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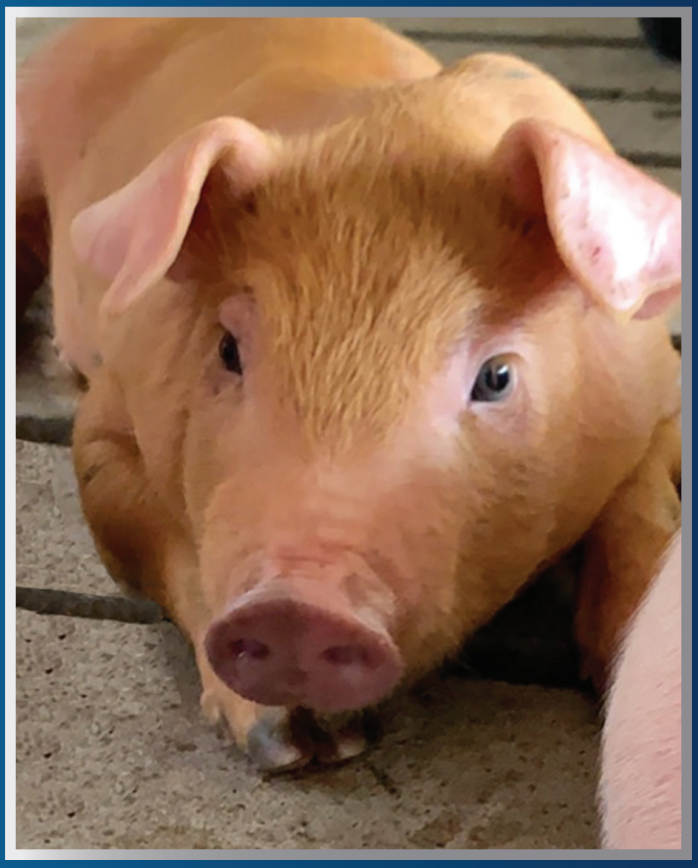



*The Journal of the American Association of Swine Veterinarians*

# *Journal of Swine Health and Production*

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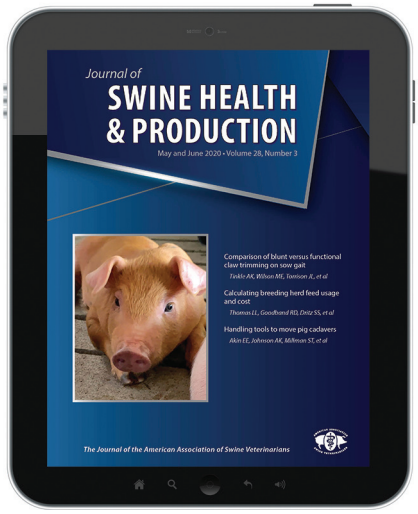


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*quoted from the President's message, page 113*

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# Application of lessons learned

As I sit here practicing my social distancing soon after the 51st AASV Annual Meeting, I am contemplating the events of the last couple of weeks leading up to and soon after the annual meeting. Considering the cancellation of the remaining NBA season and the NCAA basketball tournament, it would be no surprise if our meeting had occurred 1 week later, the entire meeting would have been canceled. This may seem trivial to most outside our organization. However, I think back to the discussions held at the meeting and the wisdom imparted by many of the speakers that would have been missed if the meeting had been canceled. Two things I hope you took home from the Monday general session: help your state veterinarian get to know your practice and the swine industry and meet with the dean of your alma mater veterinary school to encourage more swine curriculum. If we do these things, then the risk of attending the meeting was worth it.

It is interesting to observe the current infectious disease situation in the human population and how the experts are handling decision making with very few facts. Things like zero tolerance and worst-case scenario are being thrown around without knowing the real extent of the infection to date and the immune status of recovered individuals. I can remember similar issues when the swine population was breaking with porcine epidemic diarrhea virus and porcine deltacoronavirus.

The good news is that the rest of the human population is learning biosecurity, isolation, and down time between contact with multiple other susceptible people. Personal hygiene and good biosecurity practices will be much easier to teach to prospective employees after engaging control measures to prevent the spread of coronavirus disease 2019 (COVID-19).

In the last issue of this journal, I wrote about the adaptability strength. This is never more necessary than in the current environment with the spring AASV Board Meeting having been converted to an online meeting. Our organization is adaptable and ready to change course on short notice to such a meeting. I believe we can have a very effective and productive board meeting using this platform.

Overall, I am hopeful that this experience through the COVID-19 infection in the human population will help the swine industry be better prepared for a foreign animal disease if one should come to our shores, ensuring that we make decisions based on facts and good science as well as decisions to help our specific farms and our entire industry.

*"Two things I hope you took home from the Monday general session: help your state veterinarian get to know your practice and the swine industry and meet with the dean of your alma mater veterinary school to encourage more swine curriculum."*

The hoarding strategies of certain necessary items by some are detrimental to the overall population, and there are some in our population attempting to make a profit based on this disease while putting other individuals at greater risk. I fear that this may also occur with foreign animal disease introduction. Decisions may be made that do not benefit the entire industry. I am hopeful that the veterinarians in our organization can help guide producers if a foreign animal disease comes to the United States and help to navigate these farms through the disease without imposing harmful impacts on others to benefit themselves.

I hope that you all enjoyed the annual meeting and I look forward to seeing you next year in San Francisco.

