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About the cover…

Pigs at University of Missouri.

Photo courtesy of Barbara Molnar-Smith

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quoted from the Executive Editor's message, page 311.

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Glass half full (Part 2) – ASF preparedness and response

At the risk of foreign animal disease (FAD), and specifically African swine fever (ASF), information overload, I will continue the "Glass half full" series. It is simply amazing the groundswell of activity and information within the industry since ASF infected and swept through China over 1 year ago. Previously, I described the 3 likely primary risks of ASF entry into our country and the significant biosecurity breakdown that would have to occur for the virus to make the giant leap onto at least one pig farm.[1] Now, I would like to review some of what is being done for ASF preparedness and response if an outbreak were ever to occur.

USDA's functional exercises

This 4-day ASF exercise is still a couple of weeks away as I write this. This is the culmination of 3 previous exercises, which began last fall and were designed to target key areas of ASF response and mitigation.[2] I am sure many AASV members will be involved in the challenges and potential chaos of this 4-day event. I look forward to the lessons learned and strengths and weaknesses revealed from the exercise among the 14 participating states.

FAD response plans

The US Department of Agriculture's (USDA) Disease Response Strategy-African Swine Fever is called the "green book" and is a living document that provides strategic guidance for responding to an ASF animal health emergency in the United States.[3] It is a thorough treatise on the nature of the virus and disease, control, eradication, and recovery. It follows the World Organisation for Animal Health's (OIE) Terrestrial Animal Health Code definitions and guidelines. I encourage you to read it.

Likewise, each state has a tailored FAD response plan.[4] Minnesota's plan emphasizes the unique cooperative relationships between the Minnesota Board of Animal Health (BAH), Minnesota Department of Agriculture, and USDA Veterinary Services. Minnesota alone has had 59 FAD investigations from January through August, of which 53 were vesicular cases according to the Minnesota BAH (B. Peterson, oral communication, August 2019).

Like other states, Minnesota has developed an Emergency Disease Management Committee (EDMC) to act as an advisory group to the BAH. Committee members are from the swine industry and regulatory agencies. This advisory group will help build trusted relationships and expertise prior to an emergency to lead a more effective response in case of an ASF outbreak.

The EDMC consists of 10 subcommittees tasked to address the following critical activities of an outbreak response: 1) communications; 2) surveillance and diagnostics; 3) information management including epidemiological investigations, mapping, and tracing; 4) health, safety, and welfare of pork producers, veterinarians, disease responders, and animals; 5) biosecurity and quarantine; 6) permitted movement control as part of risk-based disease management and pork production strategies; 7) mass depopulation, euthanasia, and disposal; 8) cleaning and disinfection; 9) wildlife management and vector control; and 10) regionalization or compartmentalization for interstate and international trade. I share this list to emphasize the plethora of information and expertise needed in case of a real FAD outbreak.

"I am confident and optimistic that we will stay vigilant and do our best to prepare, control, contain, and eliminate ASF if it were to occur."

As an example, the surveillance and diagnostics subcommittee is addressing issues such as early identification of the index case. Currently, the National Animal Health Laboratory Network can test for ASF virus via whole blood, tonsil, spleen, and gastrohepatic, inguinal, and mesenteric lymph nodes. According to Dr Jerry Torrison (oral communication, August 2019), blood swab assays could be very sensitive and specific but are not yet considered official tests. Oral fluid assays have not yet been validated. At the University of Minnesota's Veterinary Diagnostic Laboratory, active surveillance occurs with about 40 ASF assays per week on sample submissions from practitioners and slaughter plants (oral communication, J. Torrison, August 2019). Is this enough active surveillance for early ASF detection? Probably not. Confirming an infected ASF herd within the first 10 days vs the first 30 days of exposure will make a tremendous difference in the number of herds infected and the subsequent economic damage.

Where will the resources (eg, people and lab tests) come from for diagnostic surveillance during and after the initial 72-hour shutdown? A primary limitation in a large FAD outbreak is enough qualified veterinarians or technicians to obtain the appropriate type and number of samples within the

President's message continued on page 307

US Trial Report

Tonisity Px™ *fed to* ***nursing pigs*** *produced* ***more weaned pigs*** *and heavier pre-harvest weights.*

1 *Tonisity Px helped improve survival to weaning, so* ***MORE weaned pigs*** *were produced.*

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3 *More pigs + heavier pre-harvest weights =* ***MORE lb of pork***

Summary

Study Design

An extensive research study[1] conducted at facilities of a major Midwest commercial producer investigated the effects of Tonisity Px on pre-weaning mortality and pre-harvest weight gain.

353 litters from 1st-litter gilts, composed of **3862 individually weighed piglets,** randomly assigned to 2 treatment groups:

- **Control** = routine management (n=176 litters, 1969 piglets);
- **Tonisity Px** = used per Tonisity recommendations at days 2-8 and again pre- and post-weaning (n=177 litters, 1893 piglets).

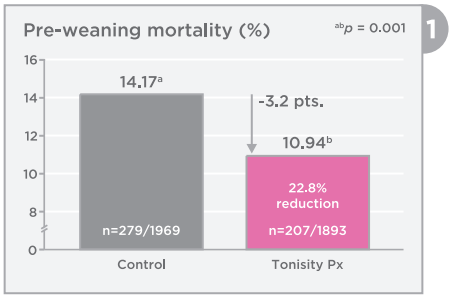
Pigs moved to finisher units at 68 days of age, weighed at 168 days of age.

Individual weights of all pigs measured **4 times:** at birth, weaning, end of nursery, and at day 168, thereby providing exceptional statistical power for analysis of study outcomes.

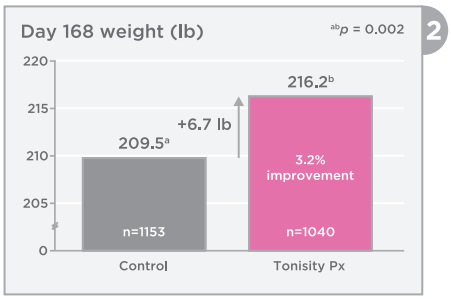
Tonisity Px is an isotonic nutritional supplement designed specifically for pigs. It is not a drug and it does not contain ingredients with drug-like properties. It is not intended to diagnose, treat, cure, or prevent any disease. Any observed differences in performance are due to the nutritional and hydration properties of Tonisity Px.

Results

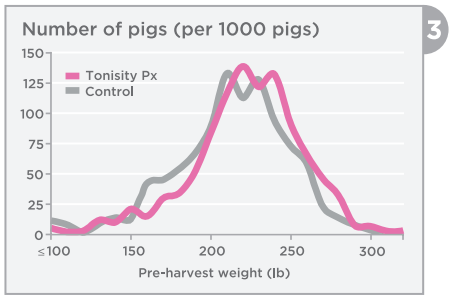
Pre-weaning mortality fell **22.8%** in the **Tonisity Px** group compared to controls, yielding **3.8%** more weaned pigs.



Tonisity Px pigs averaged **6.7 lb (3.2%) heavier** at 168 days.

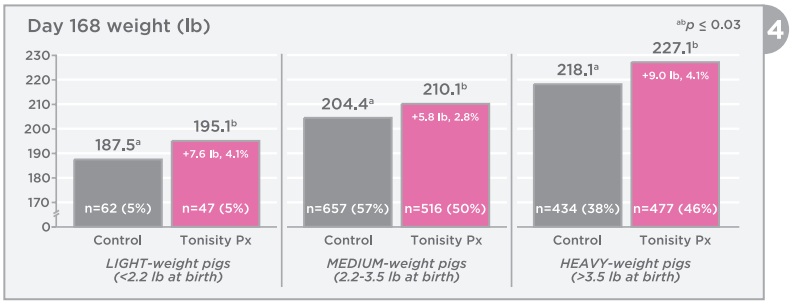


Tonisity Px pigs were 5.8 to 9.0 lb heavier at 168 days **regardless** of birth weight.



The populations of pigs fed **Tonisity Px** demonstrated a clear shift to heavier pre-harvest weights compared to controls.

- This favorable shift in pre-harvest weight distribution further confirms the **more-pigs/heavier-pigs** benefits of **Tonisity Px**.



1. Data on file, Study Report PRO-18-020. Tonisity Int. Ltd.

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President's message continued from page 305

surveillance zones and to epidemiologically trace back and trace forward any and all suspect pig sites. In Minnesota, there are only 10 FAD diagnosticians with the BAH or USDA to make a confirmatory FAD diagnosis. Some states are considering allowing accredited swine veterinarians to train certified authorized agents to fill this people power void in case of an emergency. Further guidance is needed, but it could be another important role for swine veterinarians.

How would we respond? It is difficult to predict what an ASF outbreak in the United States would look like, but here are some key points:

- The index case could be identified by you (or me) or one of our clients. Hopefully not at a packing plant.
- The United States has some of the best swine farm and truck biosecurity practices in the world. However, an ASF outbreak will likely be due to a lapse in biosecurity somewhere. This cannot be emphasized enough with our clients.
- An FAD laboratory will confirm the diagnosis and an FAD diagnostician will establish infected, buffer, and surveillance zones. Chaos at some level will likely ensue.
- There will be a temporary 72-hour shutdown on movements. This could be local or widespread depending on the situation. Try to establish with each of your clients what to do if this happens. Also review an individual site plan for euthanasia and disposal.
- Permitted movements may resume on day 4 if allowed by the Incident Commander only. Everything, including sites, packing plants, and diagnostic cases, must be associated with a premises identification number for movement. Having a Secure Pork Supply Plan in place will help expedite pig movements.

The end game – elimination

The US swine industry has export market economic incentives to eliminate OIE reportable diseases. I believe there would be an all-out effort to do so quickly. The process of cleaning and disinfection, naïve sentinel exposure, and restocking each swine herd will likely take months, but we will learn how to do it as efficiently as possible. The United States has had significant historical success in eliminating previous swine FADs.[5] Although not in swine, the most recent, most expensive, and arguably the most significant animal health event in US history was highly pathogenic avian influenza. It was eliminated over 13 months at a direct cost of $1.6 billion to turkey and layer-chicken flocks and about $3.3 billion indirect costs to the US economy.[6] It is another success story of an FAD eradication.

African swine fever has successfully been eradicated from some countries. What can be learned from their efforts?

Spain and Portugal. Between 1985 to 1995, Spain successfully carried out an extensive coordinated program to eradicate ASF with the support of the European Union. This occurred even though ASF was present in their feral pig population and in the *Ornothodoros* tick vector. Many of the tests we use today for rapid detection in both swine and ticks come from Spain's experience. Portugal became ASF-free in 1993 but had a small re-occurrence in 1999 likely from positive tick vectors, which can remain infective for over 600 days![7]

Brazil. A successful ASF elimination program over 6 years (1980-1986) led Brazilian authorities to apply emergency sanitary measures in which 66,966 pigs were depopulated in 224 outbreaks of ASF in 3 southern states.[8] Regionalization, as in Brazil, may be a useful tool for the United States in the case of an ASF outbreak.

Dominican Republic and Haiti. The closest geographically the ASF virus has come to the United States was in the Dominican Republic and Haiti around 1978. The disease was eradicated over 13 months through a cooperative effort by the United States, Canada, Mexico, and the Haitian government in which the entire pig population on the island nation was eliminated (400,000 were euthanized and 600,000 died from ASF).[9] If ASF were to infect any North American country, the United States, Canada, and Mexico would be in it together.

The USDA's Animal and Plant Health Inspection Service and the state agriculture and BAH departments deserve a lot of credit for coordinating and attracting industry participation in these efforts. The statement, "I'm from the government, and I'm here to help" is said with sincerity, not satire, regarding ASF preparation and response.

The point of all of this is that even if the US swine industry has an ASF outbreak, my glass is half full. I am confident and optimistic that we will stay vigilant and do our best to prepare, control, contain, and eliminate ASF if it were to occur.

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Nathan Winkelman, DVM
AASV President

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"Hey look! That must be the new guy."

I recently attended the 46th Annual Conference of the Rocky Mountain Outdoor Writers and Photographers (RMOWP) Club. Although I've been a member of the club for almost a decade, I had never actually been to one of their conferences. But this year, the conference was being held in Estes Park, Colorado adjacent to Rocky Mountain National Park, one of my favorite national parks, so I had an additional incentive to go.

Having never been to the conference, I really had no idea what to expect. Would there be a lot of people or just a small intimate gathering? Old? Young? A mix of ages? Would everyone be a professional photographer or writer and way out of my league? How would I interject myself into a group I had never met? Although we have a common interest in photography, it is just a hobby for me and not something I feel comfortable discussing in-depth with a bunch of experienced photographers.

I will admit, I approached the door with a bit of trepidation. I entered the meeting room and rounded the corner. There, I was met by approximately 10 people gathered around the registration table, which also served as the bar. They turned as I approached and in unison shouted, "Harry!" It was something right out of Cheers! They even offered me a beer. After recovering from the initial surprise and a quick glance around the room, it became evident that of course they would recognize me. The 40 or so people in that room had been getting together once a year for many of the last 45 years. It appeared I was the first new addition they had welcomed in quite a while.

The thing that struck me, and what I wanted to share with all of you, was how immediately at ease I felt thanks to how all those strangers welcomed me. They approached me and introduced themselves and invited me to sit at their table. It was as much family reunion as it was conference. Throughout the entire meeting, someone new would come up and introduce themselves and strike up a conversation. They knew I was from North Carolina and they wanted to know about the recent hurricane we had just been through. How did I like Colorado? Was the altitude a problem? Interestingly, they asked very little about my photography experience. I began to realize that photography and writing were just the reasons they came together, not the reason they liked being together.

While photography was a common thread throughout the discussions among the attendees, their real interest was in what was going on while they were taking pictures. In the 3 days I was there, I never once heard anyone mention aperture or shutter speed. What I heard a lot about was how much someone enjoyed their trip to Alaska, or their experiences guiding trips to Africa, or fly-fishing in Colorado.

I kept thinking, "I hope this is how a new member in AASV feels." I know that for those of us who have been AASV members for many of our association's 50 years, our annual meeting is as much family gathering as it is scientific conference. But it has been a long time since I was a new member. This past week reminded me how important it is to reach out to our new members and make them feel comfortable and that they belong regardless of their experience.

"This past week reminded me how important it is to reach out to our new members and make them feel comfortable and that they belong regardless of their experience."

We can all learn and grow from everyone's experiences and what we each bring to the gathering enriches us all. It is incumbent on us "old-timers" to make the effort to reach out to our new members rather than waiting on them to come to us. So, when you get a chance, introduce yourself to someone new. Invite them to sit at your table. Take the opportunity to learn from them and be willing to answer their questions and offer your expertise.

The RMOWP is a small club with approximately 130 members and one paid staff person. They publish a newsletter six times a year and I always look forward to seeing the photos and reading the articles. In addition, they plan the annual conference, administer a scholarship, maintain access to various resources, support a website, and conduct photo and writing contests. All of this is thanks to the hard work of a dedicated group of volunteers.

This reminded me of the importance of any organization's volunteers including those in AASV. Without the free use of your time and expertise, we would not be able to provide our membership with the resources and representation we currently enjoy. Thanks to all of you that give of your time, money, and expertise to make AASV the great association it is! If you haven't taken the opportunity to get more involved with the AASV, that's ok. We are happy to have you as a member and we hope you find value in the resources and opportunities your membership brings. I promise you, however, there is a whole other level of reward to be gained once you partake in the opportunities to contribute your experiences and knowledge to the benefit of everyone in the family.

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Never too many thank yous!

Every year in the November-December issue of the *Journal of Swine Health and Production* (JSHAP) we publish a list of the peer reviewers who have kindly volunteered their time and expertise to review submitted manuscripts. And, in many of my messages for the November-December issues I have extended a thank-you personally. Well, I want to thank everyone again who has contributed to the journal in their own way. Perhaps it is a repetitive message but I sincerely think it is important and so, I am going to thank you again.

The manuscript contributions of the scientific component of every issue are a result of a team effort. Obviously, the authors, but also the peer reviewers and editorial and staff team invest significant time and energy into each published manuscript. Call me biased, but I think that as swine veterinarians, swine scientists, etcetera we are very lucky to have a journal so species and topic specific available to us. In order to keep the flow of information adding to our growing swine library, we need the combined and collaborative efforts of many. In past messages I have asked you to thank a reviewer and again in this message I invite you to turn to the list and recognize all those individuals who have volunteered their time and expertise to provide a peer review. If you see one of these peer reviewers in your daily travels or at a conference, please pass on a thank you.

I am always impressed with how progressive and collaborative our profession is, and another example came across my desk recently. At the time when I was writing this message, the AASV e-Letter published a message bringing member attention to the availability of the "Developing Day-1 Competencies for Swine Veterinary Graduates" report.[1] If by some chance you haven't seen the report, then you can access it here **www.aasv.org/news/story.php?id=11937**. The development of swine specific entry-level veterinary competencies is a highly valuable addition to our profession, and I wanted to use this message to extend a thank you to those involved in that project. To any veterinary students reading this message, I also recommend you check out the competency list. I am involved in the veterinary curriculum here at my home university and the entry-level competency list is a great tool to aid in informing my own lectures and instructional exercises. It is also a productive way for students to take ownership of their own learning as well. What a great example of supporting the growth of our profession and I encourage students to also thank anyone they recognize who has contributed to the project. I look forward to seeing the complete manuscript once published.

"In order to keep the flow of information adding to our growing swine library, we need the combined and collaborative efforts of many."

I will also, shamelessly, take this opportunity to remind everyone that there is always opportunity to be a peer reviewer for the journal. We always need peer reviewers! The journal has a link (**uoguelph.eu.qualtrics.com/jfe/form/SV_3q6Wc4gJKeg0GGh**) where you can indicate your interest to be a reviewer and provide some information regarding your area of interest and expertise.

Regarding this issue of JSHAP, I hope you enjoy the manuscripts. Thank you to everyone who has contributed and continues to contribute time and expertise to the journal.

