeding (double dose of semen and supplies).

6. **Marketing, Grading, Trucking** - The market hog estimate in cludes the Ontario Pork Universal service fee ($0.95), the grading fee ($0.06), and an allowance for fees charged for marketing, trucking and assembly ($5.00). A trucking allowance of $0.95 per early weaned pig and $1.60 per feeder pig will be phased into the variable cost, respectively.

7. **Utilities (Hydro & Gas)** – These costs have been estimated and allocated based on individual site barns (i.e. sow, nursery, grow-finish), farrow to feeder pig and farrow to finish operations. Costs will vary due to a number of rea sons including barn and equipment efficiencies, cost of inputs, size, production efficiency, and management.

8. **Miscellaneous** – These are estimated figures to cover other costs that are allocated to the swine enterprise.

9. **Repairs and Maintenance** – These are estimated using 1.5% of the estimated building, equipment, and site investment values.

10. **Labour Cost** – These costs will vary depending on the number of employees, wage and benefit level, number of hours worked and management and owner-operator labour allocation. For the purposes of this budget, an estimated cost of $52,000 per person is used. Labour estimates used are farrow to wean labour cost based on 300 sows per person and the nursery and grow-finish on 4,000 pig spaces per person.

11. **Operating Interest** – Calculated on one-half of the operating costs less the marketing costs at the prime chartered bank rate plus 1%. The farrow to wean interest cost is based on 22 weeks, the nursery on 8 weeks and the grow-finish on 18 weeks. The nursery phase also includes an interest cost based on the cost of producing the weaned pig and the grow-finish phase includes an interest cost based on the cost of producing the feeder pig.

12. **Fixed Costs – (Depreciation, Interest, Taxes, and Insurance)** –. The estimated building, equipment and site cost values are $2300 per sow for the farrow to wean, $265 per pig space for the nursery, and $450 per pig space for the grow-finish. Investment cost over the years have varied depending on a variety of items including the quality of equipment, site conditions, supply and demand of inputs, site services costs, upgrading costs, and the year the buildings were constructed.

    1. **Depreciation** – Depreciation is estimated by dividing the investment value by 20.

    2. **Interest** – The interest cost is estimated using 40% of the investment value at a rate of 7%.

    3. **Taxes and Insurance** – These are estimated using 1.0% of the investment value.

13. **Summary of Costs** – This section provides a summary of the costs within each production phase. The Other Variable Costs include the applicable lines from Net Replacement Cost for Gilts to Operating Loan Interest and the Fixed Costs include the Depreciation, Interest, Taxes and Insurance.

14. **Summary** – this section provides the following information:

- **Farrow to Weaned Pig Cost** – this is the estimated total variable and fixed costs to produce a weaned pig five months prior on a per pig basis.

- **Farrow to Feeder Pig Cost** – this is the estimated total variable and fixed costs to produce a feeder pig three to four months prior on a per pig basis.

- **Wean to Finish Cost** – this is the estimated total variable and fixed costs to produce a market hog for sale in the stated month based on the nursery and grow-finish costs on a per pig basis.

- **Farrow to Finish Cost** – this is the estimated total variable and fixed costs (birth to market) in the stated month on a per pig basis.

- **Net Return Farrow to Finish** – this is the difference between the Market Pig Income at the top of the budget and the total variable and fixed costs on a per pig basis.

- **Farrow to Finish Breakeven Base Price - includes 101% and $2 premium**
  The following formula is used:

  $/ckg, 100 index base price =
  [total variable and fixed costs ($/pig)
  - $2 (premium/pig)]
  ÷ 1.01 (percentage of formula)
  ÷ 1.10 (index)
  ÷ average dressed weight (ckg)

- **Farrow to Finish Breakeven Base Price ($/ckg, 100 index) - excludes 101% and $2 premium**
  The following formula is used:

  $/ckg, 100 index base price =
  total variable and fixed costs ($/pig)
  ÷ 1.10 (index)
  ÷ average dressed weight (ckg)

The OMAFRA Swine Budget provides a format and guide to estimate a cost of production. The variation in production practices gives rise to a large variation in costs of production. Interpretation and utilization of the information will require adjustments to apply these figures to an individual swine production enterprise. Therefore, it is important for individual operations to determine their cost of production based on their records. Accurate and up to date information is essential to determine an individual farm cost of production and to make management, financial, and marketing decisions.