Jeff Harker, DVM
AASV President

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# Making sausage

As I write this message, we have just returned from the 2020 AASV Annual Meeting. This was the first for which I was solely responsible. I say "solely," but that is really not true. It takes a village. There are a lot of people that work very hard to put together the Annual Meeting. I was asked numerous times during the meeting, "how's it going?" My response was always, "well, you tell me." Our job is to put on a meeting that you find valuable and worth attending in a safe, fun, and comfortable venue. I equate it to making sausage. The sausage maker's job is to produce a safe wholesome product that customers enjoy and want to experience again and again. If he has done his job well, the customer never has to see how the sausage is made. I thought, however, I would give you a peek into the sausage grinder that is AASV Annual Meeting preparation.

It starts with the AASV President-elect more than a year before the actual meeting. It is their challenge to come up with a theme, identify a Program Planning Committee, and twist some arms to find just the right speakers for the Howard Dunne and Alex Hogg lectures showcased on Monday morning.

The Program Planning Committee meets for a day in May to brainstorm ideas to fill the workshops, seminars, and general sessions. They decide what topics would provide the most value to the membership, identify the speakers they would like to have present, and determine who will moderate each session. But that is just the beginning of their work. They must contact the speakers and convince them to write and submit a proceedings paper to the AASV office by early November.

This is when Sue Schulteis really kicks into high gear. She coordinates all the communication with the moderators and the speakers, collects all the proceedings papers, and contacts the authors if changes need to be made. Sue ensures that the proceedings are in sync with the program booklet and the meeting app. Karen Richardson, publications manager for the *Journal of Swine Heath and Production*, jumps in to help with reviewing and editing the proceedings. Sue then works with our graphic designer, Tina Smith, and our technology guru, David Brown, to transform this stack of papers into the collection of proceedings that you can access online. In addition, Sue works with a third-party app developer to provide the agenda, sessions, speakers, social events, technical table and poster layouts, and maps necessary to produce the Annual Meeting app.

In the meantime, Sherrie Webb and Abbey Canon are working with the committees to assist them with developing agendas for the individual committee meetings. The committees are the backbone from which a lot of the ideas for Annual Meeting topics and much of the educational outreach efforts arise. They are responsible for helping committee leaders communicate with the committee members and identify the issues of interest to our members.

As the meeting draws near, Sue pulls in friends and family members (Karen Menz, Jenni Patience, and Patricia Hartley) to come into the office to stuff and coordinate registration packets. A lot of hours go into amassing the paperwork that makes the registration process work smoothly at the meeting. The week before the meeting is a flurry of activity at the AASV office gathering all the AASV materials and AASV Foundation auction items that need to be transported to the meeting site.

> *"Our job is to put on a meeting that you find valuable and worth attending in a safe, fun, and comfortable venue."*

A few days before the meeting, Lee Schulteis and Dave Menz pack everything into a 16-foot trailer and drive to the meeting venue, planning to arrive on Thursday before the Annual Meeting. The AASV staff gathers at the venue on Thursday afternoon and is joined by a few additional people who help throughout the meeting. In addition to those already mentioned, Joel Burkgren, Miranda Ayers, Kay Kimpston-Burkgren, and Lance Daharsh join the staff to help unload and store all of the materials, staff the registration desk, set up rooms and signage, and manage items for the Foundation auction. Most of these individuals have been helping us out for as long as I have been associated with AASV. They make the process run as smoothly as it can, and they are the ones to thank for all the things that went right.

Me? What do I do? Besides staying out of everyone's way, it is my job to make sure you had a room to sleep in, a space to meet in, a chair to sit on, a video screen to watch, and food to eat. I am the guy behind the counter selling you the sausage that all these other people dedicated their time and energy to produce.

I hope you enjoyed the sausage we made. If we failed in some way, I hope you will let us know so we can strive to make it better in the future. If we did alright, I hope you will plan to spend a few days with us next year in San Francisco. You are the reason AASV exists and why we hold the Annual Meeting. We appreciate your attendance and hope you found the 51st AASV Annual Meeting educational and entertaining.

Harry Snelson, DVM
Executive Director

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# Digital object identifiers

I am writing my message today from my newly set-up home office. Yes, you guessed it, I am working from home now due to coronavirus disease 2019 (COVID-19) pandemic social distancing recommendations.

For those of you who do not know, I live in Canada, which is now essentially "closed". So much change has happened in so many aspects of everyone's lives over the past weeks and months. Sometimes change is good, but the change lately has been uninvited. I was unable to attend the AASV Annual Meeting in Atlanta, but I hope that those of you who did attend enjoyed the meeting. It must have been dramatic foreshadowing to chair the *Journal of Swine Health and Production* Editorial Board meeting remotely via video conference because little did I know that virtual meetings were going to be my new normal, an uninvited change. But, all this change lately is not going to be our forever normal. I hope that by the time my message reaches you that you are all well and that we have turned the corner with respect to our global COVID-19 control efforts.

One new invited change has been introduced at the *Journal of Swine Health and Production*. We are in the process of introducing digital object identifiers (DOIs) to our JSHAP peer-reviewed publications. Essentially, a DOI is a digital fingerprint for an electronic object. The use of DOIs is favored over the use of URLs as it is a more permanent and reliable digital link to an object, such as our published manuscripts. Additionally, DOIs are favored over URLs because it is easier to accurately link an object with other digital information such as citations, article corrections or retractions, and supplementary materials, to name a few. Even though the *Journal of Swine Health and Production* has been available online since 2007, the introduction of DOIs to our publications will increase accessibility. The journal staff is excited to see this implemented – watch for more details in the near future.