Terri O'Sullivan, DVM, PhD
Executive Editor

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Brief communication

Peer reviewed

Pleurisy evaluation on the parietal pleura: an alternative scoring method in slaughtered pigs

Andrea Di Provvido, DVM, MS; Abigail R. Trachtman, DVM; Elena Farina, DVM, MS; Michael Odintzov Vaintrub, DVM; Giorgio Fragassi, DVM; Giorgio Vignola, DVM, PhD; Giuseppe Marruchella, DVM, MS

Summary

The present study aims to develop and assess an alternative method for scoring pleurisy in slaughtered pigs. Overall, data indicates that pleurisy can be scored effectively and efficiently by inspecting the parietal pleura. Moreover, this evaluation can be suitably carried out on digital images, thus optimizing the workload of veterinarians.

Key words: swine, slaughterhouse, pleurisy, scoring methods

Received: March 18, 2019
Accepted: May 15, 2019

Resumen - Evaluación de pleuresía en la pleura parietal: un método alternativo de puntuación en cerdos sacrificados

El objetivo del presente estudio es desarrollar y evaluar un método alternativo de puntuación de pleuresía en cerdos sacrificados. En general, la información indica que la pleuresía puede evaluarse efectiva y eficientemente mediante la inspección de la pleura parietal. Además, esta evaluación puede hacerse apropiadamente en imágenes digitales, optimizando así la carga de trabajo de los veterinarios.

Résumé - Évaluation de la pleurésie sur la plèvre pariétale: une méthode alternative de pointage chez les porcs abattus

La présente étude visait à développer et évaluer une méthode alternative de noter la pleurésie chez des porcs abattus. Globalement, les données indiquèrent que la pleurésie peut être notée de manière efficace et compétente en inspectant la plèvre pariétale. De plus, cette évaluation peut être effectuée adéquatement sur des images digitales, optimisant ainsi la charge de travail des vétérinaires.

The slaughterhouse is recognized worldwide as a useful check point for assessing the health status of livestock, as well as the effectiveness of strategies implemented to prevent or treat disease conditions. This is especially true for pigs, since their lifespan does not permit the full healing of lesions, which are often still evident at slaughter.[1-4]

Several methods have been developed to quantify the impact of diseases. However, the greatest attention has always been paid to the so-called porcine respiratory disease complex, which deeply reduces the profitability of pig farming.[3-5]

Regardless of the animal species and the disease taken into consideration, each scoring method should fit some general requirements: a) it should be simple, fast, and compatible with the slaughter line speed; b) it should be easily standardizable and reproducible; and c) it should provide data that can be easily interpreted and analyzed.[3]

Pleurisy is commonly observed at necropsy or during the postmortem inspection at the abattoir, its prevalence often being close to or above 50% in slaughtered pigs.[2] Multiple pleurisy scoring systems have been developed over the years; among these is the slaughterhouse pleurisy evaluation system grid (SPES),[6] which suitably meets the above criteria and is widely used to quantify pleurisy caused by *Actinobacillus pleuropneumoniae* (App) infection.[2,3,7]

The present work aims to assess an alternative method to score pleurisy in slaughtered pigs, based on the inspection of the parietal pleura. This method has been compared with the SPES grid, which is considered the gold standard in this field of study. The feasibility of scoring pleurisy on digital images has also been thoroughly examined.

ADP, ART, EF, MOV, GV, GM: Faculty of Veterinary Medicine, University of Teramo, Teramo, Italy.

GF: Veterinary practitioner, Teramo, Italy.

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This article is available online at http://www.aasv.org/shap.html.

Di Provvido A, Trachtman AR, Farina E, et al. Pleurisy evaluation on the parietal pleura: An alternative scoring method in slaughtered pigs. *J Swine Health Prod.* 2019;27(6):312-316.

Materials and methods

Animals

A total of 476 heavy pigs (9-11 months of age; 150-180 kg) were included in the present study. These pigs were slaughtered in Central and Northern Italy, between November 2017 and June 2018. The study was performed in 2 distinct steps, scoring pleurisy at the slaughterhouse and using digital images.

Scoring pleurisy at the slaughterhouse

Two hundred sixteen slaughtered pigs were investigated. The scoring was carried out by 3 skilled veterinary surgeons after a training period and reaching consensus about how to score and record lesions. Specifically, the presence or absence and the features of pleurisy were evaluated.

A veterinarian was stationed on the slaughter line where the postmortem inspection of viscera is usually performed. The inflammatory reaction of the visceral pleura (ie, the serous membrane lining the lungs) was scored according to the SPES grid (Table 1) and reported in an *ad hoc* format.[6] Another veterinarian was at a different point of the slaughter line and inspected the parietal pleura (ie, the serous membrane lining the chest wall). The presence or absence of

Table 1: Scoring pleurisy by the SPES method[6]

Score	Features of pleurisy, considering the extension and localization of lesions
0	Absence of lesion.
1	Pleurisy affecting the cranial-ventral portion of the lung; interlobar adhesion.
2	Discrete, unilateral pleurisy of the diaphragmatic lobe.
3	Discrete, bilateral pleurisy of both the diaphragmatic lobes; large, unilateral adhesion affecting the diaphragmatic lobe.
4	Large, bilateral adhesions between both the diaphragmatic lobes on one side and the chest wall on the other.

SPES = slaughterhouse pleurisy evaluation system.

pleurisy was reported in an *ad hoc* format and scored using the pleurisy evaluation on parietal pleura (PEPP) scale as detailed in Figure 1. Pleurisy was scored in each area regardless of the extent of lesions in order to limit the subjectivity of the judgment. According to the SPES grid,[6] considering the topography of the thoracic organs and that App-induced lesions usually affect the diaphragmatic lung lobes,[8] the following scores were established: 1 point for pleurisy affecting the cranial area of the parietal pleura; 2 points for pleurisy affecting the middle area of the parietal pleura; 3 points for pleurisy affecting the remaining caudal area of the parietal pleura. The points of both carcass halves are summed for a total score for each pig ranging from 0 to 12 (explanatory examples are shown in Figure 2).

Scoring pleurisy using digital images

The reliability of scoring pleurisy on digital images was also evaluated. A veterinarian scored lesions at the slaughterhouse using the PEPP method and took pictures of all the animals under study (n = 260). These pictures were shared with 2 veterinarians, who independently applied the PEPP method, being unaware of the score given at the slaughterhouse.

Statistical analysis

The suitability of the sample size was assessed for a generalized linear model using G* Power.[9] The mean scores obtained by applying SPES and PEPP were compared according to the diagnostic outcome (negative vs positive) by one-way analysis of variance. The relationship between the scores obtained with the 2 methods was evaluated using the Pearson's linear correlation coefficient (r). The functional relationship between the variables measured with the 2 scoring methods was solved by linear regression analysis, whose statistical significance was evaluated by the analysis of variance; the appropriateness of the fitting was estimated using the coefficient of determination (R^2).

The correlation among the scores obtained by applying the PEPP method at the slaughterhouse and on digital pictures was investigated and expressed by the Pearson's linear correlation coefficient (r). Finally, the agreement between the 2 veterinarians scoring pleurisy on digital images was measured by the Cohen's kappa coefficient (κ value).

Results

Scoring pleurisy at the slaughterhouse by SPES and PEPP methods

The presence of visceral pleurisy was demonstrated in 109 of 216 pigs (50.46%), while no pleural inflammation was detected in the remaining 107 of 216 pigs (49.54%) by the application of the SPES grid. On the same pigs, the application of the PEPP method demonstrated the presence of inflammatory reactions of the parietal pleura in 108 of 216 pigs (50%), while the remaining 108 of 216 pigs (50%) were considered healthy.

The scores obtained using both SPES and PEPP are shown in Figure 3. The similarity between the 2 scoring systems appears quite evident, although based on a different reference scale. In particular, the total number of healthy pigs (score 0) was almost identical. Actually, 8 pigs showing interlobar adhesions (score 1 with the SPES grid) were erroneously regarded as healthy by applying the PEPP method; on the other hand, 7 pigs with small lesions affecting the cranial intercostal spaces (score 1 with the PEPP method) were missed by applying the SPES grid.

Overall, the PEPP method was able to effectively discriminate diseased from healthy pigs ($P < .001$), when compared with the SPES grid. The scores obtained with the 2 methods showed a very high Pearson's correlation coefficient (r = 0.913), which was statistically significant ($P < .001$). The linear regression analysis indicated that the coefficient of determination was very high ($R^2 = 0.833$) and statistically significant ($P < .001$).

Scoring pleurisy using digital images

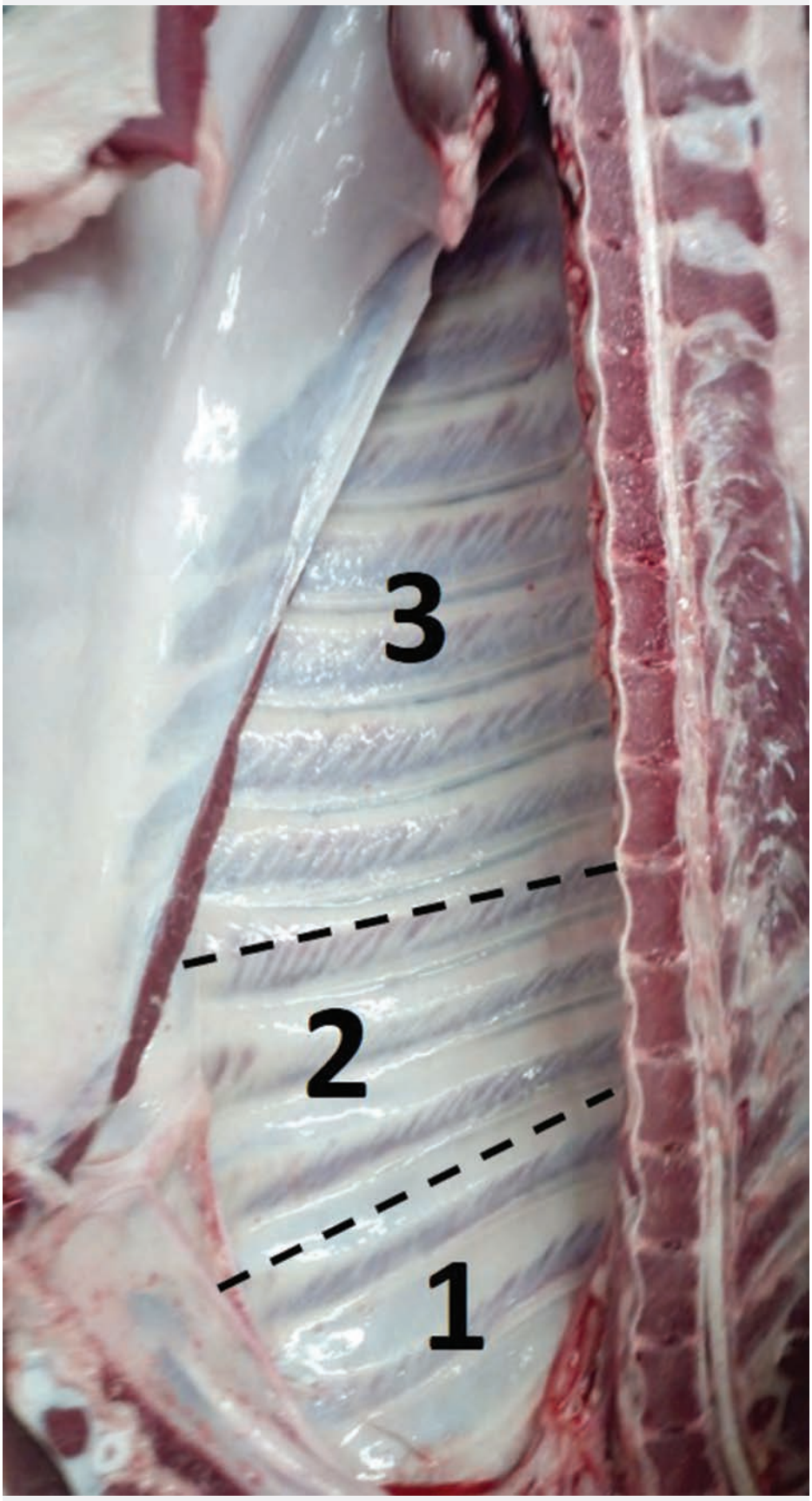
Scoring lesions on digital images proved to be quite easy and fast (around 8 pigs/minute, including recording scores in a spreadsheet). The scores obtained using the PEPP method at the abattoir and on digital images are shown in Figure 4, which underlines the high level of similarity among independent investigators. In particular, the number of healthy pigs (score 0) was almost identical, ranging between 140 to 144 of 260 pigs. The correlation among the investigators proved to be very high and statistically significant (r = 0.89 and 0.94; $P < .001$). Finally, the agreement between the 2 veterinarians scoring pleurisy on digital images was also very high (κ value = 0.852).

Discussion

The examination of slaughtered pigs is extremely useful and cost-effective to assess the health status of livestock, along with data collected in the herds (eg, clinical signs, necropsy findings, consumption of drugs, daily weight gain, and feed efficiency) or resulting from laboratory tests (eg, serological surveys).[3,5] For this reason, the assessment of innovative and suitable scoring methods is always highly desirable.

Actinobacillus pleuropneumoniae is the etiologic agent of porcine pleuropneumonia, a respiratory disorder of pigs distributed worldwide, causing significant economic losses to the swine industry.[8] A large body of evidence indicates that a high prevalence of chronic adhesive pleuritis at slaughter is very suggestive of previous App infection, thus further emphasizing the importance of the abattoir as a valuable source of data.[2,5,10,11] Different scoring systems have proven suitable to quantify App lesions. However, the SPES grid is the only one that can be reliably

Figure 1: The parietal pleura was divided into three, easily identifiable areas: 1) from the 1st to the 3rd intercostal space; 2) from the 4th to the 6th intercostal space; and 3) all the remaining caudal intercostal spaces.



assessed under field conditions, hence why it is considered the most informative system worldwide.[7]

Overall, our data indicate that the SPES and PEPP methods provide well matching results. We consider this to be widely expected, as pleurisy usually involves both pleural sheets (visceral and parietal), with very rare exceptions being possible (eg, interlobar pleuritis). Therefore, the PEPP scoring method could represent a reliable alternative to the SPES grid.

Obviously the PEPP method, like all the others, shows both strengths and weaknesses. For example, the inspection of the parietal pleura may not be compatible with the simultaneous evaluation of other lesions (eg, pneumonia, pericarditis, parasitic hepatitis). On the other hand, the PEPP method seems to be simple, not very influenced by possible confounding factors (eg, blood staining, lung scarring), and it can be applied in alternate locations on or off the slaughter line. In addition, it could be much faster than other methods if all carcasses are available at the end of the slaughter chain.

In our opinion, the effective application of the PEPP method on digital images could be particularly useful. The same approach appears difficult if not impossible for the SPES method because of a number of practical issues: (a) the difficulty in obtaining good quality images of the lungs along the slaughter chain; (b) the presence of large amounts of blood on the surface of viscera, including lungs; and (c) the inspiration of blood and water into the lungs from the scalding tank. Our data indicate that scoring pleurisy on digital pictures of the chest wall is fast, relatively simple, and easily standardizable, providing results which are largely comparable with those obtained by a veterinarian at the slaughterhouse. Therefore, this could be timesaving, efficient, and effective, notably streamlining the workload of the investigators.

Implications

- Pleurisy evaluation of parietal pleura was effective and efficient.
- Using PEPP on digital images was effective and optimized inspector time.

Acknowledgments

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Conflict of interest

None reported.

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Figure 2: Scoring pleurisy using the PEPP method. A) Pleurisy affecting the cranial portion of the chest wall, corresponding to a score of 1. B) Pleurisy of the 4th and 5th intercostal spaces, corresponding to a score of 2. C) Pleurisy affecting both the cranial and the middle portion of the chest wall, corresponding to a total score of 3. D) Pleurisy affecting the caudal intercostal spaces, corresponding to a score of 3. E and F) The entire parietal pleura was affected by pleurisy, corresponding to a total score of 6. The points of both carcass halves are summed for a total score for each pig ranging from 0 to 12. PEPP = pleurisy evaluation on parietal pleura.

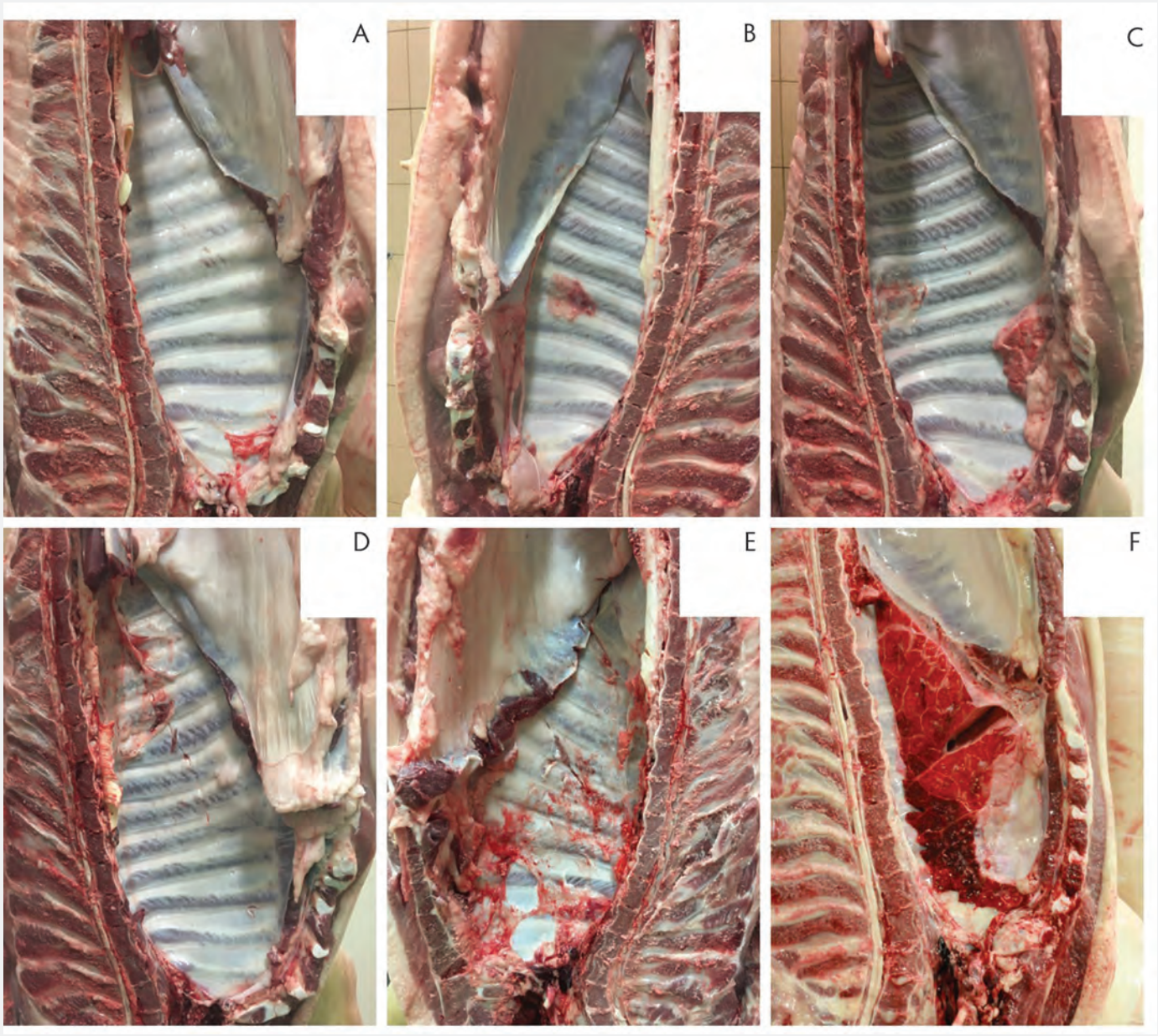


Figure 3: Pleurisy scores obtained by applying the A) SPES and B) PEPP pleurisy evaluation systems. Approximately, 50% of the pigs evaluated showed no pleural lesion and obtained a score of 0 using both scoring systems. The distribution of scores using the SPES system was rather uniform, with a score of 2 most frequently recorded. Using the PEPP method, most of the pigs with pleural lesions received scores of 1 to 6, with a small number of pigs scoring > 7. SPES = slaughterhouse pleurisy evaluation system; PEPP = pleurisy evaluation on parietal pleura.