For more information on cost of production budgeting see Guide to Cost of Production Budgeting or Farm Business Calculators on the OMAFRA website.

If you have questions on the monthly Swine Budgets, please contact Jaydee Smith, OMAFRA Swine Specialist at 519-358-5829 or jaydee.smith@ontario.ca

Agricultural Information Contact Centre:
1-877-424-1300
E-mail: ag.info.omafra@ontario.ca

Ontario Pork has produced these posters in a number of languages. Download them at **www.ontariopork.on.ca/Communications/ASF-Resources**. Post them where people will see them and help spread the message. *In the meantime, clip this page out and post it at the barn entry.*

Ontario

Swine Budget – February 2020

Compiled by Jaydee Smith, Swine Specialist, OMAFRA *jaydee.smith@ontario.ca*

Income ($/pig)	**Farrow to Wean**	**Nursery**	**Grow-Finish**	**Farrow to Finish**
Market Pig @ 101% of Base Price $137.59/ckg, 110 index, 105.87 kg plus $2 premium				$163.84
Variable Costs ($/pig)				
Breeding Herd Feed @ 1,100 kg/sow	$15.02			$16.48
Nursery Feed @ 33.5 kg/pig		$16.97		$17.89
Grower-Finisher Feed @ 287 kg/pig			$90.53	$90.53
Net Replacement Cost for Gilts	$2.96			$3.24
Health (Vet & Supplies)	$2.16	$2.10	$0.45	$5.03
Breeding (A.I. & Supplies)	$1.80			$1.98
Marketing, Grading, Trucking	$0.95	$1.60	$6.01	$8.74
Utilities (Hydro, Gas)	$2.40	$1.41	$2.17	$6.29
Miscellaneous	$1.00	$0.10	$0.20	$1.40
Repairs & Maintenance	$1.35	$0.61	$2.34	$4.46
Labour	$6.27	$1.85	$4.15	$12.98
Operating Loan Interest	$0.35	$0.42	$1.37	$2.20
Total Variable Costs	**$34.26**	**$25.06**	**$107.22**	**$171.21**
Fixed Costs ($/pig)				
Depreciation	$4.51	$2.04	$7.79	$14.88
Interest	$2.53	$1.14	$4.36	$8.33
Taxes & Insurance	$0.90	$0.41	$1.56	$2.98
Total Fixed Costs	**$7.94**	**$3.59**	**$13.70**	**$26.19**
Summary of Costs ($/pig)				
Feed	$15.02	$16.97	$90.53	$124.89
Other Variable	$19.24	$8.09	$16.69	$46.32
Fixed	$7.94	$3.59	$13.70	$26.19
Total Variable & Fixed Costs	**$42.20**	**$28.65**	**$120.92**	**$197.40**

Summary	**Farrow to Wean**	**Feeder Pig**	**Wean to Finish**	**Farrow to Finish**
Total Cost ($/pig)	**$42.20**	**$72.57**	**$151.12**	**$197.40**
Net Return Farrow to Finish ($/pig)				**-$33.56**
Farrow to Finish Breakeven Base Price ($/ckg, 100 index) includes 101% Base Price & $2 Premium				**$166.12**
Farrow to Finish Breakeven Base Price ($/ckg, 100 index) excludes 101% Base Price & $2 Premium				**$169.50**

This is the estimated accumulated cost for a market hog sold during the month of February 2020.
The farrow to wean phase estimates the weaned pig cost for September 2019 and the nursery phase estimates the feeder pig cost for Noember 2019.
For further details, refer to the "2020 Budget Notes" posted at: : http://www.omafra.gov.on.ca/english/livestock/swine/finmark.html .

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MOE'S MARKET MINUTE

by
MOE AGOSTINO
& ABHINESH GOPAL

ARE WE POISED FOR ANOTHER RECORD YEAR?