*"We are in the process of introducing digital object identifiers (DOIs) to our JSHAP peer-reviewed publications."*

Terri O'Sullivan, DVM, PhD
Executive Editor

ORIGINAL RESEARCH PEER REVIEWED

# Comparison of blunt versus functional claw trimming effects on sow gait

Amanda K. Tinkle, PhD; Mark E. Wilson, PhD; Jerry L. Torrison, DVM, PhD; Michael A. Parsley; Kylee J. Duberstein, PhD; Michael J. Azain, PhD; C. Robert Dove, PhD

## Summary

**Objective:** To determine the effect of functional claw trimming versus blunt claw trimming on the gait of sows.

**Materials and methods:** Nineteen sows (PIC C29) were transported to the research center and claws were trimmed 3 times over an 8-day period. Dewclaws were trimmed even with the coronary band of the hoof on day 1. Claws were blunt trimmed on day 4 and functional trimming occurred on day 8. The gait of each sow was recorded prior to each trimming to compare the effect of the previous trimming. A final gait recording was taken on day 12. The gait data collected from the sows was compared across days to determine if any changes occurred.

**Results:** Positive improvements in gait data were noted after dewclaw trimming. Changes were seen in velocity ($P = .03$), stride length ($P = .02$), stride duration ($P = .04$), stance ($P = .04$), and rear percent stance ($P = .03$). Blunt trimming offset the improvement gained by trimming dewclaws, seen in the changes to rear percent stance ($P = .02$) and front swing ($P = .04$). Functional trimming increased the improvement observed by trimming dewclaws. Changes were seen in the stance ($P < .001$), percent stance ($P < .001$), stride duration ($P = .003$), stride length ($P = .008$), and velocity ($P = .003$).

**Implications:** Trimming dewclaws and functionally trimming claws improved the sow's gait. Blunt trimming did not provide the same benefits observed by trimming dewclaws or functionally trimming the claws.

**Keywords:** swine, gait analysis, claw trimming, blunt trimming, functional trimming

**Received:** March 22, 2019
**Accepted:** November 4, 2019

**Resumen - Comparación de los efectos de recorte de pezuña sin detalle versus funcional en la marcha de la cerda**

**Objetivo:** Determinar el efecto del recorte funcional de la pezuña versus el recorte sin detalle de la pezuña en la marcha de las cerdas.

**Materiales y métodos:** Diecinueve cerdas (PIC C29) fueron transportadas al centro de investigación y las pezuñas fueron recortadas 3 veces durante un período de 8 días. Se cortaron los espolones incluso con la banda coronaria de la pezuña el día 1. Las pezuñas se recortaron sin detalle el día 4 y el corte funcional se hizo el día 8. La marcha de cada cerda se grabó antes de cada corte para comparar el efecto del corte anterior. La marcha final se grabó el día 12. Los datos de la marcha recolectados de las cerdas se compararon a lo largo de los días para determinar si se produjeron cambios.

**Resultados:** Se observaron mejoras positivas en la información recolectada de la marcha después del corte de pezuña. Se observaron cambios en la velocidad ($P = .03$), la longitud del paso ($P = .02$), la duración del paso ($P = .04$), la postura ($P = .04$), y la posición del paso trasero ($P = .03$). El recorte sin detalle disipó la mejora obtenida al recortar los espolones, observado en los cambios en la posición del paso trasero ($P = .02$) y la oscilación frontal ($P = .04$). El recorte funcional aumentó la mejora observada por el corte de espolones. Se observaron cambios en la postura ($P < .001$), el porcentaje de postura ($P < .001$), la duración del paso ($P = .003$), la longitud de la zancada ($P = .008$), y la velocidad ($P = .003$).

**Implicaciones:** El corte de los espolones y el corte funcional de las pezuñas mejoraron la marcha de la cerda. El corte sin detalle no proporcionó los mismos beneficios observados al recortar los espolones o al cortar funcionalmente las pezuñas.

**Résumé - Comparaison des effets d'une coupe fonctionnelle versus une coupe émoussée des onglons sur la posture des truies**

**Objectif:** Déterminer les effets d'une coupe fonctionnelle des onglons versus une coupe émoussée des onglons sur la posture des truies.

**Matériels et méthodes:** Dix-neuf truies (PIC C29) furent transportées au centre de recherche et les onglons furent taillés trois fois sur une période de 8 jours. Les ergots furent taillés à égalité avec la bande coronaire du sabot au jour 1. Une coupe émoussée des onglons fut effectuée au jour 4 et une coupe fonctionnelle réalisée au jour 8. La posture de chaque

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truie fut enregistrée avant chaque coupe pour comparer les effets de la coupe précédente. Un enregistrement final de la posture fut fait au jour 12. Les données amassées sur la posture des truies furent comparées en fonction des différents jours afin de déterminer si des changements étaient survenus.

**Résultats:** Des améliorations positives dans les données de la posture furent notées après la taille des ergots. Des changements furent notés dans la vélocité ($P = .03$), la longueur de l'enjambée ($P = .02$), la durée de l'enjambée ($P = .04$), la posture ($P = .04$) et le pourcentage de posture arrière ($P = .03$). La coupe émoussée annula les améliorations apportées par la taille des ergots, tel que vu dans les changements au pourcentage de posture arrière ($P = .02$) et le balancement avant ($P = .04$). La coupe fonctionnelle augmenta les améliorations observées lors de la taille des ergots. Les changements furent observés dans la posture ($P < .001$), le pourcentage de posture ($P < .001$), la durée de l'enjambée ($P = .003$), la longueur de l'enjambée ($P = .008$) et la vélocité ($P = .003$).