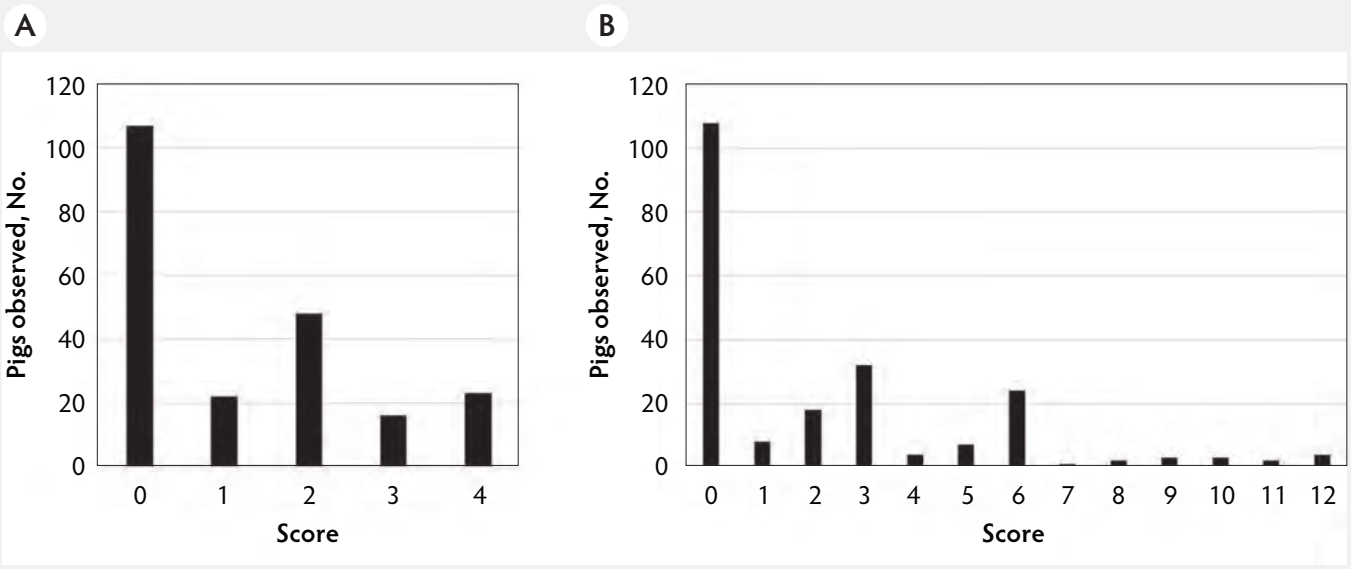
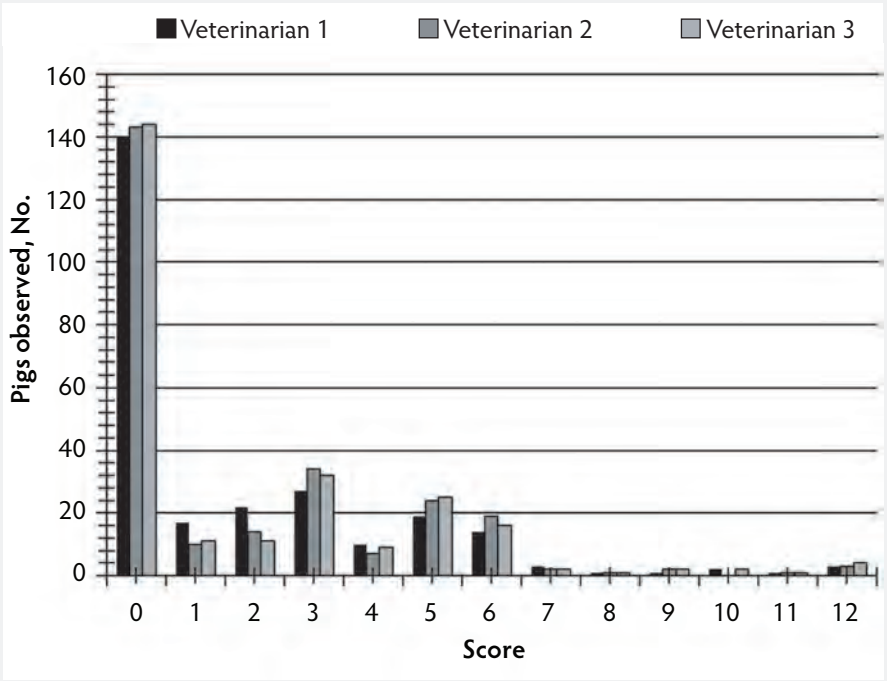


Figure 4: Pleurisy scores obtained by applying the PEPP method to carcasses at slaughter (veterinarian 1) and to digital pictures of the carcasses (veterinarians 2 and 3). PEPP = pleurisy evaluation on parietal pleura.



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Peer reviewed

Brief Communication

The effect of oral meloxicam on piglet performance in the preweaning period

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Summary

A total of 5045 piglets were castrated and received 1 of 2 treatments: control (C; surgically castrated); or meloxicam (M; surgically castrated and administered oral meloxicam). Oral meloxicam administration at castration required 5 additional seconds and had no effect on average daily gain, mortality, or survivability in the preweaning period.

Keywords: swine, castration, meloxicam, growth, mortality

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Resumen - El efecto de meloxicam oral en el comportamiento de lechones durante el periodo de predestete

Un total de 5045 lechones fueron castrados y recibieron 1 de 2 tratamientos: control (C; quirúrgicamente castrados); o meloxicam (M; quirúrgicamente castrados y meloxicam oral). La administración oral de meloxicam al momento de la castración requirió de 5 segundos adicionales y no tuvo efecto en la ganancia diaria de peso, mortalidad o supervivencia en el periodo predestete.

Résumé - Effet de meloxicam oral sur les performances des porcelets durant la période de présevrage

Un total de 5045 porcelets furent castrés et reçurent un des deux traitements suivants: témoin (C; castré chirurgicalement); ou meloxicam (M; castré chirurgicalement et administration orale de meloxicam). L'administration orale de meloxicam lors de la castration demandait 5 secondes additionnelles et n'avait aucun effet sur le gain moyen quotidien, la mortalité, ou la survie durant la période de présevrage.

In commercial swine production systems, surgical castration is a routine practice performed on male piglets within the first week of life.[1] This procedure results in a negative affective state of pain as demonstrated by physiological and behavioral deviations in the piglet.[2] Health and performance can also be compromised as castrated piglets are more likely to die during the preweaning stage[3] and lose weight post procedure.[4] Currently, both Canada and the European Union require analgesic administration prior to or at the time of castration.[5,6]

A class of analgesics, non-steroidal anti-inflammatory drugs (NSAIDs), are ideal options for on-farm use based on low cost and administration ease.[7] Meloxicam is an NSAID that alleviates pain and inflammation by decreasing prostaglandin synthesis through inhibition of the cyclooxygenase 2 pathway.[8] In the United States, under the Animal Medicinal Drug Use Clarification Act, meloxicam can be prescribed extra-label to alleviate pain and suffering in pigs.[9] Meloxicam is a potential candidate for castration pain management based on previous work demonstrating its efficacy when administered preemptively via intramuscular injection.[10,11]

While previous work has shown meloxicam to reduce pain sensitivity associated with castration, no studies to date have evaluated the effects of administering oral meloxicam at the time of castration on piglet performance in the preweaning period. Therefore, the objective of the present study was to evaluate the effects of oral meloxicam administered at the time of castration on piglet performance preweaning.

Materials and methods

The protocol for this study was approved by The Ohio State University Animal Care and Use Committee.

Animals

Male commercial crossbred piglets (n = 5045) across 783 multiparous sow litters (≥ parity 2) were enrolled in 1 study during the preweaning period on 1 commercial sow farm in the Mideastern United States from May to August 2018 (11 weeks total). Formal sample size calculations were not conducted; rather, the sample size was determined utilizing previous literature evaluating the effect of meloxicam on production parameters in commercial preweaned piglets.[7] In addition, sample size was selected to ensure pigs were enrolled across all farrowing rooms and throughout the entire summer season to minimize seasonal or room effect and was limited based on farm productivity. Herd health was consistent throughout the study; the herd tested negative for porcine reproductive and respiratory syndrome virus, porcine epidemic diarrhea virus, and *Mycoplasma*, and showed no signs of swine influenza. For the entirety of the study, male piglets were housed with the sow and female littermates in a standard farrowing crate (1.5 m wide × 2.1 m long; Pig Saver Bowed Bar Farrowing Crate; Farmer Boy Ag). At 1 day of age, piglets were tail docked, ear tattooed, and processed according to farm standard operating procedures. Piglets had free access to the sow for nursing and to 1 water source throughout the study (Stainless Steel Farrowing Pan Waterer; Farmer Boy Ag).

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Enrollment and treatments

Piglets were enrolled in the trial the day prior to castration. Enrollment was continuous over 11 weeks of production, with a daily target enrollment of 100 to 150 male piglets. Litters were selected across 8 farrowing rooms (72 stalls per room) based on litter age (2-4 days of age at enrollment), and all male piglets within the selected litters were enrolled. At the time of enrollment, piglets were weighed (start weight) and uniquely identified by ear tag (style 681 tag; National's Band and Tag Company). Piglets within a litter were blocked by weight and assigned to 1 of 2 treatments, ensuring both treatments were equality represented within a litter and the average start weight of both treatments were similar. Treatments were as follows: control (C; surgically castrated without treatment); or meloxicam (M; surgically castrated and administered 1.0 mL of 2.4 mg/mL oral meloxicam; target dose was 1.0 mg/kg; Aurora Pharmaceutical, LLC). No positive sham treatment group was included because this research was conducted on a commercial swine farm whose standard operating procedures required all male piglets be castrated. Given the individual castrating the piglets was also administering meloxicam, a saline control was not administered as the individual was already not blinded to the treatment groups.

Throughout the trial, enrolled piglets could be cross fostered by farm personnel to a recently weaned nurse sow if the piglets met the criteria outlined in the farm cross fostering protocol (eg, thin, small, overall poor doing, and < 10 days of age). Data on cross fostering, mortality, and end weights were recorded for each individual piglet.

Castration procedure

Piglets were castrated the day following enrollment (average age [SD], 3.9 [0.4] days; range, 3-5 days of age). Piglets were individually removed from the farrowing stall and castrated by the same trained technician starting at 7:00 AM. One vertical incision was made through the scrotum over each testicle using a side cutter instrument (Multi-Use Side Cutter; Jorgensen Labs). Testicles were extracted through the fascia by applying pressure to the scrotal area and were removed by severing the spermatic cord using scissors (German Surgical Scissors; Jorgensen Labs). Piglets in the M treatment received a 1.0 mL oral drench of meloxicam immediately following castration, whereas C treatment piglets did not receive drug administration. Once the castration procedure was complete, piglets were placed back into the farrowing stall. The castration procedure was timed for a subset of piglets (n = 9 per treatment; N = 18) during the final week of the trial to determine procedure length for both treatments. Castration time was defined as time from the first skin incision to placement of the piglet into the farrowing stall.

Statistical analysis

Data were analyzed using SAS version 9.4 (SAS Institute Inc). Piglet was the experimental unit, treatment was the predictor of interest, piglet start weight, and sow parity were the relevant variables included. Outcomes included procedure time, average daily gain (ADG; kg/d), cross foster, mortality, and survival. Procedure time was analyzed using a linear mixed model (PROC MIXED) with time in seconds as the outcome and treatment as the only predictor. Average daily gain was calculated ([end weight-start weight]/days on trial). Cross foster and mortality were recorded as binary outcomes (yes or no). Mortality data between castration to 18 days of age were analyzed to standardize the risk period for all piglets due to differences in time on trial. Start weight was grouped by quartiles into 3 categories: Small (S; < 1.6 kg), Intermediate (I; 1.6-2.2 kg), and Large (L; > 2.2 kg). Sow parity (range, 2-11) was collapsed into natural groupings based on similar piglet ADG and similar sow age. Average daily gain between parity was assessed using a mixed model with ADG as outcome and parity as the only predictor. Sequential parities with similar ADG ($P > .05$) were collapsed together into 4 categories: Parity 2 (P2), Parity 3 and 4 (P34), Parity 5 and 6 (P56), and Parity 7 and older (≥ P7). Univariable analysis was used to check for collinearity among sow parity category and start weight category.

Four separate multivariable models were constructed for each of the previously listed outcomes. All final multivariable models included litter as a random effect and treatment, sow parity category, and start weight category as fixed effects. Two-factor interactions were tested, found not to be significant ($P > .05$), and removed from the model. Average daily gain was analyzed using a mixed linear model with the PROC MIXED procedure in SAS. Residuals of ADG were also plotted and checked for normality. Average daily gain data was also screened for outliers using visual inspection of graphs and Cook's distance. The odds of a piglet on trial being cross fostered or dying prior to 18 days of age was analyzed using 2 separate generalized linear mixed models with the PROC GLIMMIX procedure in SAS. These generalized linear mixed models included a binary distribution and the logit link function to account for the binary nature of these variables. Survival analysis with Cox proportional odds (PROC PHREG) was used to determine the odds of a piglet surviving to 18 days of age, with death being the censored variable. Piglets with missing end weights due to unknown causes and unknown sow parity were not included in any of the final analyses (n = 215). In addition, 881 piglets were removed from trial prior to 18 days of age due to early weaning. For all models, the significance level was set at $P \leq .05$ and $P \leq .1$ was considered a trend.

To determine which explanatory variables should be included in multivariable models, univariable analysis was performed between all potential explanatory variables and outcomes of interest using either a mixed or logistic model. Explanatory variables tested at the univariable level for all models included start weight, sow parity group, removal weight, days of age at removal, age at castration, and litter. Explanatory variables were used in multivariable analysis only if they were associated with the outcome and the predictor of interest ($P < .20$).[12] Explanatory variables with $P \leq .05$ were included in the final model by utilizing backwards stepwise elimination. A change in estimate criterion ≥ 30% for the predictor of interest detected confounding variables and these variables remained in the model.

Results

For all piglets, the mean (SD) start weight was 1.9 (0.5) kg (C: 1.9 [0.5] kg; M: 1.9 [0.5] kg), the mean (SD) end weight was 5.6 (1.5) kg (C: 5.7 [1.5] kg; M: 5.6 [1.5] kg), and the mean (SD) days on trial was 16.6 (2.9) days (C: 16.6 [3.0] days; M: 16.6 [2.9] days). The mean (SD) castration time was 24.8 (2.5) seconds for M piglets and 19.9 (1.9) seconds for C piglets (Table 1).

A total of 4584 piglets were included in the final analysis for ADG (n = 246 died before removal from trial). Start weight category influenced ADG (standard error of the mean; SEM) ($P < .001$; S: 0.19 [0.01] kg/day; I: 0.23 [0.01] kg/day; L: 0.27 [0.01] kg/d). Treatment did not affect ADG SEM (Table 1).

A total of 4830 piglets were included in the final analysis for cross fostering. Start weight category influenced ($P < .001$) cross fostering with S piglets being 11.6 and 4.4 times more likely to be cross fostered than L and I piglets, respectively. The odds of cross fostering tended to be 1.3 times higher in C piglets compared to M piglets (Table 2; C: n = 165, M: n = 138).

A total of 3949 piglets were included in the final analysis for mortality from castration to 18 days of age (n = 881 piglets did not die but were removed from trial prior to 18 days of age). Start weight category influenced mortality ($P < .001$) with S piglets being 9.2 and 4.4 times more likely to die than L and I piglets, respectively. Treatment had no effect on mortality to 18 days of age (Table 2; C: n = 114, M: n = 124). A total of 4830 piglets were included in the final analysis for survival. Based on Cox proportional odds, treatment did not affect survival to 18 days of age (Figure 1; $P = .56$).

Discussion

The objective of this study was to evaluate the effects of oral meloxicam administered at the time of castration on piglet performance. Given the welfare consequences associated with castration and the pressure placed on producers to manage pain, establishing realistic protocols that can be utilized on-farm without negatively impacting performance is critical. Results from this study indicate oral meloxicam administration at the time of castration resulted in no differences in piglet performance as demonstrated by no changes in ADG, mortality, or survivability.