American pork exports broke several records in 2019 and the sector might be in for another strong year.

MSPhotographic/iStock/Getty Images Plus photo

The initial winners in the Phase 1 U.S.-China trade deal will be the pork, poultry and beef sectors as China becomes the top meat importer.

Being African swine fever (ASF)-free has paid dividends for producers in unaffected countries.

As the disease decimated hog herds in Asia, especially in China, and affected swine (mostly wild hogs) in some European countries, ASF also boosted the global pork trade.

The ASF-free regions saw marked year-over-year (Y/Y) increases in pork exports in 2019. The major exporters who benefited were the European Union (EU), Brazil, Canada and the United States.

2019 was a record year for U.S. pork exports as the country broke its export records for volume and value, U.S. Department of Agriculture data showed. At almost US$7 billion, the 2019 U.S. pork export value was 9 per cent higher Y/Y. The 2019 U.S. pork export volume of 2.67 million metric tons (MMT) was 10 per cent higher Y/Y and broke the 2017 record of 2.45 MMT.

The United States also broke its record for the monthly percentage of pork exported in December with a figure of 32.1 per cent of total pork production.

In December, U.S. pork exports to Mexico, America's top market for pork, were the biggest in two years. That month, the American export volume reached 66,181 metric tons, which was 10 per cent higher Y/Y. Notably, the monthly export value at US$137.6 million was 46 per cent higher Y/Y, showing an increase in market prices.

But one of the key standouts from the stellar American pork export performance in 2019 was the significantly larger exports to China and Hong Kong.

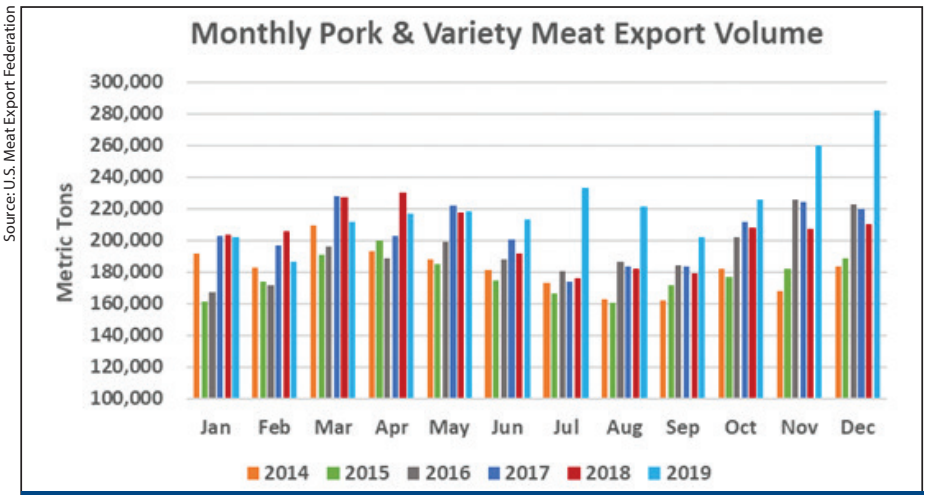
The total annual U.S. pork export volume (665,665 MMT) was 89 per cent higher Y/Y. And these exports were valued at US$1.45 billion, which was 71 per cent higher Y/Y.

It was not just the U.S. that benefited from China and Hong Kong's strong pork imports in 2019. China and Hong Kong's imports from all pork suppliers in 2019 reached a record of 3.45 MMT, the U.S. Meat Export Federation said. This figure was up 40 per cent Y/Y.

In 2020, Chinese pork imports are expected to rise from 2019 levels by 30 to 40 per cent, which would set another new record.

Chinese pork prices are still too high, and the country will continue to look to imports to fulfill its demand. Because of ASF, Chinese pork prices were 116 per cent higher Y/Y in January. This increase follows from December's 97 per cent Y/Y increase.

Source: U.S. Meat Export Federation



In 2019, U.S. pork exports broke volume and value records.