**Implications:** La taille des ergots et la coupe fonctionnelle des onglons améliora la posture des truies. La coupe émoussée n'apporta pas les mêmes bénéfices que ceux observés lors de la taille des ergots et la coupe fonctionnelle des onglons.

Lameness is a major issue in the swine industry caused by factors including limb malformation, infected skin lesions, osteochondritis disease, skeletal design, and joint swelling.[1-4] Within a sow herd, 9% to 15.2% of removals are due to lameness or foot lesions.[2,4-6] One of the possible preventative treatments for lameness is claw trimming.[7] While, claw trimming is standard practice in the dairy cattle industry, it is not as common in the swine industry. In cattle, there are multiple methods of trimming that focus on improving the pressure distribution across both claws. The swine industry has adapted and patterned functional trimming in dairy cows as a method to trim swine claws.[7-10] Functional trimming is the correction of claw horn overgrowth and re-establishing even weight distribution across the claw.[7,11,12] The functional trimming method, sometimes referred as the Dutch trimming method, comes from a cattle trimming technique composed of five steps originally developed in the Netherlands.[13,14]

Different than functional trimming, blunt trimming only takes length off the claw by cutting the toe of the claw off without balancing and shaping any other part of the claw. It also includes trimming dewclaws even with the claw coronary band without causing bleeding. This method is faster and cheaper than functional trimming due to the ability to trim the claw toe while the pig is in a crate or lying down, therefore no chutes or special equipment are needed. This method also does not require the extensive training that is necessary for functional trimming, which allows anyone on the staff to trim the claw with minimum risk of injury to the pig or the handler. Unfortunately, blunt trimming does not change the height or angle of the claw. Leaving the toe square instead of rounding it increases the chance of the sow hitting its front claw toe on the ground as it walks, potentially injuring the claw.

Computer-assisted gait analysis is a widely accepted tool that is more accurate in assessing gait deviation than visual gait analysis.[15] Such analysis can be used to assess changes to the sow's gait in response to claw trimming. Gait analysis can be used to detect abnormalities in swine that are not visually observable.[16,17] Programs used for gait analysis illustrate the differences in gait characteristics of lame sows.[18] This helps to provide a basis on which to compare subclinical gait changes in response to lameness or treatment.

The objective of this study was to determine the effect of functional claw trimming versus blunt trimming on the gait of visibly sound sows with overgrown claws. It was hypothesized that blunt trimming will not improve the gait of the sow compared to functional trimming due to blunt trimming not addressing all issues related to long claws.

## Materials and methods

Experimental protocols were approved by the University of Georgia Institutional Animal Care and Use Committee A2016 01-010-R2. In this study, 19 PIC C29 (Pig Improvement Corporation) sows from the University of Georgia research herd were used. Prior to the study, sows were housed in a group housing setting on cast iron floors. Sows were transported from the farm to the on-campus animal facility. Sows were multiparous, non-pregnant and had a body condition score of 2.5 to 3.5 on a scale of 1 to 5. None of the sows were visually lame, but all sows presented with overgrowth of claws. When using the Feet First Lesion Scoring System (Zinpro Corporation) for lesion identification, claws for all sows were moderately overgrown with the length of the rear claw midline being over 7 cm. Using the same system, dewclaws were categorized as mild although they were not measured for exact length. Due to the short time frame of this study, sows were not trained to trot on the track, however all sows were used to being handled. Over the duration of the study, sows were allowed access to ad libitum water provided by nipple waterers and 2 kg of standard gestational diet, which met 2012 NRC requirements.[19] Sows were maintained in small groups of 2 to 3 sows on a solid concrete floor within the University of Georgia Large Animal Research Unit. At the end of the study, sows were transported back to the University of Georgia swine farm.

### Gait recording

Sow gaits were recorded immediately prior to dewclaw trimming, blunt trimming, functional trimming and 4 days post functional trimming (Figure 1). All sows were used as their own control and were compared to their original gait.[7] Sows were trotted through a commercial, hog-panel walled, dog-bone track, with a 7.5-m GAITFour electronic walkway (GAITRite). A shaker paddle was used to encourage sows to cross the mat and treats were provided as a reward. The GAITFour electronic walkway contained 10 sensor pads (each 48 sensors wide × 48 sensors long; sensors were 12.7 cm off-center) encapsulated in a roll-out carpet to produce an active area 60.96 cm wide and 609.6 cm long. In this arrangement the active area is a grid, 48 sensors wide × 480 sensors long, totaling 23,040 sensors (Figure 2). The pressure mat was covered with a layer of PIG Grippy Absorbent mat (Mat 32100, New Pig) to protect the pressure mat from moisture and to provide a non-slip walking surface for the sows. Sows were trotted through the gait track until 6 usable repetitions were recorded or a maximum of 20 minutes had passed. Usable repetitions were defined as recordings where at least 16 consecutive steps were captured at a trot. All pigs in this study provided the minimal repetitions collected at each time point and were in the walkway for less than 20 minutes.