In this study, administering meloxicam added an additional 5 seconds to the procedure. This conclusion is based on a small subset of piglet castrations and not all the piglets on trial. However, mean procedure length was recorded the last week of the study from the one trained technician castrating all piglets on trial, therefore providing an estimate of additional time required to administer oral meloxicam. In perspective, administering meloxicam on a 5000-sow farm farrowing 240 litters each week with 6 male piglets per litter would result in 2 additional hours of labor a week. This suggests that oral meloxicam can be effectively integrated into a large production system without resulting in exorbitant labor cost.

In our study, M piglets demonstrated no difference in ADG, mortality, or survivability compared to C piglets. Our results agree with previous work conducted by Kluivers-Poodt et al[10] and others[2,7] who found meloxicam had no effect on growth or mortality when administered intramuscularly (IM) and preemptively. Although preemptive administration is likely to result in greater pain control,[8] it requires more handling and labor time and will not result in piglet performance benefits as demonstrated by our work.

In the present study, C piglets tended to have higher odds of being cross fostered compared to M piglets. Castration performed without analgesics has been shown to reduce nursing bouts and result in temporary weight loss in the days following the procedure.[4,13] Meloxicam administered IM prior to castration can eliminate this deviation in feeding behavior and prevent temporary piglet weight loss.[10,14] As per the cross fostering protocol on this farm, any piglet identified as small, thin, overall poor doing, and < 10 days of age was a candidate for cross fostering. The potential short-term effects of meloxicam on nursing behavior around the time of castration may have influenced piglet body condition resulting in more C piglets being cross fostered.

Table 1: Least squares means (SEM) for ADG and castration time for piglets castrated or castrated and given oral meloxicam

Parameter	Control*	Meloxicam†	*P* value‡
ADG, kg/day	0.23 (0.01)	0.23 (0.01)	.92
Castration time, s/pig	19.9 (1.05)	24.8 (1.05)	.002

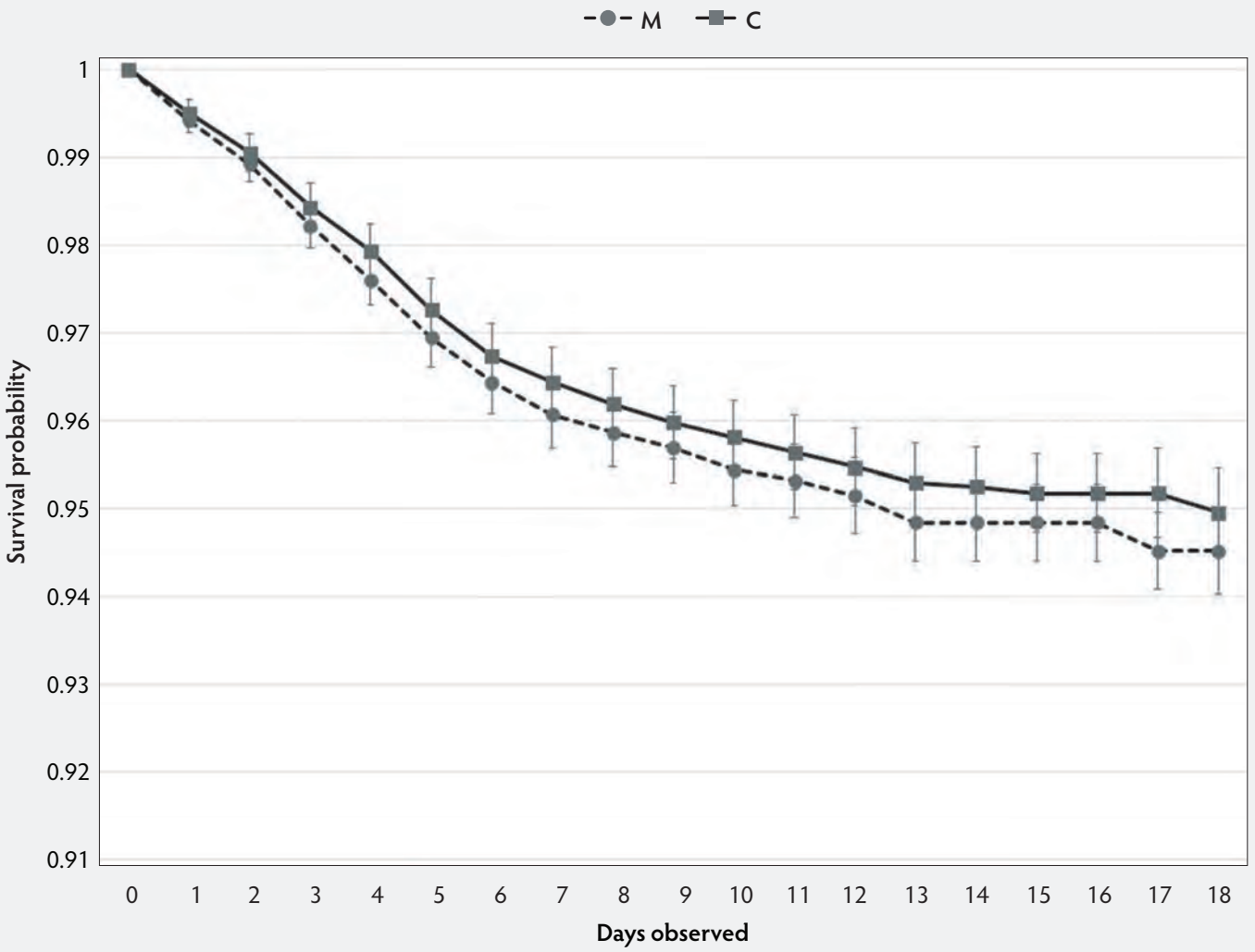
* Control pigs were surgically castrated without treatment.
† Meloxicam pigs were surgically castrated and administered 1.0 mL of oral meloxicam with a target dose of 1.0 mg/kg.
‡ The *P* value for ADG was obtained using a multivariable linear mixed model with litter as the random effect and treatment, sow parity category, and start weight category as fixed effects. The *P* value for castration time was obtained using a linear mixed model with treatment as the only fixed effect.
SEM = standard error of the mean; ADG = average daily gain.

Table 2: Probability of being cross fostered or dying for piglets castrated or castrated and given oral meloxicam

Variable	Odds ratio	95% CI	*P* value*
Probability of being cross fostered†			
Control‡ compared to Meloxicam§	1.3	0.99-1.61	.07
Probability of dying between castration and 18 days of age			
Control‡ compared to Meloxicam§	0.9	0.69-1.20	.5

* *P* values were obtained using multivariable linear mixed models with a binary distribution and a logit link function which included litter as the random effect, and treatment, sow parity category, and start weight category as the fixed effects.
† Cross fostered was defined as piglets being moved to a recently weaned nurse sow by farm personnel.
‡ Control pigs were surgically castrated without treatment.
§ Meloxicam pigs were surgically castrated and administered 1.0 mL of oral meloxicam with a target dose of 1.0 mg/kg.

Figure 1: Survival analysis using Cox proportional odds of surviving to 18 days of age for piglets castrated or castrated and given oral meloxicam. Data were anaylsed using PROC PHREG in SAS version 9.4 (SAS Institute Inc) and the model included treatment, sow parity, and piglet start weight as fixed effects. There was no treatment effect on piglet survival (P = .56). Control (C; surgically castrated without treatment); or Meloxicam (M; surgically castrated and administered 1.0 mL of 2.4 mg/mL oral meloxicam; target dose 1.0 mg/kg).



However, this trend in cross fostering did not translate to a difference in ADG in our trial. This may be due to meloxicam's short-term effect on nursing bouts[10,12] and castration's short-term effect on weight gain.[4] Further research evaluating oral meloxicam's effect on nursing behavior and piglet body condition is needed.

Our study demonstrated that oral meloxicam administered at the time of castration had no effect on piglet preweaning performance. As consumers become increasingly concerned with animal welfare and pressure is placed on producers to manage pain, establishing realistic protocols that can be utilized on-farm without negatively impacting performance is critical. Based on our results, oral meloxicam administered at the time of castration had no effect on ADG, mortality, or survivability in piglets during the preweaning stage and required only 5 additional seconds to administer.

Implications

Under the conditions of this study, administration of oral meloxicam at the time of castration:

- Did not impact piglet ADG, mortality, or survivability.
- Decreased the odds of cross fostering, likely due to increased nursing bouts.
- Increased the castration procedure time by 5 seconds per piglet.

Acknowledgments

Conflict of Interest

None reported.

Disclaimer

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Conversion tables

Weights and measures conversions

Common (US)	Metric	To convert	Multiply by
1 oz	28.35 g	oz to g	28.4
1 lb (16 oz)	453.59 g	lb to kg	0.45
2.2 lb	1 kg	kg to lb	2.2
1 in	2.54 cm	in to cm	2.54
0.39 in	1 cm	cm to in	0.39
1 ft (12 in)	0.31 m	ft to m	0.3
3.28 ft	1 m	m to ft	3.28
1 mi	1.6 km	mi to km	1.6
0.62 mi	1 km	km to mi	0.62
1 in^2	6.45 cm^2	in^2 to cm^2	6.45
0.16 in^2	1 cm^2	cm^2 to in^2	0.16
1 ft^2	0.09 m^2	ft^2 to m^2	0.09
10.76 ft^2	1 m^2	m^2 to ft^2	10.8
1 ft^3	0.03 m^3	ft^3 to m^3	0.03
35.3 ft^3	1 m^3	m^3 to ft^3	35
1 gal (128 fl oz)	3.8 L	gal to L	3.8
0.264 gal	1 L	L to gal	0.26
1 qt (32 fl oz)	946.36 mL	qt to L	0.95
33.815 fl oz	1 L	L to qt	1.1

Temperature equivalents (approx)

°F	°C
32	0
50	10
60	15.5
61	16
65	18.3
70	21.1
75	23.8
80	26.6
82	28
85	29.4
90	32.2
102	38.8
103	39.4
104	40.0
105	40.5
106	41.1
212	100

$^{\circ}F = (^{\circ}C \times 9/5) + 32$

$^{\circ}C = (^{\circ}F - 32) \times 5/9$

Conversion chart, kg to lb (approx)

Pig size	Lb	Kg
Birth	3.3-4.4	1.5-2.0
Weaning	7.7	3.5
	11	5
	22	10
Nursery	33	15
	44	20
	55	25
	66	30
Grower	99	45
	110	50
	132	60
Finisher	198	90
	220	100
	231	105
	242	110
	253	115
Sow	300	135
	661	300
Boar	794	360
	800	363

1 tonne = 1000 kg

1 ppm = 0.0001% = 1 mg/kg = 1 g/tonne

1 ppm = 1 mg/L

Case report

Peer reviewed

Performance of immunologically castrated pigs at a commercial demonstration farm over 3.5 years

Larry Rueff, DVM; Martha A. Mellencamp, PhD; Lucina Galina Pantoja, DVM, PhD

Summary

A longitudinal study was conducted to evaluate performance and mortality of male pigs following immunological castration with a commercial gonadotropin releasing hormone analog-diphtheria toxoid conjugate (Improvest). Twelve groups of intact male weanling pigs (approximately 250/group) were delivered to a single barn over 3.5 years. Two doses of Improvest were administered subcutaneously, with the first dose given at 10 to 15 weeks of age and the second dose given at 18 to 19 weeks of age. Wean-to-market average daily gain (ADG) among the 12 test groups ranged from 0.83 to 0.99 kg/day (mean, 0.89 kg/day), feed efficiency (FE) ranged from 2.10 to 2.50 (mean, 2.24), and mortality ranged from 1.61% to 7.20% (mean, 3.25%). When lysine levels were increased by approximately 12% (groups 6-12), ADG increased by 6.3% and FE improved by 4.1%. Except for group 7 mortality, performance of all groups surpassed two 2016 industry benchmarks for ADG, FE, and mortality (National Pork Board Top 25% Producers and MetaFarms). Immunologically castrated barrows performed similarly with or without antimicrobial feed additives under these conditions. This study demonstrated that immunological castration delivered consistent high performance and livability that exceeded industry benchmarks.

Keywords: swine, castration, immunological castration, feed efficiency, Improvest

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Resumen - Desempeño de cerdos inmunológicamente castrados en una granja comercial de demostración durante 3.5 años

Se desarrolló un estudio longitudinal para evaluar el desarrollo y mortalidad de cerdos machos después de la castración inmunológica con un conjugado comercial que libera un análogo de la hormona gonadotropina con un toxoide de difteria (Improvest). Doce grupos de machos intactos destetados (aproximadamente 250/grupo) fueron colocados en un solo edificio durante 3.5 años. Se administraron dos dosis subcutáneas de Improvest, la primera dosis se aplicó entre las 10 y 15 semanas de edad y la segunda dosis se aplicó 18 a 19 semanas de edad. La ganancia diaria de peso (ADG por sus siglas en inglés) de destete a sacrificio varió en los 12 grupos entre 0.83 a 0.99 kg/día (media, 0.89 kg/día), la eficiencia alimenticia (FE, por sus siglas en inglés) varió entre 2.1 a 2.5 (media, 2.24), y la mortalidad varió entre 1.61% a 7.20% (media 3.25%). Cuando los niveles de lisina se aumentaron aproximadamente en 12% (grupos 6-12), la ADG aumento en 6.3% y la FE mejoró en un 4.1%. Excepto por la mortalidad del grupo 7, el desempeño de todos los grupos sobrepasó dos evaluaciones comparativas de ADG, FE, y mortalidad (el 25% de los mejores productores del National Pork Board y MetaFarms). Bajo estas condiciones, los machos castrados inmunológicamente se desempeñaron de manera similar con o sin antibióticos en el alimento. Este estudio demostró que la castración inmunológica produjo de manera consistente, alto desempeño y sobrevivencia que sobrepasó las evaluaciones comparativas de la industria.

Résumé - Performances des porcs castrés immunologiquement sur une ferme commerciale de démonstration pendant une période de 3.5 ans

Une étude longitudinale a été menée afin d'évaluer les performances et la mortalité de porcs mâles à la suite de la castration immunologique avec un conjugué commercial d'analogue de l'hormone relâchant la gonadotrophine et de toxoïde de la diphtérie (Improvest). Douze groupes de porcelets mâles intacts (environ 250/groupe) furent livrés à une ferme unique pendant 3.5 ans. Deux doses d'Imrovest furent administrées par voie sous-cutanée, la première dose donnée à 10 à 15 semaines d'âge et la seconde dose donnée 18 à 19 semaines d'âge. Le gain moyen quotidien (ADG) entre le sevrage et la mise en marché parmi les 12 groupes variaient de 0.83 à 0.99 kg/jour (moyenne, 0.89 kg/jour), l'efficacité alimentaire (FE) variait de 2.10 à 2.50 (moyenne de 2.24), et la mortalité variait de 1.61% à 7.20% (moyenne, 3.25%). Lorsque les quantités de lysine furent augmentées par approximativement 12% (groupes 6-12), l'ADG augmenta de 6.3% et la FE s'améliora de 4.1%. À l'exception de la mortalité dans le groupe 7, les performances de tous les groupes ont surpassé deux valeurs repères de 2016 pour l'ADG, la FE, et la mortalité (National Pork Board Top 25% Producers et MetaFarms). Les performances des castrats immunologiques étaient similaires avec ou sans ajout d'antibiotiques dans l'alimentation dans les présentes conditions expérimentales. Cette étude a démontré que la castration immunologique permettait d'obtenir de manière constante d'excellentes performances et une viabilité qui surpasse les valeurs repères de l'industrie.

LR: Swine Veterinary Services, Greensburg, Indiana.

MAM: Outcomes Research, Zoetis, Parsippany, New Jersey.

LGP: Pork Technical Services, Zoetis, Parsippany, New Jersey.

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A growing body of research and field experience has confirmed that immunological castration of male pigs has several advantages compared with physical castration in commercial pork production. The immunological castration agent in greatest use in the United States and worldwide is a synthetic analog of gonadotropin releasing hormone (GnRH) conjugated with diphtheria toxoid (Improvest, Zoetis). Improvest is an FDA-approved, 2-dose, nonhormonal product that is given to intact male pigs to reduce unpleasant odor in the meat. After the second dose, the GnRH analog-conjugate consistently stimulates high levels of antibodies that neutralize endogenous GnRH,[1] the hormone that regulates testicular function and production of testicular steroids. As a result, production and accumulation of the off-odor compounds androstenone and skatole are suppressed in immunized boars, resulting in pork that has improved sensory appeal to consumers. Consumer perception studies have shown that anti-GnRH immunization was 100% and 99% effective in suppressing androstenone and skatole, respectively, below sensory levels.[1] Physically and esthetically, cooked pork from immunologically castrated (IC) barrows has been shown to be no different than meat from gilts or physically castrated (PC) barrows and has superior qualities to meat from intact, sexually normal postpubertal boars.[1-3]

Immunological castration has been shown to consistently improve feed efficiency (FE). By functioning as intact boars until several weeks before marketing then transitioning to physiological castrates following the second anti-GnRH dose, IC barrows grow faster and more efficiently than PC males for the majority of the grow-finish period. Studies conducted in experimental and production settings have shown that, compared to PC pigs, IC counterparts have increased carcass leanness, greater cutting yields, and more efficient feed conversion.[1,4-12] More efficient feed utilization has the potential to contribute to environmental sustainability by reducing the carbon footprint associated with pork production.[13] Immunological castration also avoids animal discomfort, stress, morbidity, mortality, and performance losses associated with physical castration. A meta-analysis found that IC barrows (n = 2197) had a 1.6% lower castration-to-weaning mortality rate (4.1% [0.81% SE] vs 5.7% [1.08% SE]; $P = 0.02$) compared to PC barrows (n = 2196), a 39% relative improvement and a strong indication that immunological castration can contribute to lower pre-weaning death loss.[14] Within a week after the second dose and lasting at least 10 weeks, immunological castration reduces aggressive and sexual behavior in male pigs, minimizing aggression-related skin and carcass lesions.[15] Avoidance of aggression, fighting, and sexual behavior in IC pigs prior to marketing not only contributes to more active eating behavior and greater ADG but avoidance of pre-slaughter environmental and physiological stress responses that result in suboptimal carcass pH associated with poor quality pork.[1]

Most studies demonstrating the advantages of IC have been single experiments performed during one growing period. The purpose of this case report is to share the results of a long-term evaluation (3.5 years) of performance and mortality of IC barrows raised at a single site in the Midwest United States. As this was a real-world production setting, management and nutrition changes occurred over the 3.5 years. The impact of these changes is described.