The sky-high domestic pork prices were the primary reason behind the 20.6 per cent Y/Y January increase in Chinese food prices and the 5.4 per cent Y/Y increase in Chinese consumer inflation.

The EU, which is China's biggest pork supplier, saw record December carcass prices in 2019. The average carcass prices were only 5 per cent behind the 30-year high of EUR2.07/kg set in 1997, Rabobank said. (An outbreak of classical swine fever in 1997 in some of the EU's major hog-producing countries reduced the supply of hogs then.)

China's lowering of pork import tariffs in 2020 due to its burgeoning pork demand means that EU carcass prices should continue to strengthen in the first half of 2020, and likely throughout the year.

Brazil, another major exporter, saw its pork exports to China grow by a huge 59 per cent Y/Y in 2019, reaching a total of 249,000 metric tons (MT). Brazil is building upon that robust pace so far this year.

Despite all the political tensions between China and Canada, China was still the second-largest export market for Canadian pork in 2019. Trade analysts expect that trend to continue and improve this year as China could easily become Canada's top pork export market.

Although the strong American dollar is a headwind, market analysts expect U.S. pork exports to surge again this year on strong demand. Several factors look positive on that front. U.S. pork production in 2020 is expected to rise 3.2 per cent Y/Y.

The United States needs the trend of 30 to 35 per cent of total American hog production going to exports to continue this year so demand outpaces supply.

Pork export demand will remain robust due to an expected increase in shipments following the start of the trade agreements with China, Mexico, Canada and Japan. American pork exports are boosted by the fact that they are quite competitive in global trade due to the industry's push to improve production efficiency.

U.S. pork exports also should get a boost because China is showing good faith in trying to comply with the U.S.-China trade deal, especially on ag. China is also working hard to contain the coronavirus outbreak, which would reinvigorate demand.

Chinese officials have indicated that the government would offer domestic buyers waivers, so they aren't hit with extra tax, to purchase American goods. Meat protein should be on the top of China's shopping list.

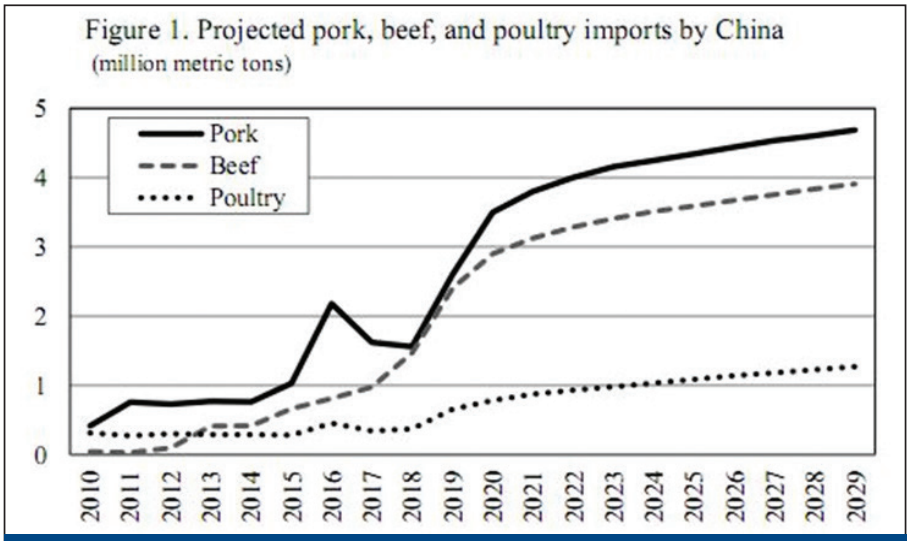
The initial winners in the Phase 1 U.S.-China trade deal will be the pork, poultry and beef sectors as China becomes the top meat importer. Exports to China could account for up to 33 per cent of all American meat production.

The general market principle is that the broad marketspace captures all information first and the public only gets to know it after the key events have transpired. So, we will know when the big Chinese purchases are about happen if we see other major pork-importing countries scrambling to buy as much pork as they can before China comes to shop and drives prices higher.