Recordings from the mat were collected in the GAIT4Dog software program (GAITRite). This program provides a digital copy of the pig's footfalls as they land on the mat. The footfalls are then processed so that each one is numbered in the order they land. Once all feet are assigned a number, the program designates the foot that the footfall belongs to depending on direction of travel and pattern

**Figure 1:** Study timeline for gait scoring and claw trimming.

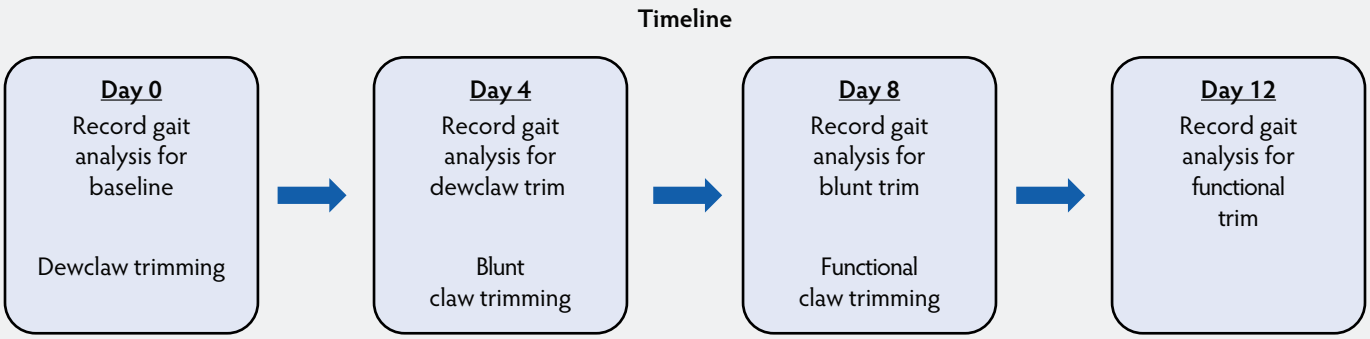
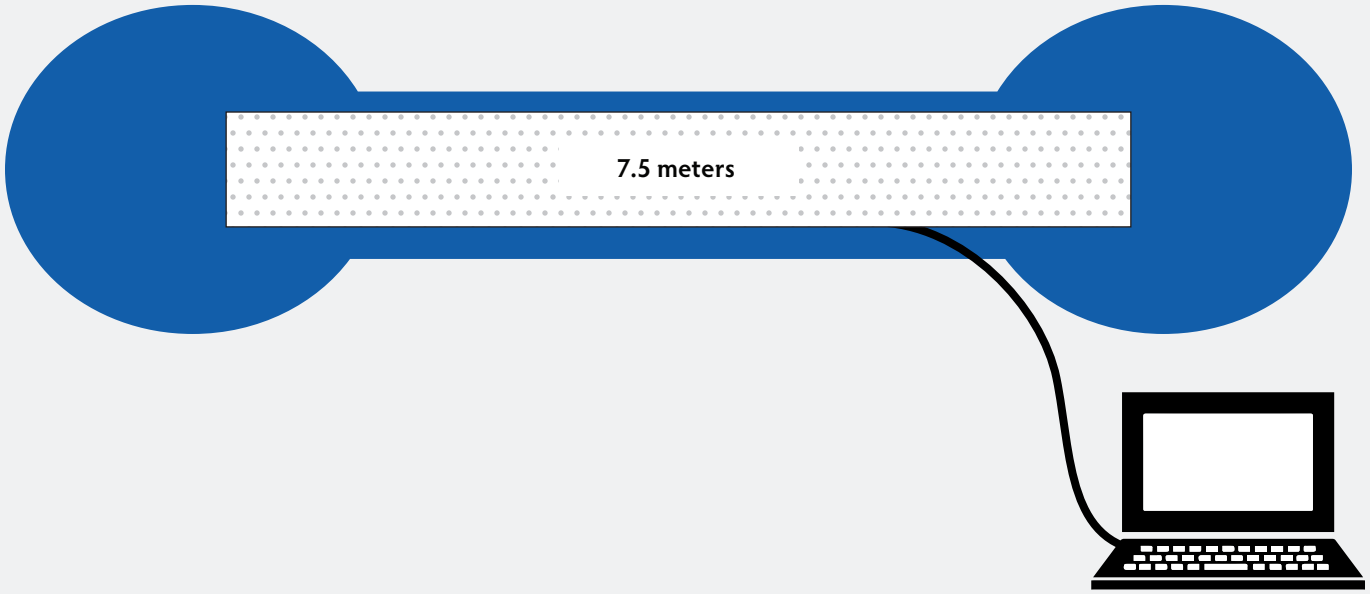



**Figure 2:** Set up and sensor arrangement of GAITFour electric walkway in the middle of the dog-bone track.




of movement so that each foot is categorized as right front, left front, right rear, or left rear. Any erroneous assignments of number or foot assignment can be corrected by the user before the run is analyzed for gait parameters. Velocity, stance time, swing time, stride duration, stride length, and percent stance of stride duration were calculated by the computer software for each recording.[7] Velocity is defined as displacement of the object with respect to time. Stance time is the length of time in which the claw initially contacts the ground until contact is broken. Swing time is the length of time in which the limb breaks contact with the ground until it touches again. Stride duration is the total time for the limb to move through a stride cycle of stance and swing time. Stride length is the distance between sequential footfalls of the same claw. Percent stance is defined as the ratio of the stance time to the stride duration. Following recording, sows were moved to another room for trimming. Each day of data recording followed this pattern.