Case description

The study was conducted at a commercial swine facility in Indiana from January 2014 to July 2017 under the supervision of a licensed veterinarian utilizing management practices specified in the Animal Welfare Act (7 USC 54) and in the Federation of Animal Science Societies' 2010 Guide for the Care and Use of Animals in Research and Teaching. Nursery and finishing rooms each consisted of 10 pens per room. Approximately 25 intact male pigs were housed in each pen. Nursery and finisher pen dimensions were 5.7 × 1.8 m and 6.1 × 2.9 m, respectively. This resulted in 0.42 and 0.71 m^2/pig, respectively. Each room had a computer-controlled tunnel ventilation system with ceiling inlets.

Animals originated from a 400-sow farrow-to-wean herd sired by a PIC line 337 boar. The source herd was negative for porcine reproductive and respiratory syndrome virus (PRRSV). Periodic oral fluids testing confirmed that study pigs were PRRSV-negative for the 3.5-year study duration. Intact, male pigs from a 2-week weaning period (average weaning age was 19-25 days) were obtained from the source herd in consecutive groups of 250 pigs. Upon arrival, all pigs were individually ear tagged, which enabled individual antibiotic treatments to be linked to specific animals. Pigs were housed in the nursery until approximately 51 days after weaning, then moved in an all-in-all-out, wean-to-market pig flow to the finishing room, where they were maintained until marketing.

Husbandry activities were performed by local Future Farmers of America students working in pairs, usually for 4 to 5 months. The students were trained in all areas of swine husbandry and supervised by the attending veterinarian. Each pen was inspected twice daily for animal welfare and functionality of feed and watering systems. All treatment decisions were made by the attending veterinarian. Individual treatments were recorded for each pig. Feed was hand-weighed, and weights recorded by pen to calculate daily feed intake.

Wean-to-finish diets were modified on a stepwise basis by body weight to accommodate the changing nutritional requirements and feed consumption patterns of test pigs and to maximize the production returns associated with anti-GnRH immunization. All diets met National Research Council (NRC) recommendations. Groups 1 to 5 were fed rations formulated according to the 2013 Improvest nutritional guidelines, which recommends lysine at 112% of contemporary PC barrows.[16] Rations for groups 6 to 12 were formulated according to the updated 2014 Improvest nutritional guidelines, which recommends lysine at 125% of contemporary PC barrows.[16] Lysine changes were accompanied by concomitant phosphorus adjustment to maintain calcium to phosphorus ratios consistent with NRC standards. Additional lysine was added to achieve greater lean tissue deposition, optimum fat-to-lean tissue characteristics, and improved cutting yields in IC pigs, as shown in previous studies.[4,17-19] Following the second anti-GnRH dose, dietary lysine was decreased for all groups as immunized pigs assumed barrow-like behaviors and increased their feed consumption.[17]

To control infections, pigs in groups 1 to 7 were given antimicrobial feed additives at therapeutic levels until they reached 50 kg in weight. From weaning to 18 kg, feed contained chlortetracycline (400 g/ton) and tiamulin hydrogen fumarate (35 g/ton). From 19 to 27 kg, feed contained lincomycin hydrochloride (100 g/ton). From

28 to 50 kg, feed contained lincomycin hydrochloride (40 g/ton). Antimicrobial feed medications were discontinued in feed of groups 8 to 12.

On the day of arrival, pigs were vaccinated according to label instructions with a porcine circovirus type 2 and *Mycoplasma hyopneumoniae* combination vaccine (Fostera PCV MH, Zoetis). When clinical signs of infectious disease were evident, pigs were individually treated per label instructions with injectable antimicrobial agents (Draxxin or Excenel, Zoetis). The percentage of pigs in each group that were treated was calculated. The sow farm was routinely monitored for disease by serological and nasal swab diagnostics.

On arrival at the study site, a shipment of 125 weanling pigs was sorted into five pens of 25 pigs each. Pigs were assigned to each pen based on visual assessment of size, from largest to smallest, so that the fifth pen had the 25 smallest pigs. A second shipment of 125 pigs was received a week later and similarly sorted to complete a group of 250 pigs. The procedure was repeated for all 12 groups. Each group consisted of approximately 250 intact male pigs except for groups 3 and 5, which consisted of 80% IC pigs and 20% PC pigs (PC barrow performance is not reported here). Two 2-mL doses of commercial anti-GnRH immunizing agent (Improvest, Zoetis) were administered by subcutaneous injection to all study pigs. The first dose was administered at 10 to 15 weeks of age, followed by the second dose at 18 to 19 weeks of age. The syringe used for administering Improvest was equipped with a manufacturer-provided protective shield that minimized the potential for inadvertent user self-inoculation.

Feed consumption, average daily gain (ADG), and FE were determined for each pen and group at the end of the nursery and finishing periods. Individual pig mortality and group mortality were determined for the nursery and finishing periods and for the overall wean-to-finish period. To monitor variances in production outcomes over time, statistical process control (SPC) charts were used to assess ADG and FE by plotting the average values for each group of IC pigs enrolled during the 3.5-year study using Minitab statistical software (version 17.3.1; Minitab Inc). The software automatically generated mean, upper control limit (UCL), and lower control limit (LCL) values from the input data. The UCL and LCL were 3 sigma units above or below the average value, meaning that 99.73% of the data was located within the control limits. This control-limit range enabled quick identification of marked variances from population norms.

Performance and mortality

Wean-to-market ADG, FE, and mortality outcomes for individual groups and for the entire 12-group test population are shown in Table 1. Average daily gain ranged from 0.83 to 0.99 kg/day (mean, 0.89 kg/day), FE ranged from 2.10 to 2.50 (mean, 2.24), and mortality ranged from 1.61% to 7.20% (mean, 3.25%). Mortality was < 5% for all groups except groups 2 and 11 (5.18% and 7.20%, respectively). There was no single predominant cause for the elevated mortality rates in groups 2 and 11, which experienced pig mortality from various infectious and physical origins.

Groups fed the 125% lysine diets showed consistent improvement in ADG and FE over groups fed the 112% lysine diets (Table 2). The highest ADG (0.99 kg/day, group 6) and best FE (2.10, group 9) were observed in groups fed the 125% lysine diets. The effect of lysine on ADG and FE becomes more convincing considering that the groups with the 5 highest ADG were all fed 125% lysine diets, and the 7 groups (6-12) fed 125% lysine diets had superior FE compared to that of the 5 groups (1-5) fed the 112% lysine diet. Figures 1 and 2 provide visual demonstration that groups 6 to 12 fed the 125% lysine diet had superior FE and ADG compared to groups 1 to 5 fed the 112% lysine diet. The SPC charts show that variances in FE and ADG values from group to group remained within the upper and lower control limits regardless the dietary regimen. The ADG varied within a much narrower range for groups 1 to 5 compared to groups 6 to 12 (Figure 2).

Mortality rates were variable and without apparent associations with lysine concentration in the diet. For example, groups fed a 125% lysine diet had both the highest and lowest mortality rates, 7.20% (group 11) and 0.80% (group 6), and the mean mortality rate in groups 1 to 5 (3.25%) was virtually identical to that for groups 6 to 12 (3.26%). However, pigs fed the antibiotic-free diet (groups 8-12) had a 3.92% mortality rate, which was higher than the overall rate for all other groups, 3.25% (Table 2). Mortality varied depending on production phase (Table 3). Nursery pigs had a 1.89% (57 of 3010 pigs) mortality rate compared to a 1.39% rate for finisher pigs (41 of 2953). Of the dead nursery pigs, 71.93% had been treated with injectable antibiotics compared to 19.51% antibiotic treatment rate of dead finisher-phase pigs. Whereas mortality in nursery pigs almost always occurred in clinically sick animals, 75.6% of finishing pigs (30 of 41) died spontaneously without showing clinical signs or were euthanized due to hernia or lameness.

The antibiotic treatment rate for all nursery groups was 16.41% (494 of 3010 pigs). This figure was skewed upward by the administration of antimicrobials to 100% of the pigs in group 5 to control possible secondary bacterial infection associated with exposure to influenza A virus-swine the week prior to shipment to the study site. When group 5 was excluded, the treatment rate in nursery pigs dropped to 8.81% (243 of 2759 pigs). By the finishing phase, treatment rates for group 5 pigs had moderated and were nearly equivalent to the overall finishing population, 1.19% vs 1.15% (Table 3). Cause of death was not determined.

Discussion

This longitudinal study showed that performance and livability of IC barrows in a commercial production setting was consistent over a 3.5-year period. In most cases, results exceeded 2016 benchmark data compiled by the National Pork Board and MetaFarms (Table 2).[20, 21] Compared to 2016 National Pork Board Top 25% Producer data, pigs in our study had an 11.3% greater ADG, 9.4% better FE, and 60.6% lower mortality. Compared to MetaFarms data, pigs in our study had 20.9%, 14.3%, and 72.9% improvements in ADG, FE, and mortality, respectively. These results reflect the potential impact of consistently applying good husbandry and management practices, including immunological castration.

Removing antimicrobial feed additives from IC barrows in groups 8 to 12 had little effect on ADG, FE and mortality. The comparatively high mortality rate in pigs fed the antibiotic-free diet was due to an unexpected 7.20% death loss in group 11. When group 11 is excluded, the remaining groups fed the antibiotic-free diet had a 3.10% mortality rate, which was less than the 3.25% rate for the overall study population. As expected, additional dietary lysine fed to

Table 1: Wean-to-market performance of immunologically castrated barrows from January 2014 to July 2017

					Dietary regimen	
Group	**No. IC pigs**	**ADG (SD), kg/day**	**FE (SD)**	**Mortality (SD), %**	**Lysine, %**	**Antimicrobials**
1	251	0.86 (0.04)	2.34 (0.03)	1.99 (2.82)	112	Included
2	251	0.83 (0.05)	2.23 (0.07)	5.18 (4.48)	112	Included
3	209*	0.88 (0.03)	2.50 (0.12)	2.72 (3.18)	112	Included
4	255	0.86 (0.04)	2.37 (0.05)	2.35 (3.30)	112	Included
5†	204*	0.86 (0.02)	2.37 (0.08)	3.98 (2.82)	112	Included
6	248	0.99 (0.03)	2.14 (0.11)	0.80 (1.69)	125	Included
7	249	0.93 (0.03)	2.15 (0.07)	2.40 (5.01)	125	Included
8	249	0.88 (0.03)	2.16 (0.09)	4.82 (7.27)	125	Antibiotic-free
9	251	0.87 (0.03)	2.10 (0.04)	2.39 (2.79)	125	Antibiotic-free
10	249	0.96 (0.03)	2.20 (0.06)	1.61 (2.80)	125	Antibiotic-free
11	250	0.87 (0.05)	2.15 (0.07)	7.20 (5.90)	125	Antibiotic-free
12	251	0.91 (0.49)	2.11 (0.05)	3.58 (2.95)	125	Antibiotic-free
All groups	2,917	0.89 (0.05)	2.24 (0.13)	3.25 (1.79)		

* Groups 3 and 5 consisted of 80% IC barrows comingled in pens with 20% physically castrated barrows (data not shown).
† All group 5 pigs received injectable antibiotic therapy on arrival due to a confirmed diagnosis of IAV-S in the sow herd of origin, which created the possibility of viral respiratory disease complicated by bacterial infection.
IC = immunologically castrated; ADG = average daily gain; FE = feed efficiency; IAV-S = influenza A virus-swine.

Table 2: Wean-to-market performance of immunologically castrated barrows segmented by dietary regimen and compared to 2016 US swine industry benchmarks

Group	**ADG (SD), kg/day**	**FE (SD)**	**Mortality (SD), %**
2016 NPB Top 25% Producers[20]	0.79 (0.20)	2.53 (0.19)	5.53 (3.32)
2016 MetaFarms Benchmarking[21]	0.74	2.6	5.62
Groups 1-5: 112% lysine diet	0.86 (0.01)	2.36 (0.09)	3.25 (1.18)
Groups 6-12: 125% lysine diet	0.91 (0.05)	2.14 (0.03)	3.26 (2.17)
Groups 8-12: Antibiotic-free diet	0.90 (0.04)	2.14 (0.04)	3.92 (2.20)
Groups 1-12: All diets	0.89 (0.05)	2.24 (0.13)	3.25 (1.79)

ADG = average daily gain; FE = feed efficiency; NPB = National Pork Board.

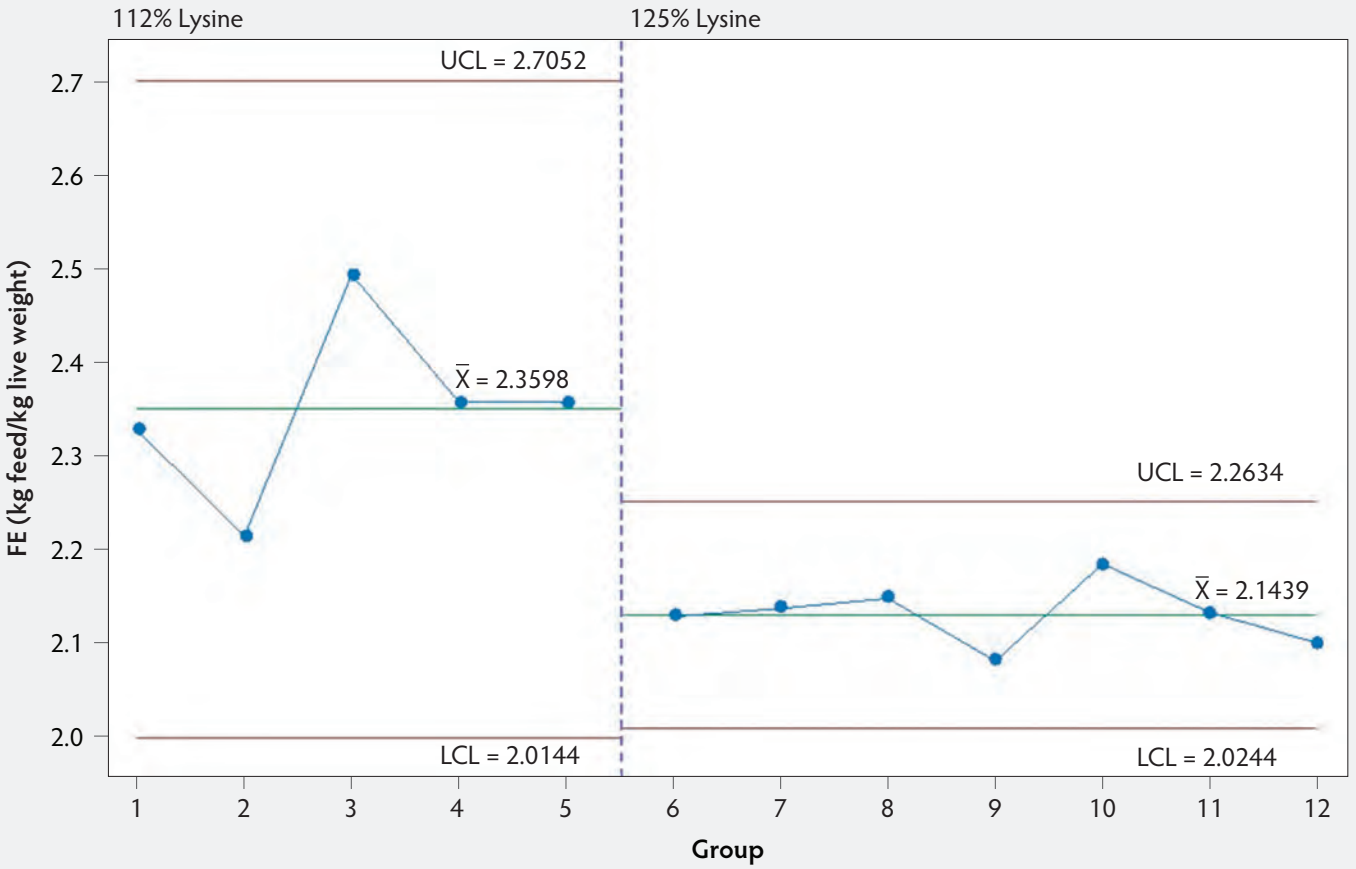
groups 6 to 12 corresponded to improved ADG and FE compared to that for groups 1 to 5. Relatively little data exists on the effect of supplementary lysine fed to intact boars. Results of our study indicate that adjusting dietary lysine is beneficial in a wean-to-finish population of intact, anti-GnRH immunized male pigs.

Individual antimicrobial treatments were followed throughout this 3.5-year study. Because the pigs were individually tagged, it was possible to determine mortality outcomes for treated and non-treated pigs in each of the 12 groups (Table 3). Nearly 3 of 4 nursery pigs that died were individually treated with injectable antibacterial agents, while only 1 of 5 finisher pigs that died were treated. This suggests that finisher pigs died from rapid onset, acute disease that occurred before it could be treated by caregivers. Absence of clinically apparent infectious disease could explain the lower treatment rate in finisher pigs compared to nursery pigs. A more aggressive approach to antibiotic therapy in response to overt clinical signs indicative of infectious disease in the finisher population may have helped reduce the death loss in this group of pigs.

As an alternative to a controlled, experimental study, the demonstration barn provided a real-world setting where variations in husbandry personnel, seasonality, diet, and antibiotic treatment existed. Even under these variable conditions, anti-GnRH immunization resulted in consistent outcomes over an extended, multi-year period.

Statistical process control is a powerful tool for analyzing the effects of management or disease control changes.[22,23] In our case, the management change was additional lysine added to rations of groups 6 to 12. The SPC chart showed improvement in FE after the

Figure 1: Feed efficiency (FE) for each of 12 groups (n = approximately 250 pigs/group) is shown. Groups 1 to 5 were fed diets with 112% lysine; groups 6 to 12 were fed diets with 125% lysine. The chart shows a distinct improvement in FE in groups 6 to 12 (mean 2.36 vs 2.26) The FE trend line remains within the UCL and LCL regardless the diet and does not indicate a sustained upward or downward trend or shift in FE in groups fed either dietary regimen. LCL = lower control limit; UCL = upper control limit; $\overline{X}$ = population mean.



diet change with reduced variation, as shown by narrowed range between the upper and lower control limits. The mean ADG was increased after the diet change and variation also increased. This change was easily observed in the SPC chart because the upper and lower control limits increased.