Hog futures could catch fire if big Chinese purchasers show up first for U.S. pork. **BP**

MicroStockHub/iStock/Getty Images Plus photo

Despite all the political tensions between China and Canada, China was still the second-largest export market for Canadian pork in 2019.



Source: U.S. Department of Agriculture

In 2020, the U.S. Department of Agriculture expects Chinese pork imports to rise by 30 to 40 per cent from 2019 levels.

Maurizio "Moe" Agostino is chief commodity strategist with Farms.com Risk Management and Abhinesh Gopal is head of commodity research. Risk Management is a Farms.com company, as is Better Pork.

Visit RiskManagement.Farms.com for more information.

SECOND LOOK

by
RICHARD SMELSKI

CONSIDER HOW THIS FABLE STILL RINGS TRUE

While we've made some significant advances in our scientific knowledge, some mindsets are puzzling.

"The Emperor's New Clothes," a children's story by Hans Christian Andersen, may apply to the regulations surrounding today's pork industry.

Just to remind you of the tale, a vain emperor ordered his weavers to make him a unique garment. However, two cunning weavers spent a lot of time doing nothing. Then, they claimed only the very wise and loyal could see their work – and thus see this unique clothing.

No one would admit to not being wise or loyal, even though they could not see the garment.

So, the emperor was naked but no one said anything. Then, one day, when the emperor was on parade, a boy shouted out "The emperor has no clothes on."

Don't you want to sometimes stand up and shout out like this little boy about some of the frustrations in society today?

Shouldn't Canada's new food guide address not only what you eat but also how much you eat? In total, 64 per cent of Canadians over the age of 18 are overweight or obese, and about 30 per cent of children aged five to 17 are overweight or obese.

The average gratuity of a restaurant meal is larger than the farmer's share; producers receive roughly 2.4 cents of every dollar.

While alarmists still talk about trichinosis in pork, it is not a problem. Freezing kills the worms, and *Trichinella* is very easy to kill with a low heat. That's why we cook pork at 145 F (63 C). And a three-minute rest time is ideal.

Is the hypersensitivity about food safety in our country out of context? We spend millions of dollars on food inspections but let our dogs lick our faces. Their mouths can contain *Salmonella*, E. coli, Clostridia and *Campylobacter* and parasites like *Giardia* and *Cryptosporidium*.

Andrey Lomakin/iStock/Getty Images Plus photo

We should reflect on some of the lessons from childhood tales.

Also on the subject of pets, they're responsible for about 64 million tons of greenhouse gases annually, the University of California reported in 2017. So, dogs and cats are to blame for about a quarter of the environmental effects associated with meat consumption in the United States.

Continuing the scientific discovery vein, University of Guelph researchers developed the Enviropig. These animals were genetically enhanced Yorkshire pigs that excreted manure with phosphorus levels that were 30 to 65 per cent lower than manure from regular pigs. Due to political pressure, however, the scientists discontinued the project in 2012.

In 2018, Xianwei Zhang and collaborators in China developed transgenic pigs that not only expressed the microbial phytase enzyme but also xylanase and β-glucanase. These pigs had a growth rate increase of 23 per cent, and their manure also had up to 45.8 per cent less nitrogen and phosphorus than regular pigs. These parallel developments suggest that researchers sometimes work in silos.

The American agricultural industry is supposedly a free-enterprise system but the government provides significant support for its producers. In 2019, for example, the federal government provided a US$16-billion trade aid program.

The pork industry is interested in benchmarking but few people are average; everyone else is either above or below average. Of course, most people think they are above average.

As Winston Churchill once said, "There is nothing government can give you that it hasn't taken from you in the first place." **BP**

Richard Smelski has over 35 years of agribusiness experience and farms in the Shakespeare, Ont. area.

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Grow-Finish Feeding Program Results

Number of Trials	40
Total Number of Pigs	16,749
Starting Weight (kg)	25
Weight at Market (kg)	121.6
Average Daily Gain (g/d)	977
Average Daily Feed Intake (kg/d)	2.37
Feed/Gain Ratio	2.44

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