## Claw trimming

Following gait recordings, sows were loaded into a Feet First (Zinpro Corporation) chute equipped with a padded center support allowing for ventral cushioning of the sow. The front and rear chute gates were secured, and the chute was raised to allow trimmers easy access to the claws. Most sows did not require additional restraint and remained calm in the chute. If sows were fractious, hobbles with Velcro were used as a non-invasive method of restraint on the front feet.[7]

On day 1, sows had all 8 of their dewclaws trimmed even with the coronary band using loppers. The unbranded loppers had a heavy-duty Teflon-coated, high carbon-steel guillotine style blade with extendable handles. While not commercially available, they were similar to Kew Gardens Loppers (Spear and Jackson). On day 4, sows' claws were blunt trimmed to 6.5 cm from the coronary band using the loppers. Blunt trimming claws any shorter would increase the chance of exposing blood vessels to the environment, which would be detrimental to the health of the claw. Claws were closely trimmed straight across using a line drawn perpendicular to the claw end as a guide. The bottom of the foot was not leveled, and the side walls were not corrected. Blunt trimming of all four claws occurred within 5 minutes. On day 8, claws were functionally trimmed using a DeWalt heavy-duty 11.5 cm (model D28402W) electric power grinder with

20.34-cm, 60-grain grinding pads. Following Zinpro's Feet First: Functional Sow Claw Trimming protocol, each claw was marked at 5.5 cm, but no less than 5.0 cm, from the coronary bands, with dewclaws marked even with the coronary band. Claws were then carefully shaped so that each claw would not interfere with its partner and would maintain a rounded edge, decreasing bluntness and providing a smooth, level sole. Each claw was carefully inspected visually and tactilely for evenness to ensure that pressure applied to the foot would be distributed evenly across both claws and heel. Functional trimming of all four claws was performed within 15 minutes. Following each trimming, sows were given 3 days to adjust to the trimming.

### Data analysis

Data were analyzed in SAS (version 9.4; SAS Institute Inc) using the mixed linear regression (PROC MIXED procedure) to evaluate the differences of the front and rear paired limbs at the four time points as repeated measures. Descriptive statistics, such as means and standard deviations, for variables were obtained. Each pig was its own unit with the average of the two paired limbs being taken. Runs were used as replications for each of the time points. Gait parameters were analyzed separately from each other. Each parameter was analyzed using the appropriate units. Time, distance, and length were the dependent variables of interest. Statistical significance was considered at $P < .05$ for all parameters measured, and the PDIFF command was used to separate means where necessary.

## Results

There was an improvement in gait and movement down the length of the mat when trimming dewclaws to the coronary band of the hoof. This improvement is observed in the increased velocity ($P = .03$; Figure 3A) and stride length (front $P = .01$; rear $P = .02$; Figure 3B). The improvement can also be observed in the decrease in stride duration (front $P = .04$; rear $P = .03$; Figure 3C), stance (front $P = .04$; rear $P = .02$; Figure 3D), and rear percent stance ($P = .03$; Figure 3E) when comparing trimmed dewclaws to the sows' control data. Looking at blunt trimming, the only changes observed were a decrease in rear percent stance ($P = .02$; Figure 3E) when comparing blunt trimming to the control data. There was also an increase ($P = .04$; Figure 3F) in front swing when comparing blunt trimming to dewclaw trimming.

Functional claw trimming had the greatest improvement compared to the other trimming methods. Functional trimming data, when compared to the control data, exhibited that sows were able to move forward more efficiently as demonstrated by the smaller stance ($P < .001$; Figure 3D), percent stance ($P < .001$; Figure 3E), and stride duration (front $P = .003$; rear $P = .001$; Figure 3C). Stride length (front $P = .003$; rear $P = .008$; Figure 3B) and velocity ($P = .003$; Figure 3A) increased, suggesting that the sows were more comfortable moving across the mat after corrective trimming compared to the shorter, slower strides that were observed in the control data.

The only measurements that were significantly different between the data collected after dewclaw trimming and the data collected after functional trimming was an increase in front swing ($P = .01$; Figure 3F) and decrease in percent stance (front $P = .001$; rear $P = .02$; Figure 3E). These two measurements revealed that functional trimming had a greater benefit to the pigs than the dewclaw trimming as the sows were more willing to move their limbs through the air instead of having them on the ground during the stride duration.

When comparing blunt trimming versus functional trimming, functional trimming improved sow gait. Pigs became more efficient moving across the mat after functional trimming as observed in the decrease in stance (front $P = .004$; rear $P = .005$; Figure 3D), stride duration (front $P = .03$; rear $P = .02$; Figure 3C), and percent stance (front $P < .001$; rear $P = .002$; Figure 3E). The increase in stride length (front $P = .035$; rear $P = .04$; Figure 3B) and velocity ($P = .009$; Figure 3A), in conjunction with the decrease in the previously mentioned values, demonstrated that the pigs stood less during the stride duration and that they moved a greater distance in a shorter amount of time. Swing did not change (front $P = .57$; rear $P = .89$; Figure 3F), revealing that the improvement in stride duration value was only due to the pigs being more comfortable having their feet off the ground.