Anti-GnRH immunization has been commercially available for more than 20 years and is used in more than 60 swine-producing countries worldwide,[24] including extensive use in Australia and New Zealand where the concept of immunological castration originated. The adoption of immunological castration in overseas markets has been driven in part by public opposition to physical castration of pigs, particularly in the European Union, and the desire for productivity gains.[6,17,25] In contrast, anti-GnRH immunization has not been widely adopted in the United States. Survey data and expert opinion suggests that this is due in large measure to lack of consumer awareness of immunological castration and its advantages.[12,26,27] When advised of the benefits of immunological castration, consumers have consistently expressed a high level of acceptance and preference over physical castration, even if pork from IC pigs is more costly.[12,26,27] Ultimately, acceptance of a novel technology, such as immunological castration, involves the agreement of all stakeholders in the pork production chain.

Implications

Under the conditions of this study:

- IC barrows delivered consistent high performance during the 3.5 years.
- Productivity and mortality outcomes in IC pigs were unaffected by antibiotic treatments.
- Feeding IC barrows with 125% lysine diets improved ADG and FE.

Acknowledgments

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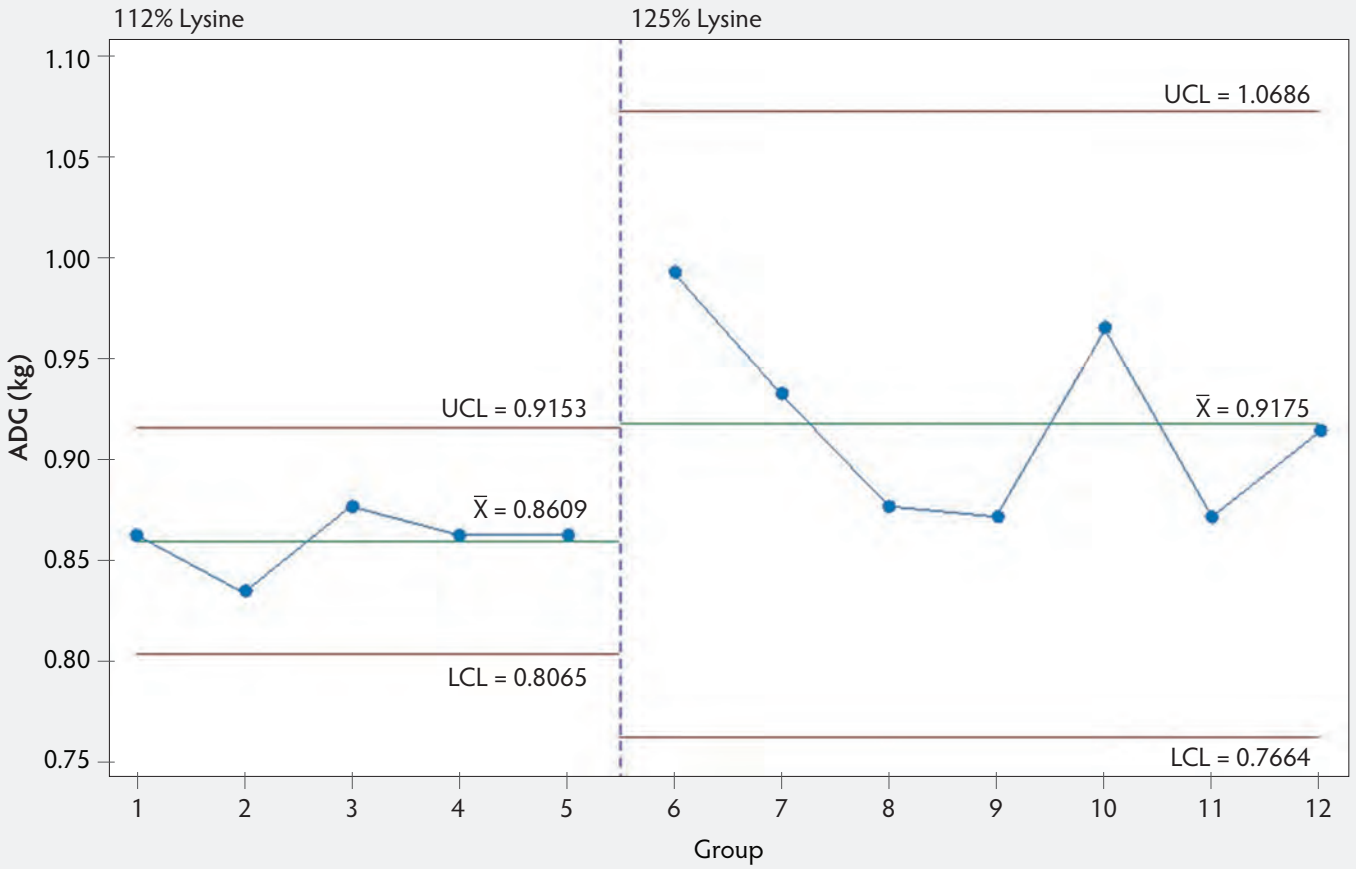
Conflict of interest

Drs Mellencamp and Galina Pantoja are employed by Zoetis. Dr Rueff was compensated by Zoetis for the use of facilities, data collection, and management of the test animals.

Disclaimer

Scientific manuscripts published in the *Journal of Swine Health and Production* are peer reviewed. However, information on medications, feed, and management techniques may be specific to the research or commercial

Figure 2: The average daily gain for each of 12 groups (n = approximately 250 pigs/group) is shown. Groups 1 to 5 were fed diets with 112% lysine; groups 6 to 12 were fed a diet with 125% lysine. The chart shows that groups 6 to 12 had a marked improvement in ADG vs groups 1 to 5 (mean, 2.01 vs 1.89 kg). The ADG trend line remains within the UCL and LCL regardless the diet and does not indicate a sustained upward or downward trend or shift in ADG in the groups fed either dietary regimen. ADG = average daily gain; LCL = lower control limit; UCL = upper control limit; $\overline{X}$ = population mean.



situation presented in the manuscript. It is the responsibility of the reader to use information responsibly and in accordance with the rules and regulations governing research or the practice of veterinary medicine in their country or region.

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Table 3: Injectable antimicrobial treatment rates and mortality outcomes for each group

	Nursery				Finisher			
Group	No. pigs	No. pigs treated (%)	No. dead pigs	No. dead pigs treated (%)	No. pigs	No. pigs treated (%)	No. dead pigs	No. dead pigs treated (%)
1	251	20 (7.97)	3	3 (100.00)	248	1 (0.39)	2	0 (0.00)
2	251	16 (6.37)	8	5 (62.50)	243	9 (3.58)	5	0 (0.00)
3*	255	41 (16.08)	2	2 (100.00)	253	6 (2.35)	5	0 (0.00)
4	255	16 (6.28)	3	0 (0.00)	252	3 (1.17)	3	0 (0.00)
5*	251	251 (100)	5	5 (100.00)	246	3 (1.19)	5	5 (100.00)
6	248	34 (13.71)	1	1 (100.00)	247	1 (0.40)	1	1 (100.00)
7	249	35 (14.06)	5	5 (100.00)	244	3 (1.20)	1	0 (0.00)
8	249	25 (10.04)	6	6 (100.00)	243	4 (1.61)	6	0 (0.00)
9	251	5 (1.99)	3	1 (33.33)	248	1 (0.39)	3	0 (0.00)
10	249	13 (5.22)	3	1 (22.22)	246	1 (0.40)	1	1 (100.00)
11	250	19 (7.60)	13	8 (61.53)	237	1 (0.40)	5	0 (0.00)
12	251	19 (7.57)	5	4 (80.00)	246	1 (0.39)	4	1 (25.00)
1-12	3010	494 (16.41)	57	41 (71.93)	2953	34 (1.15)	41	8 (19.51)
1-4 and 6-12†	2759	243 (8.81)	52	36 (69.23)	2707	31 (1.15)	36	3 (8.33)

* Groups 3 and 5 consisted of 80% immunologically castrated and 20% physically castrated barrows.

† To accurately represent the usual mortality and treatments on this farm, group 5 was excluded because 100% of the pigs received injectable antibiotic therapy on arrival due to a confirmed diagnosis of influenza A virus-swine in the sow herd of origin, which created the possibility of viral respiratory disease complicated by bacterial infection.

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New study: better air quality linked to overall industry improvements, efficiencies

In a much-anticipated study, researchers found that air emissions from North Carolina pig farm lagoons have decreased since research began in 1997. Most notably, ammonia levels have dropped by 22% to 54% in all lagoon types. While this finding is counter to what industry detractors have often asserted, researchers in this Checkoff-funded study scrutinized data from 182 lagoons to reach their final analysis – improvements in feed efficiency and management of swine farms have resulted in decreased nutrient output in manure, which has led to reduced air emissions. In addition, the researchers say data indicate that any overall increase in ammonia deposition in North Carolina over the past 40 years is likely due to increased human population growth, especially since the ammonia trendline continues upward even as the state's pig population has decreased.

For more information, visit **www.pork.org/research** or contact Dr Dave Pyburn at **dpyburn@pork.org** or 515-223-2600.

Secure Pork Supply plan and AgView update

The National Pork Board continues its work to deliver a digital data management solution to support the Secure Pork Supply plan. There have been development delays due to the complexity of the project and the challenge of translating use cases and requirements to software development. However, stakeholder feedback continues to be positive about the intended product.

One of the tools in the AgView system is already operational and in use by all the state animal health officials. Today, they are using the AgView electronic Certificates of Veterinary Inspection, generating 5000 to 6000 certificates a month. The AgView minimum viable product in support of a foreign animal disease response and business continuity is anticipated to be delivered in 2020, so producers should continue to get their sites and records for Secure Pork Supply ready using the Checkoff Secure Pork Supply tools and guidance at **www.securepork.org**.

For more information, contact Dr Patrick Webb at **pwebb@pork.org** or 515-223-2600.

Successful debut of Swine Innovation Summit on global food trends

The industry's first-ever Swine Innovation Summit was held recently in Indianapolis. At this conference, which was one day ahead of the Forbes Ag Tech conference, participants learned how the US pork industry is adapting in a dynamic production environment. The event included the role technology plays in food production and consumer information and how entrepreneurs are assessing the trillion-dollar food market.

At the end of the summit, 5 entrepreneurs presented their products to the audience and a critique panel. Two of these went on to present in the Forbes event and eventually went on to both win the top prize. Forbes and SVG Ventures announced SwineTech, an Iowa-based startup, and BinSentry a Canadian-based startup as winners of the THRIVE Midwest Challenge and recipients of the 2019 THRIVE-Forbes Innovation Icon Award at the Forbes AgTech Summit in Indianapolis. Learn more by visiting **www.pork.org**.

Pork Checkoff moving remittance payments into online system

The National Pork Board is moving Pork Checkoff remittances to its online platform by November 1, 2019. The online Checkoff remittance system will provide pork producers flexibility with payment options, increase transparency, and will reduce Checkoff administrative costs by $150,000. Producers not currently using the system will need to register before they can begin using the secure system at **www.pork.org/pay** or call 800-456-7675 to sign up.

NPB news continued on page 331

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NPB news continued from 329

Board approves moving forward with new Checkoff 4.0 strategic vision

In a board meeting earlier this fall, the National Pork Board's directors unanimously approved the general process and priorities for Checkoff staff to begin necessary work in support of the new strategic vision. The approval directs the entire organization to align staff to assess and define priorities, work, and budgets. This includes developing specific work objectives, key performance indicators, and budget.

Pork Checkoff restructuring

- The National Pork Board of Directors is close to finishing a major restructuring of the Pork Checkoff based on input from over 1000 producers and allied industry members this spring.
- One fundamental change involves the Board's decision to move away from 5-year planning cycles, programs, and committees into an agile business model built around annual planning, project-based work, and task forces focused on short- and long-term priorities. Task forces built around industry priority projects have a beginning and an end and are driven to outcomes focused on time, scope, and budget.
- The Board recognizes the Pork Checkoff must move at the speed of business to be relevant and must align and collaborate with allied industry organizations to maximize effectiveness of research, promotion, and education spending.
- In addition, the Pork Checkoff has been hiring employees who have robust for-profit business experience to better serve business-minded pork producers. In the past 24 months we have hired people with experience working at JBS, McDonalds, Zoetis, Hormel, Monsanto, Tyson, Bloomin' Brands, Smithfield, Corteva, and Kroger. These people know what it takes to hit a production, business, or sales target.
- The new organization structure will go live on January 1, 2020.

For more information, please contact Bill Even at **beven@pork.org** or 515-223-2600.

Register now for annual sustainability summit

The Pork Checkoff will take part in the 2019 Sustainable Agriculture Summit, November 20-21, in Indianapolis. The annual summit is titled Accelerating Progress: A Roadmap for Sustainable Agriculture and will draw more than 500 food and agriculture supply chain leaders to explore key drivers in defining and advancing sustainability across the industry. This year's speakers include MC Corby Kummer, senior editor at *The Atlantic*; Zach Johnson and Mitchell Hora, farmers and hosts of American Public Media's FieldWork—a podcast; and Amanda Little, professor and author of *The Fate of Food*.

To register or learn more, visit **sustainableagsummit.usdairy.com** or contact Dr Brett Kaysen at **bkaysen@pork.org** or 515-223-2600.

Pig Welfare Symposium 2019 set for November 13-15

The Pig Welfare Symposium (PWS) 2019, presented by the National Pork Board, will take place on November 13-15, in Minneapolis. Featuring a stellar lineup of speakers, PWS 2019 will be an interactive forum to discuss recent research, share ideas, learn from other industry segments and identify potential solutions for animal welfare issues. You can see the daily agenda at **www.pork.org/wp-content/uploads/2017/08/2019-agenda.pdf**.

Registration to attend onsite is still open, but you may also participate virtually if you cannot travel to Minneapolis. Visit **www.pork.org/pws** for more information and to register. All presentations, including the Thursday breakout sessions, will be live-streamed and virtual attendees will be able to ask questions and participate in discussions. Each virtual attendee will receive an email with links to join PWS 2019. It's important to note that these links are unique to you and are not transferable. You also will receive a separate email with a .pdf file of the meeting proceedings.

For more information, contact Dr Sara Crawford at **scrawford@pork.org** or 515-223-2790.

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AASV awards nominations due December 15

Do you know an AASV member whose dedication to the association and the swine industry is worthy of recognition? The AASV Awards Committee would like your help in identifying members who are well deserving of this "pat on the back." We would love to hear from you if you have nominations for the following five awards to be presented at the AASV Annual Meeting in Atlanta.

Howard Dunne Memorial Award – Given annually to an AASV member who has made a significant contribution and rendered outstanding service to the AASV and the swine industry.

Meritorious Service Award – Given annually to an individual who has consistently given time and effort to the association in the area of service to the AASV members, AASV officers, and the AASV staff.

Swine Practitioner of the Year – Given annually to the swine practitioner (AASV member) who has demonstrated an unusual degree of proficiency in the delivery of veterinary service to his or her clients.

Technical Services/Allied Industry Veterinarian of the Year – Given annually to the technical services or allied industry veterinarian who has demonstrated an unusual degree of proficiency and effectiveness in the delivery of veterinary service to his or her company and its clients as well as given tirelessly in service to the AASV and the swine industry.

Young Swine Veterinarian of the Year – Given annually to a swine veterinarian who is an AASV member, 5 years or less post-graduation, who has demonstrated the ideals of exemplary service and proficiency early in his or her career.

Nominations are due December 15. The nomination letter should specify the award and cite the qualifications of the candidate for the award. Submit to: AASV, 830 26th Street, Perry, Iowa 50220, Email: **aasv@aasv.org**.

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FOUNDATION NEWS

Up to $60,000 research funding available; proposals due January 17

As part of its mission to fund research with direct application to the profession, the American Association of Swine Veterinarians Foundation is accepting research proposals to be considered for funding in 2020. Proposals are **due January 17, 2020** and may request a maximum of $30,000 per project. Up to $60,000 will be awarded across two or more projects. The announcement of projects selected for funding will take place at the AASV Foundation Luncheon in Atlanta, Georgia on Sunday, March 8, 2020. Awardees will be notified in advance.

Proposed research should fit one of the five action areas stated in the AASV Foundation mission statement (see sidebar).

The instructions for submitting proposals are available on the AASV Foundation website at **aasv.org/foundation/2020/research.php**. Proposals may be submitted by mail or email (preferred).

A panel of AASV members will evaluate and select proposals for funding, based on the following scoring system:

- Potential benefit to swine veterinarians/swine industry (40 points)
- Probability of success within timeline (35 points)
- Scientific/investigative quality (15 points)
- Budget justification (5 points)
- Originality (5 points)

A summary of the research funded by the foundation over the past 13 years is available at **aasv.org/foundation/research**.

For more information, or to submit a proposal:

AASV Foundation
830 26th Street
Perry, IA 50220-2328
Tel: 515-465-5255
Fax: 515-465-3832
Email: **aasv@aasv.org**

AASV Foundation Mission Statement

The mission of the AASV Foundation is to empower swine veterinarians to achieve a higher level of personal and professional effectiveness by:

- enhancing the image of the swine veterinary profession
- supporting the development and scholarship of students and veterinarians interested in the swine industry
- addressing long-range issues of the profession
- supporting faculty and promoting excellence in the teaching of swine health and production
- funding research with direct application to the profession

Debt relief scholarship available to young practitioners

For the second year, the AASV Foundation will award a $5000 scholarship to an AASV member engaged in private practice who is between 2 and 5 years post-graduation from veterinary school and who carries a significant student debt burden.

The scholarship was initiated with a $110,000 contribution to the foundation by the Conrad Schmidt and Family Endowment. Dr Schmidt, a charter member of AASV, explained, "Together, Judy and I noticed that many new DVM graduates interested in swine medicine begin their professional life with heavy educational debt obligations. It is our desire to help AASV members who have dedicated their professional skills to swine herd health and production. We hope that this endowment will grow over time to assist in reducing the educational debt load of AASV members as they begin their professional journeys."