## Discussion

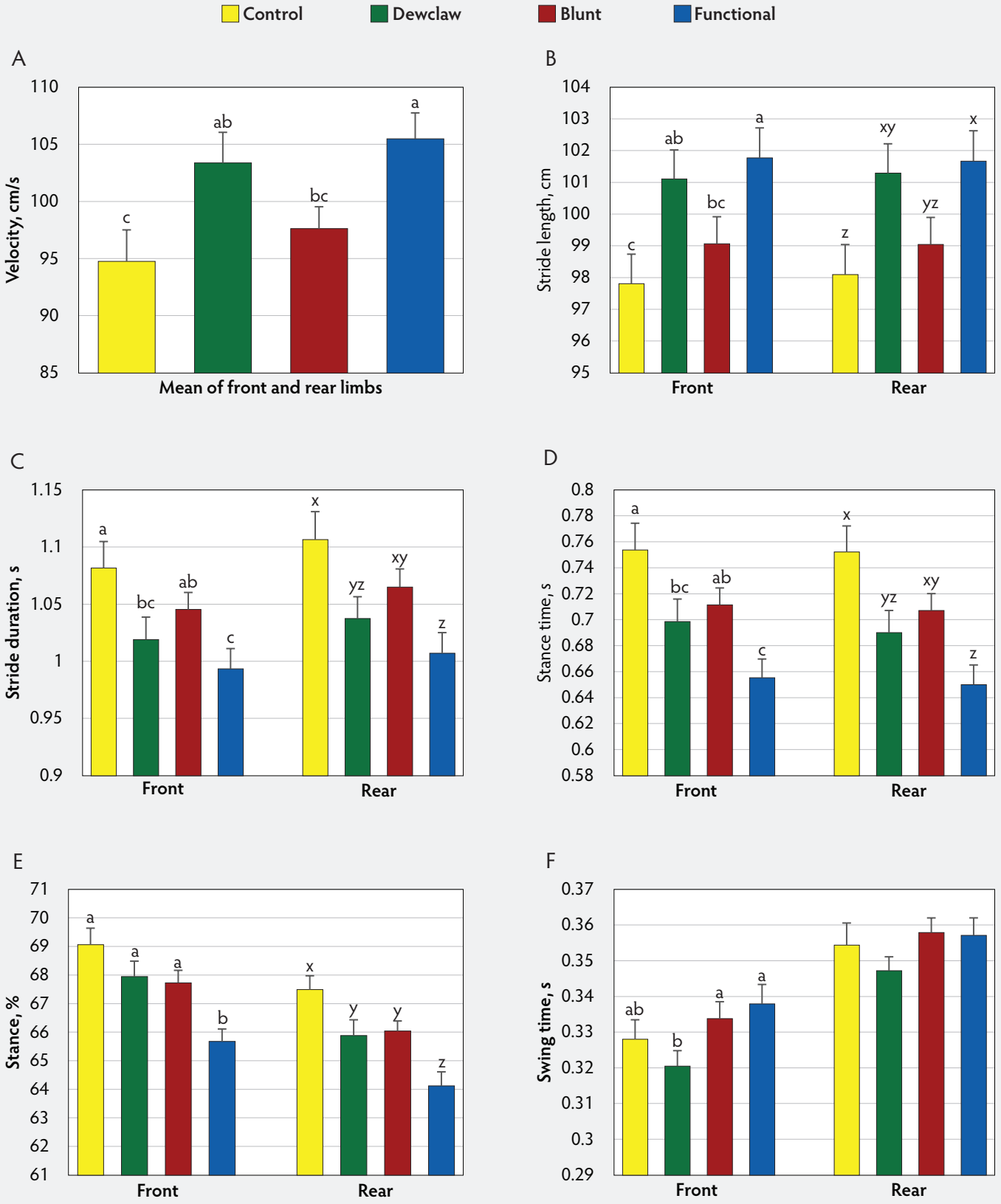
Sows are quadrupeds, and like all quadrupeds there is a set pattern to footfall for each gait. Throughout the study, sows were maintained at a two-beat, symmetrical gait, with diagonal pairs that moved in sync with each other and diagonal support phases.[20] This gait is preferred in horses for lameness detection and evaluation because the symmetry allows for detection of asymmetries in the animal's movement.[20] During this gait, the swing time is longer than the stance time, making stance time less than 50% of the total stride duration.

In this study, sows were not trained prior to the beginning of data collection. Due to the short amount of time that sows were present on the mat and the amount of time between sessions, training was not deemed necessary for comparisons to be made across the days.[7] Studies on swine memory indicate that swine have a long habituation period for learning tasks, [21,22] which was longer than the total time the pigs were exposed to the track. The sample size and lack of visible lameness in this study prevents these results from being universally used. Future studies need to be performed on a larger scale to separate each treatment into its own group to perform comparisons over a longer period.

While dewclaw trimming was done as a precautionary measure to decrease interference while assessing gait changes between the two trimming methods, it had a significant impact on the gait isolated from either of the trimming methods. By decreasing the length of the dewclaws, the heel can make contact with the floor faster because the dewclaws are not interfering with the heel contact. This decrease in time until contact makes the stride faster, which is seen in the increased velocity and decreased stride duration. Dewclaw trimming does not require the sow to be put in the chute and can be done in the farrowing crate, taking just a few seconds per foot. Dewclaw trimming reduces the chances of the dewclaw being caught, torn, or broken. This has the potential of reducing the culling rate in the herd.