The Schmidts also expressed their hope that the contribution will prompt additional donors to join them in the effort to reduce the debt load of young veterinarians by endowing similar scholarships for other sectors of the profession such as corporate practice, technical services, and academia.

Applications are being accepted through January 31 for the scholarship to be awarded during the AASV Annual Meeting in Atlanta, Georgia. The application form is available at **aasv.org/foundation/debtrelief.php**. The following criteria will be used to select the scholarship recipient:

1. Joined AASV as a student enrolled in an AVMA-recognized college of veterinary medicine.
2. Attended the AASV Annual Meeting as a student.
3. Maintained continuous membership in AASV since graduation from veterinary school.
4. Is at least 2 years and at most 5 years post-graduation from veterinary school.
5. Has been engaged in private veterinary practice, 50% or more devoted to swine, providing on-farm service directly to independent pork producers. Veterinarians who work for production companies, pharmaceutical companies, or universities are not eligible for this scholarship.
6. Has a significant student debt burden.

For more information, contact the AASV Foundation by email, **aasv@aasv.org**, or phone, 515-465-5255.

Swine veterinarians invited to apply for Hogg Scholarship

The American Association of Swine Veterinarians Foundation is pleased to offer the Hogg Scholarship, established to honor the memory of longtime AASV member and swine industry leader Dr Alex Hogg. Applications for the $10,000 scholarship will be accepted until January 31, 2020, and the scholarship recipient will be announced on Sunday, March 8 during the Foundation Luncheon at the AASV 2020 Annual Meeting in Atlanta, Georgia.

The intent of the scholarship is to assist a swine veterinarian in his or her efforts to return to school for graduate education (resulting in a master's degree or higher) in an academic field of study related to swine health and production. Twelve swine practitioners, recognized at **aasv.org/foundation/hoggscholars**, have been awarded this prestigious scholarship since it was established in 2008.

Dr Alex Hogg's career serves as the ideal model for successful applicants. After twenty years in mixed animal practice, Dr Hogg pursued a master's degree in veterinary pathology. He subsequently became a swine extension veterinarian and professor at the University of Nebraska. Upon "retirement," Dr Hogg capped off his career with his work for MVP Laboratories. Always an enthusiastic learner, at age 75 he graduated from the Executive Veterinary Program offered at the University of Illinois.

Hogg Scholarship Application Requirements

An applicant for the Hogg Scholarship shall have:

1. Three or more years of experience as a swine veterinarian, either in a private practice or in an integrated production setting
2. Five or more years of continuous membership in the American Association of Swine Veterinarians

Applicants are required to submit the following for consideration as a Hogg Scholar:

1. Current curriculum vitae
2. Letter of intent detailing his or her plans for graduate education and future plans for participation and employment within the swine industry
3. Two letters of reference from AASV members attesting to the applicant's qualifications to be a Hogg Scholar

The scholarship application requirements are also outlined on the AASV website at **www.aasv.org/foundation/hoggscholarship**.

Applications and requests for information may be addressed to:

AASV Foundation
830 26th Street
Perry, IA 50220
Tel: 515-465-5255
Email: **aasv@aasv.org**

Veterinary students: Apply for $5000 scholarships by December 31

The AASV Foundation and Merck Animal Health are pleased to announce the continuation of the AASVF-Merck Animal Health Veterinary Student Scholarship Program. Ten $5000 scholarships will be awarded to sophomore and junior veterinary students in 2020. Now in its fifth year, the program seeks to identify future swine veterinarians and assist with their educational expenses. Applications are due December 31, 2019 for scholarships that will be announced at the 2020 AASV Annual Meeting.

Second- and third-year veterinary students enrolled in AVMA-accredited or -recognized colleges of veterinary medicine in the United States, Canada, Mexico, South America, or the Caribbean Islands are eligible to apply. All applicants must be current (2019-2020) student members of AASV. Students who have previously been awarded one of the scholarships are not eligible to reapply.

To apply, students submit a resume and the name of a faculty member or AASV member to serve as a reference, along with written answers to 4 essay questions. The application and instructions are available at **aasv.org/foundation/2020/AASVF-MerckApplication.pdf**.

A committee of 4 conducts the selection process. Two AASV Foundation board members and 2 AASV members-at-large rank the applicants by scoring their past and current activities, level of interest in swine veterinary medicine, future career plans, and financial need. The scholarship recipients will be announced during the 2020 AASV Annual Meeting in Atlanta, Georgia, and the scholarship funds will be disbursed after the conference.

The AASVF-Merck Animal Health Veterinary Student Scholarship Program is part of how Merck Animal Health and the AASV Foundation fulfill a shared mission of supporting the development and scholarship of students and veterinarians. For more information on scholarships and other AASV Foundation programs, see **www.aasv.org/foundation**.

Students eligible for $500 externship grants

Veterinary students, are you planning an externship focusing on swine practice? Take note: the AASV Foundation reimburses up to $500 in expenses incurred by students who complete a 2-week or longer externship in a swine practice or a mixed practice with a considerable swine component. Any AASV student member in veterinary school who fulfills the requirements is eligible to apply. More information can be found at **aasv.org/students/externgrant.htm**

Student members of AASV have access to a database of swine-oriented internship and externship opportunities, found at **aasv.org/internships/index.php**.

AASV members who would like their internship and externship opportunities included in this directory (or updated) are encouraged to contact Jamie Madigan, AASV student delegate (**aasvstudentdelegate@gmail.com**) for more information.

It doesn't get any better than this

"What a beautiful day!" was the remark on everyone's lips throughout the afternoon of the AASV Foundation's annual golf fundraiser, held August 22 at Veenker Memorial Golf Course in Ames, Iowa. The new AASV executive director, Dr Harry Snelson, took full credit for arranging the picture-perfect day. This was Dr Snelson's first appearance at the event, which is now in its 21st year.

Regardless of its source, the delightful, cool, dry weather kept golfers' smiles wide and spirits high as they navigated the 18-hole course in the best-ball contest. Fifty-one golfers on 13 teams competed for top team honors, which ultimately went to the foursome of Jeff Okones, Matt Sexton, Paul Skartvedt, and Doug Wirth, hosted by Boehringer Ingelheim Animal Health.

Second place was claimed by Nick Knute, Whitney Lincoln, Eric Weaver, and Mark Weaver on the Feed Energy team. Last year's championship team, AMVC, took third place this year through the combined efforts of Josh Ellingson, Jason Hocker, Troy Kellner, and Nick Weihs.

Regardless of their placings, golfers enjoyed an afternoon filled with contests, drawings, and giveaways as they made their way around the course, thanks to generous support from sponsors. Thirteen companies chipped in to provide financial support for the outing in the form of beverage, lunch, dinner, and golf hole sponsorships. Besides adding to the enjoyment of the participants, their support increased the event's profitability for the foundation.

The proceeds from the annual golf outing support a variety of foundation programs, including scholarships, research grants, travel stipends for veterinary students to attend the annual meeting, tuition support for the Swine Medicine Education Center, swine externship grants for veterinary students, and more. This year's event raised over $14,000.

As usual, the event concluded with the awards dinner sponsored by Boehringer Ingelheim Animal Health. The golf outing coordinator, Dr Josh Ellingson, announced the team and individual contest winners as follows:

First flight

First place team hosted by Boehringer Ingelheim Animal Health (score of 61): Jeff Okones, Matt Sexton, Paul Skartvedt, and Doug Wirth

Second place team hosted by Feed Energy (score of 65): Nick Knute, Whitney Lincoln, Eric Weaver, and Mark Weaver

Third place team hosted by AMVC (score of 68): Josh Ellingson, Jason Hocker, Troy Kellner, and Nick Weihs

Second flight

First place team hosted by Aurora Pharmaceutical (score of 70): Gale Brinkman, Mark Brinkman, Jim Murray, and Grant Weaver

Second place team hosted by Merck Animal Health (score of 71): Mike Bauer, Jack Creel, Michelle Sprague, and Steve Sprague

Third place team hosted by Merck Animal Health (score of 72): Kimberly Crawford, Trevor Schwartz, Ethan Spronk, and Amber Stricker

Third flight

First place team hosted by Cambridge Technologies (score of 73): Jon Mahlberg, Nate Mahlberg, Danielle McKeown, and Doug Stine

The team hosted by Boehringer Ingelheim Animal Health took top honors at this years' AASV Foundation Golf Outing. Left to right: Doug Wirth, Matt Sexton, Jeff Okones, and Paul Skartvedt.

Photo by Andrew Kleis, courtesy of Insight Wealth Group.

Foundation news continued on page 339

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[1]Trials 1-5 - Nemechek, J. E. 2014. Effects of Pelleting and Dietary Fat and Fiber Levels on Pig Growth and Fat Quality (Doctoral Dissertation). Kansas State University, Manhattan, KS.
[2]Trials 6-10 - References available upon request.
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Foundation news continued from page 337

The second place team was hosted by Feed Energy. Left to right: Mark Weaver, Whitney Lincoln, Nick Knute, and Eric Weaver.

Photo by Andrew Kleis, courtesy of Insight Wealth Group.

The team hosted by AMVC took third place at this years' AASV Foundation Golf Outing. Left to right: Nick Weihs, Troy Kellner, Jason Hocker, and Josh Ellingson.

Photo by Andrew Kleis, courtesy of Insight Wealth Group.

Second place team (score of 74): Bo Ivers, Daryl Hammer, and Curtis Stutheit

Third place team (score of 74): Dan Little, Dan Rosener, and Rick Sibbel

Individual contests

Hole #1, **Longest drive:** Nick Weihs

Hole #9, **Longest putt:** Trevor Schwartz

Hole #9, **Longest drive:** Tom Marsteller

Hole #11, **Closest to pin:** Roy Edler

Hole #13, **Closest to pin:** Mark Weaver

Hole #13, **Closest to pin:** Tom Grady

Hole #16, **Closest in 3 shots:** Matt Sexton

Hole #18, **Drawing for cooler:** Jack Creel

Thank you!

The AASV Foundation appreciates the support of the following companies who "chipped in" to sponsor the AASV Foundation Golf Outing. Their financial support, in addition to the contests, drawings, and giveaways they provided for the golfers, helped make the event profitable for the foundation as well as fun for the participants.

DINNER SPONSOR
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National Pork Producers Council

Pharmgate Animal Health

Phibro Animal Health

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2020: A Vision for the Future!

In 2019 we celebrated AASV's 50th year since its founding. It was a great celebration and a chance to look back, enjoy the accomplishments, reminisce, and honor those who have gone before to make it all possible. Now as we plan for 2020, it is time to look to the future and the next 50 years! Dr Jeff Harker has selected "**2020: A Vision for the Future**" as the theme of the 51st AASV Annual Meeting to be held in Atlanta, Georgia, March 7-10, 2020.

The AASV Foundation was established in 1988 with a vision for the future, anticipating the need to set aside funds to expand and further the work and mission of our association. Since the founding of our Foundation, the vision and mission has continued to expand. Here is just a partial list of how our foundation is impacting the mission of AASV:

- Administers endowments for the Howard Dunne and Alex Hogg Memorial Lectures
- Administers the Hogg Scholarship for deserving AASV member veterinarians pursuing advanced degrees
- Administers funding for veterinary student scholarships
- Provides funding for AASV members pursuing board certification in the American College of Animal Welfare
- Cosponsors travel stipends for veterinary students to attend the AASV Annual Meeting
- Provides grants to supplement veterinary student swine-related externships
- Administers funding for important research with direct application and benefits to our profession and swine health
- Provides support for the awesome Heritage videos
- Provides tuition support for veterinary students to attend the Swine Medicine Education Center to encourage the development of skills related to swine health and production
- Administers and supports the AASV Member Student Debt Relief Scholarship funded through the Conrad Schmidt and Family Endowment

As you can see, the Foundation is always striving to fulfill its goal to ensure our future and create a legacy.

The mission of the American Association of Swine Veterinarians Foundation is to empower swine veterinarians to achieve a higher level of personal and professional effectiveness by:

- enhancing the image of the swine veterinary profession,
- supporting the development and scholarship of students and veterinarians interested in the swine industry,
- addressing long-range issues of the profession,
- supporting faculty and promoting excellence in the teaching of swine health and production, and
- funding research with direct application to the profession.

While the foundation's level of total endowed funds has grown each year, the ongoing use of funds for our many yearly investments in fulfilling the mission requires that we continue to encourage annual gifts. A great way for all members to contribute has been through proceeds from the annual meeting live and silent auctions. The auctions have become an integral part of the AASV Annual Meeting, thanks to the many donors and, of course, to all of you, the bidders!

Donate auction items by December 1

The Auction Committee is now reaching out to potential donors to solicit auction items or cash donations for this year's auction, but please feel free to contact any member of the committee if you would like to support the auction this year. If you have questions or just want to discuss possibilities, please contact one of the committee members listed at **aasv.org/foundation/2020/auctioninfo.php**. Download the donation form at **aasv.org/foundation/2020/Donationform.pdf** and submit a description and image of your item(s) **by December 1, 2019.** Your contribution will be recognized in the printed auction catalog as well as on the auction website, and your name will appear in the JSHAP full-page spread recognizing all our auction item donors. If that's not enough, there's a good chance you may read about your donation in the AASV e-Letter!

Just remember:

> *"If you don't have a vision for the future, then your future is threatened to be a repeat of the past."*
>
> — A. R. Bernard

Phibro offers $25,000 match for endowed contributions

Donors, take note: Phibro Animal Health Corporation will match up to $25,000 of endowed contributions made by AASV members in 2019!

Over the past 3 years, Phibro has contributed $75,000 as part of its 4-year pledge to the AASV Foundation. This is the fourth and final year for the matching funds to be available, so the foundation is calling upon its supporters to make sure the full value of the match is achieved.

Contributions from AASV members to the Leman, Heritage, and Legacy programs are endowed and count towards the match total. If you have not already become a Leman, Heritage, or Legacy donor, now is the time to make the most of your contribution by donating towards one of these programs before the end of the year.

For details on how to become a Leman ($1000), Heritage ($5000+), or Legacy ($50,000) donor, see **www.aasv.org/foundation**, or contact the AASV Foundation by email, **aasv@aasv.org**, or phone, 515-465-5255.

Schoneweis family establishes scholarship

The children of the late Dr David Schoneweis have established a scholarship in his memory to benefit swine-interested veterinary students from Kansas State and Oklahoma State Universities. The inaugural $1000 David A Schoneweis Memorial Scholarship will be awarded during the Monday luncheon at the 2020 AASV Annual Meeting in Atlanta, Georgia.

The scholarship was established through a $25,000 gift from the Schoneweis estate combined with an additional $1055 contributed by other donors in memory of Schoneweis.

Dr Schoneweis was born in Clay Center, Kansas, and earned his DVM degree from Kansas State University in 1956. He served two years in the Army Veterinary Corps before teaching clinical sciences at Oklahoma State University for six years. After two years in private practice in Lawrence, Kansas, he joined the Kansas State University College of Veterinary Medicine faculty in 1966, where he received his master's degree in Surgery and Medicine in 1971 and taught food animal medicine for 30 years.

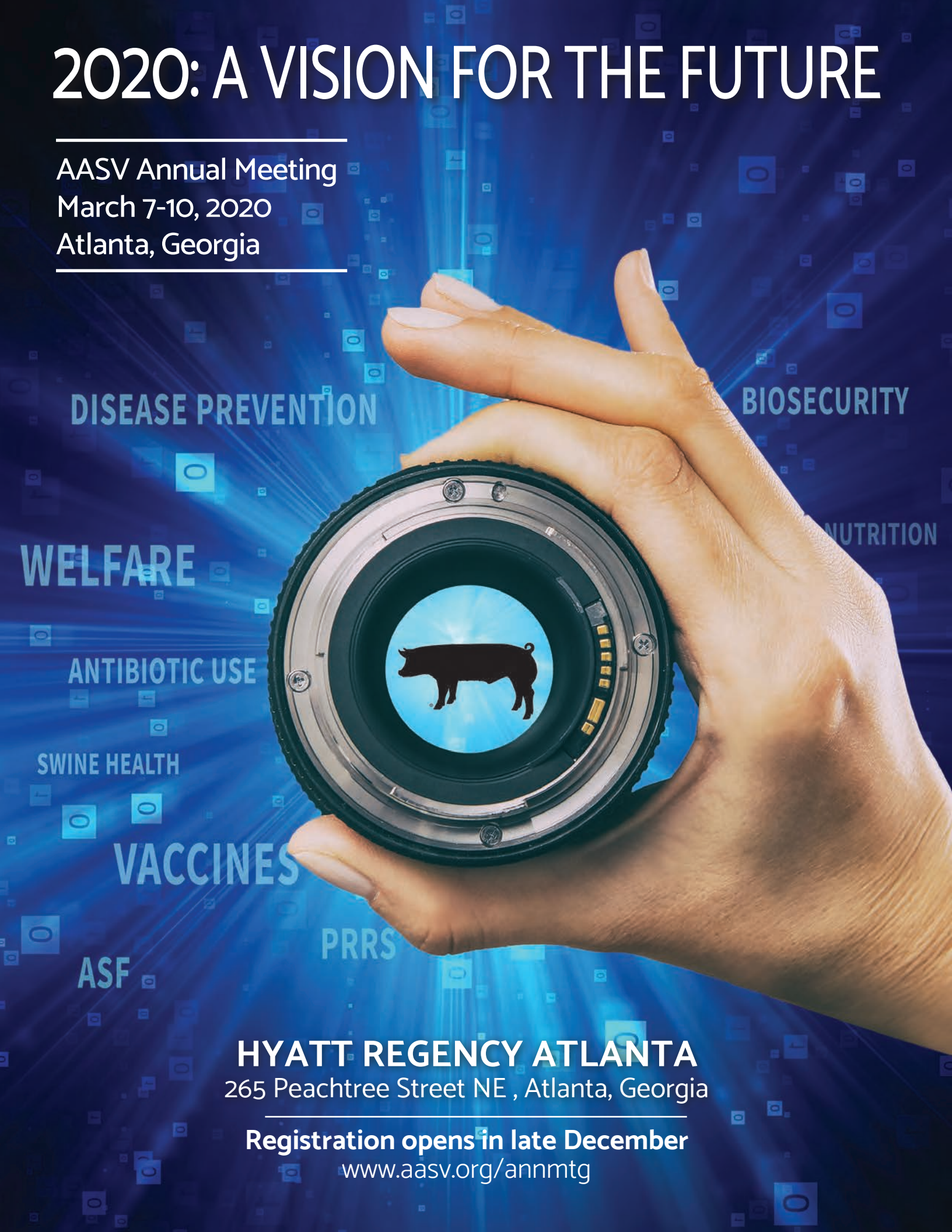
Dr Schoneweis was a charter member of the American Association of Swine Practitioners (AASP) and served on the association's Board of Directors in the late 1970s and early 1980s. In 1997, he received the AASP Meritorious Service Award for his lifetime of support for the association and in recognition of his work with students as a professor of food animal medicine at Kansas State and Oklahoma State Universities.

The scholarship will be awarded to a student or students from Kansas State or Oklahoma State who participate in the student oral or poster presentations at the meeting, based upon a selection rubric prepared with the oversight and approval of the Schoneweis family. Qualifying students will automatically be considered for the scholarship, and do not need to submit a separate application.

Dr Schoneweis was a charter member of the American Association of Swine Practitioners and served on the association's Board of Directors in the late 1970s and early 1980s.

2020: A VISION FOR THE FUTURE

AASV Annual Meeting
March 7-10, 2020
Atlanta, Georgia



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www.aasv.org/annmtg

2020 ANNUAL MEETING PROGRAM

AASV's 51st Annual Meeting

March 7-10, 2020
Atlanta, Georgia

2020: A VISION FOR THE FUTURE

SATURDAY, MARCH 7

8:00 AM
Entrance examination: American Board of Veterinary Practitioners, Swine Health Management

Pre-conference seminars

1:00 PM – 5:00 PM

Seminar #1	Why Didn't I Think of That?! Practice Tips for the Porcine Practitioner *Tyler Bauman, chair*
Seminar #2	Media Training *Mary Battrell, chair*
Seminar #3	Emerging Technologies for the Swine Industry *Chris Rademacher and Dale Polson, co-chairs*
Seminar #4	Conducting Effective Outbreak Investigations: Learning from Our Mistakes, Part 2 *Derald Holtkamp, chair*
Seminar #5	#ImNewAtThis *Shamus Brown, chair*
Seminar #6	What's Your Diagnosis? *Deborah Murray, chair*

SUNDAY, MARCH 8

Pre-conference seminars

8:00 AM – 12:00 PM

Seminar #7	Pigs are Easy; People are Hard *Ross Kiehne, chair*
Seminar #8	Sow Productivity: A Vision for the Future *Matthew Turner, chair*
Seminar #9	Ahhchoo! Discussions about How to Succeed against the Flu *Amy Maschhoff, chair*
Seminar #10	Swine Medicine for Students *Jeremy Pittman and Angela Supple, co-chairs*
Seminar #11	Foreign Animal Disease *Brent Pepin, chair*

Research Topics

8:00 AM – 12:00 PM
Session chair: Chris Rademacher

8:00 AM	Effect of two PRRS MLV doses compared to a single dose vaccination program on the wild-type virus shedding and mortality of growing pigs from endemic sources *Cesar Moura*
8:15 AM	Swine fecal samples contain ELISA-detectable antibodies against PRRSV *Alexandra Henao-Diaz*
8:30 AM	Use of an adapted commercial serum antibody enzyme-linked immunosorbent assay (ELISA) for the detection of anti-PRRSV antibody isotypes in processing fluid specimens *Will Lopez*
8:45 AM	Increasing the functionality of your processing fluid toolbox beyond PRRSV monitoring: PCV2, PEDV, and PDCoV *Giovani Trevisan*
9:00 AM	Estimating the sensitivity of two sample types for detection of *Mycoplasma hyopneumoniae* early and late after experimental and natural infection *Amanda Sponheim*

9:15 AM	Development of cost-effective surveillance protocols to minimize the risk of *Mycoplasma hyopneumoniae* introduction to sow farms *Alyssa Betlach*
9:30 AM	Impact of using nurse sows or custom-made vaccines in the occurrence of influenza A in pigs prior to weaning *Jorge Garrido Mantilla*
9:45 AM	REFRESHMENT BREAK
10:15 AM	Persistent atypical porcine pestivirus (APPV) infection in gilts *Alexandra Buckley*
10:30 AM	Efficacy of an inactivated Seneca Valley virus vaccine in pregnant sows *Alexandra Buckley*
10:45 AM	Pseudorabies virus (PRV) antibody detection in swine serum and oral fluid specimens *Ting-Yu Cheng*
11:00 AM	Susceptibility of attenuated *Salmonella* vaccines intended for swine to zinc oxide *in vitro* *Eric Burrough*
11:15 AM	Candidate virulence-associated genes identified by genome analysis of *Streptococcus suis* strains from the United States *April Estrada*
11:30 AM	Importance of capsular immunity in protection against *Glaesserella parasuis* *Samantha Hau*
11:45 AM	Scoring lesions in slaughtered pigs through artificial intelligence technology: the first extensive investigation *Abigail Trachtman*
12:00 PM	Session concludes

Poster session: Veterinary Students, Research Topics, and Industrial Partners

12:00 PM – 5:00 PM

Poster authors present from 12:00 PM to 1:00 PM
Poster display continues on Monday, 9:00 AM to 5:00 PM

Concurrent sessions

1:00 PM – 5:15 PM

Session #1	**Student Seminar** *Andrew Bowman and Perle Zhitnitskiy, co-chairs*
Session #2	**Industrial Partners** *Todd Distad, chair*
Session #3	**Industrial Partners** *Taylor Engle, chair*
Session #4	**Industrial Partners** *Megan Potter, chair*

MONDAY, MARCH 9

General Session
2020: A Vision for the Future

8:00 AM – 12:15 PM
Program and Session chair: Jeff Harker

8:00 AM	**Howard Dunne Memorial Lecture** Trust the people *Bret Marsh*
9:00 AM	**Alex Hogg Memorial Lecture** Choosing a pathway forward in practice *Bill Hollis*
10:00 AM	REFRESHMENT BREAK
10:30 AM	Current and future vision of swine medicine education *Locke Karriker*
11:00 AM	A vision for the future of global markets *Steve Meyer*
11:30 AM	Reset to positive *Betsy Charles*
12:15 PM	LUNCHEON

Concurrent Session #1: Disease Control, Prevention, and Elimination

2:00 PM – 5:30 PM
Session chair: Paul Thomas

2:00 PM — Field experiences managing PRRS through control, elimination, and prevention
Kylie Glisson

2:30 PM — Which route of exposure is best for *Mycoplasma hyopneumoniae* gilt acclimation?
Ana Paula Poeta Silva

2:50 PM — Are we there yet? The future of bacterial pathogen surveillance
Maria Jose Clavijo

3:10 PM — A practitioner's perspective of managing bacterial pathogens
Brad Leuwerke

3:40 PM — REFRESHMENT BREAK

4:10 PM — Field experiences with rotavirus-caused piglet diarrhea
Attila Farkas

4:30 PM — Ileitis prevention and elimination: we have the tools!
Nathan Winkelman

5:00 PM — Batch farrowing for disease control
Clayton Johnson

5:30 PM — Session concludes

Concurrent Session #2: Biosecurity

2:00 PM – 5:30 PM
Session chair: Andrea Pitkin

2:00 PM — African swine fever response scenarios in Europe: effective strategies for control and eradication
Tim Snider

2:15 PM — African swine fever "top 5" biosecurity strategies and considerations
Clayton Johnson

2:30 PM — Survival and transmission of foreign animal diseases in feed
Megan Niederwerder

2:45 PM — What's new with feed mitigation?
Scott Dee

3:00 PM — Applying biosecurity to the feed supply chain
Cassandra Jones

3:15 PM — Efficacy of ultraviolet C disinfection for inactivating Senecavirus A on contaminated surfaces commonly found on swine farms
Derald Holtkamp

3:30 PM — REFRESHMENT BREAK

4:00 PM — Day-to-day transport biosecurity: the real world
Mike Eisenmenger

4:13 PM — Transportation biosecurity: dos and don'ts from a breeding stock company perspective
Jean Paul Cano

4:25 PM — Biosecurity lessons learned and action steps to reduce the risks associated with live animal transport
Amy Maschhoff

4:39 PM — Transportation speaker panel: Question and answer roundtable
Mike Eisenmenger, Jean Paul Cano, and Amy Maschhoff

4:50 PM — Evaluation of a staged loading procedure for the loadout of market pigs to prevent the transfer of swine pathogen-contaminated particles from livestock trailers to the barn
Chelsea Ruston

5:05 PM — Pathogens in groundwater: entry, prevalence, distribution, long-term viability, testing, and remediation
Phil Olsen

5:30 PM — Session concludes

Concurrent Session #3: Pharmaceutical Issues

2:00 PM – 5:30 PM
Session chair: Eugene Nemechek

2:00 PM	Future regulation impact on pharmaceutical use *Liz Wagstrom*
2:30 PM	Customer pressure on future antibiotic use *Jarrod Sutton*
3:00 PM	The future of antibiotic resistance pressures on pork production *Peter Davies*
3:30 PM	REFRESHMENT BREAK
4:00 PM	VFDs: past, present, and the future *Chris Rademacher*
4:20 PM	Future of the microbiome in the pig *Bailey Arruda*
4:40 PM	Future issues of antibiotic-free production *Michael Pierdon*
5:00 PM	Future of pain medication for pigs *Hans Coetzee*
5:30 PM	Session concludes

TUESDAY, MARCH 10

General Session: Swine Welfare and Foreign Animal Disease Prevention

8:00 AM – 12:00 PM
Session co-chairs: Sherrie Webb and Matt Ackerman

Swine Welfare

8:00 AM	What a pig wants: advances in animal welfare science *Meghann Pierdon*
8:30 AM	Consumer perceptions, purchasing trends, and the evolving food marketing landscape *David Fikes*

Foreign Animal Disease Prevention

9:00 AM	African swine fever: what's working and not working in China *Joseph Yaros*
9:30 AM	US Customs and Border Protection: keeping foreign animal diseases out *Kevin Harriger*
10:00 AM	REFRESHMENT BREAK
10:30 AM	National Swine Disease Response Council *Patrick Webb*
11:00 AM	Regionalization, compartmentalization, and maintaining exports *Eric Jensen*
11:30 AM	The importance of transboundary animal disease economically, socially, and politically *Peter Fernandez*
12:00 PM	Session and meeting conclude

Thank you, reviewers

Working together and creating a journal to be proud of!

The editorial staff of the Journal of Swine Health and Production *would like to acknowledge the invaluable assistance of the following individuals for their service as referees for the manuscripts that were reviewed between September 23, 2018, and September 22, 2019.*

Glen Almond
Gary Althouse
Andréia G. Arruda
Brittany Backus
David Baum
Brad Bearson
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We apologize if we have inadvertently left a reviewer's name off the list.

Boehringer Ingelheim

AWARDS FOR ADVANCING RESEARCH IN RESPIRATORY DISEASE

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Antibiotic Awareness Week and AASV's commitment to the AMR Challenge

The American Association of Swine Veterinarians is pleased to participate in **World Antibiotic Awareness Week November 18-24, 2019**. World Antibiotic Awareness Week is a global initiative to raise awareness of the health risks of antibiotic resistance to humans, animals, and the environment and to encourage best practices among healthcare providers, policy makers, and the public to limit the emergence or spread of resistant bacteria.

The US effort is led by the Centers for Disease Control and Prevention (CDC) with participation from governments, academic institutions, private industries, and non-governmental organizations. During the annual observance, organizations highlight their activities in promoting the importance of appropriate antibiotic use and resistance.

Slowing the development of resistance and preserving effective antimicrobials for use in animals and humans are priorities for swine veterinarians. The AASV was a leader in developing and promoting guidelines for the judicious use of antimicrobials in veterinary medicine. In 1999, the AASV published the Basic Guidelines of Judicious Therapeutic Use of Antimicrobials in Pork Production, with subsequent revisions in 2004, 2014, and a scheduled revision in the upcoming year.

The pharmaceutical issues, pork safety, and human health and safety committees continuously address issues with antimicrobial use and resistance. They research new issues, develop educational material for members, provide feedback regarding new policy, disseminate information, and develop recommendations and guidance for the AASV. If this sounds interesting, consider joining one of these committees!

It is critical that we maintain our representation and participate in conversations with other organizations where discussions and decisions about judicious use and stewardship are made. We work closely with other pork industry partners to build relationships and discuss antimicrobial use with the Food and Drug Administration and the CDC.

The AASV has two member representatives on the American Veterinary Medical Association's (AVMA) Committee on Antimicrobials. Those AASV representatives helped develop the AVMA Antimicrobial Stewardship Definition and Core Principles, ensuring that they were consistent with the best practices for use in swine veterinary medicine:

- commit to stewardship,
- advocate for a system of care to prevent common diseases,
- select and use antimicrobial drugs judiciously,
- evaluate antimicrobial drug use practices, and
- educate and build expertise.

Moreover, it is important that we share our commitment to stewardship. New this year, the AASV joined other organizations in human, environmental, and animal health in making a commitment to the Antimicrobial Resistance (AMR) Challenge. **The AMR Challenge** is a yearlong international effort to accelerate the fight against antimicrobial resistance.

In addition to identifying resources that increase the knowledge of veterinarians

The American Association of Swine Veterinarians advocates for science-based approaches to solve problems and is committed to providing veterinarians the information they need to use antimicrobials judiciously and promote stewardship among their clients.

and promote the health and well-being of the pigs we care for, we also advocate for science-based approaches to veterinary, industry, and public health issues, including antimicrobial resistance. The AASV is committed to providing swine veterinarians the resources, information, and knowledge they need to use antimicrobials judiciously and promote stewardship among producers, which includes veterinary oversight, use data collection, and disease prevention.

Read more about AASV's commitment at **www.cdc.gov/drugresistance/intl-activities/amr-challenge.html**.

During Antibiotic Awareness Week, AASV will highlight our commitment. You can participate and engage your practice and clients by

- following and reposting social media messages from AASV, the National Pork Board, and the National Pork Producers Council;
- using social media #USAAW19 #BeAntibioticsAware #AMRChallenge;
- sharing stories and activities you do as a veterinarian to promote stewardship;
- including articles about antibiotic use and resistance in your newsletters;
- holding dialogues about antimicrobial use and resistance with other stakeholders; and
- joining an AASV committee.

Watch for more announcements during Antibiotic Awareness Week, November 18-24, 2019.

Abbey Canon, DVM, MPH, DAC, VPM
Director of Communications

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Cumulative index

The *Journal of Swine Health and Production* cumulative index is updated online throughout the year as issues go to press. Articles can be accessed via the "Search" function and from the Abstracts page, **www.aasv.org/shap/abstracts/**.

Index by title 2019

Index by author 2019

Pigs of #instaham

Share your best pig photos for JSHAP publication.

The *Journal of Swine Health and Production* would like to publish digital photographs submitted by our readers. Images used either on the front cover or in the photo corner on the back page are to represent healthy pigs and modern production facilities. Please ensure that the photos do not include people. Select the largest image size available on your camera (not cell phone) of the quality or compression that allows you to store the fewest images on a given memory card. Do not resize, crop, rotate, or color-correct the image prior to submission to the journal. Please send the images by e-mail attachment to **tina@aasv.org**. Also include your name, affiliation, and the approximate location of the image, or other details that you would like to submit which describe the image.

Upcoming meetings

2019 North American PRRS Symposium

November 2-3, 2019 (Sat-Sun)
Chicago Marriott, Downtown
Magnificent Mile
Chicago, Illinois

For more information:
Email: frowland@vet.k-state.edu
Web: www.vet.k-state.edu/na-prrs/index.html
To register:
Web: crwad.org/crwad2019/registration/

2019 ISU James D. McKean Swine Disease Conference

November 7-8, 2019 (Thu-Fri)
Scheman Building
Iowa State University
Ames, Iowa

For registration information:
Registration Services
Iowa State University
1601 Golden Aspen Drive #110
Ames, Iowa 50010
Tel: 515-294-6222
Fax: 515-294-6223
Email: registrations@iastate.edu

For questions about program content:
Dr Chris Rademacher
Conference Chair
Iowa State University
Email: cjrdvm@iastate.edu

Pig Welfare Symposium

November 13-15, 2019 (Wed-Fri)
Minneapolis Marriott City Center
Minneapolis, Minnesota
Hosted by the National Pork Board

For more information:
Web: www.pork.org/pws

Passion for Pigs Seminar and Trade Show

December 10, 2019 (Tue)
Holiday Inn Executive Center
Columbia, Missouri

For more information:
Julie A. Lolli
Executive Coordinator
6680 Highway 15
Shelbina, Missouri 63468
Tel: 660-651-0570
Fax: 573-588-2139
Email: julie@passionforpigs.com
Web: www.passionforpigs.com

2020 Pig Ski Seminar

February 12-14, 2020 (Wed-Fri)
Copper Mountain, Colorado
For registration or more information:
Lori Yeske
Pig Group
39109 375th Ave
Saint Peter, MN 56082
Tel: 507-381-1647
Email: pyeske@swinevetcenter.com
Web: www.pigski.com

American Association of Swine Veterinarians 51st Annual Meeting

March 7-10, 2020 (Sat-Tue)
Hyatt Regency Atlanta
Atlanta, Georgia

For more information:
American Association of
Swine Veterinarians
830 26th Street
Perry, Iowa
Tel: 515-465-5255
Email: aasv@aasv.org
Web: www.aasv.org/annmtg

26th International Pig Veterinary Society Congress

June 2-5, 2020 (Tue-Fri)
Florianopolis, Brazil

For more information:
Tel: +55 31 3360 3663
Email: ipvs2020@ipvs2020.com
Web: ipvs2020.com

International Conference on Pig Survivability

October 28-29, 2020 (Wed-Thu)
Omaha, Nebraska
Hosted by Iowa State University, Kansas State University, and Purdue University

For more information:
Email: jderouch@ksu.edu
Web: www.piglivability.org/conference

For additional information on upcoming meetings: www.aasv.org/meetings

AASV Industry Support Council

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Photo Corner

Pigs at University of Missouri.

Photo courtesy of Tina Smith