The change in gait parameters after blunt trimming illustrate that blunt trimming did not have the benefits that were expected. Shortening the toe without balancing the sole negated the positive effects that were seen after dewclaw trimming. The lack of benefit from blunt trimming is most likely due to the trimming reducing only the claw

**Figure 3:** Mean gait measurements (with standard error) by type of trimming for front and rear limbs: A) Velocity, B) Stride length, C) Stride duration, D) Stance time, E) Percent stance, and F) Swing time. Means with different letters differ ($P < .05$; PROC MIXED).



length, while ignoring claw height and any wall shape abnormalities. By ignoring these issues, blunt trimming does not balance the hoof so that it resembles the natural hoof shape. In cattle, it has been observed that not balancing the weight bearing surface of the claw causes further claw disease and dysfunction.[10] Blunt trimming also leaves the hoof with a square toe, which increases the chances of the sow to stub the front claw toes, potentially causing more damage than if the front claw was rounded.

Functional trimming regained the positive effect that was seen after dewclaw trimming. When comparing blunt trimming to functional trimming, functional trimming provided a better result in gait quality. In cattle, this newfound comfort in gait after functional trimming is reflected by increased milk yield from lame cows.[14] By trimming the full claw and balancing the sole, the sow was able to move more efficiently across the mat. The differences between the 2 trimming methods is important in determining necessary guidelines for producers to achieve the same results.[8] While blunt trimming is economically preferable to a producer due to less labor inputs, training, and special equipment needed, the results were not able to match that of functional trimming.

Trimming is an important method to help prevent and treat lameness. In this study, functional trimming was the best method of trimming due to its improvement in gait parameters. If the farm is unable to perform functional trimming, trimming dewclaws provided a greater benefit than blunt trimming the claws. These results are only applicable when the correct method of functional or dewclaw trimming is used as trimming too short and drawing blood would negate the benefits.

## Implications

Under the conditions of this study:

- Functional trimming improved locomotion compared to blunt trimming.
- Dewclaw trimming was a quick and easy method to improve locomotion.
- Blunt trimming did not provide a benefit to the sow's locomotion.

## 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 |

°F = (°C × 9/5) + 32
°C = (°F - 32) × 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

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Production Tool

# Alternative handling tools for moving grow-finish pig cadavers

Ella E. Akin, BS; Anna K. Johnson, PhD; Suzanne T. Millman, PhD; Cassandra D. Jass, DVM; Kenneth J. Stalder, PhD; John P. Stinn, PhD; Jason W. Ross, PhD

## Summary

The National Pork Board provides recommendations for humane handling tools and non-ambulatory pig handling methods. However, there are limited published studies that evaluate the efficacy of handling tools for on-farm manual movement of grow-finish non-ambulatory or cadaver pigs. A sked, deer sled, and modified deer sled were studied as handling tools for non-ambulatory grow-finish pigs. Handling tools were tested on-farm using pig cadavers (59-134 kg) to evaluate effectiveness based on employee effort and opinion. Our results support the sked and deer sled as effective handling tools to move grow-finish pigs, while the modified deer sled was ineffective.

**Keywords:** swine, caretakers, grow-finish pig, handling tools, non-ambulatory pigs

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**Resumen - Herramientas de manipulación alternativas para mover cadáveres de cerdos de crecimiento y finalización**

El Consejo Nacional de Cerdos ofrece recomendaciones de herramientas de manejo humanitario y métodos de manejo no ambulatorios. Sin embargo, existen pocos estudios publicados que evalúen la eficacia de las herramientas de manipulación para el movimiento manual de cerdos no ambulatorios o cadáveres en crecimiento y finalización en la granja. Se estudió una camilla, un trineo de ciervo y un trineo de ciervos modificado como herramientas de manejo para cerdos no ambulatorios en crecimiento y engorda. Las herramientas de manejo se probaron en la granja utilizando cadáveres de cerdo (59-134 kg) para evaluar la efectividad en función del esfuerzo y la opinión de los empleados. Nuestros resultados respaldan la camilla y el trineo de ciervos como herramientas de manejo efectivas para mover cerdos de crecimiento, mientras que el trineo de ciervos modificado no fue efectivo.

**Résumé - Équipements de manutention alternatifs pour déplacer les cadavres de porcs en période de croissance-finition**

Le National Pork Board fournit des recommandations pour l'utilisation d'équipements de manutention et des méthodes de manutention humanitaires de porcs non-ambulatoires. Toutefois, il y a un nombre limité d'études publiées qui évaluent l'efficacité des équipements de manutention lors d'utilisation à la ferme pour déplacer des porcs non-ambulatoires en période de croissance-finition ou des cadavres. Un traîneau de type sked, un traîneau à chevreuil et un traîneau à chevreuil modifié furent étudiés comme équipement de manutention pour des porcs non-ambulatoires en période de croissance-finition. Les équipements de manutention furent testés à la ferme en utilisant des cadavres de porcs (59-134 kg) afin d'évaluer l'efficacité basée sur l'effort déployé par les employés et les opinions. Nos résultats suggèrent que le traîneau sked et le traîneau à chevreuil sont des équipements efficaces de manutention pour déplacer des porcs en période de croissance-finition, alors que le traîneau à chevreuil modifié était inefficace.

Non-ambulatory pigs can occur any time on-farm due to injury, illness, or fatigue, and caretakers may be required to move non-ambulatory pigs into or out of pens, alleys, and load out areas.[1] Recommendations for swine handling are provided through the Pork Quality Assurance Plus and Transport Quality Assurance programs.[2,3] Building on these programs, the Common Swine Industry Audit (CSIA) allows packers and companies to verify that on-farm practices are in compliance with animal welfare standards, which includes humane swine handling. Willful acts of abuse and neglect are prohibited and are partially defined as "[d]ragging of conscious animals by any part of their body except in the rare case where a non-ambulatory animal must be moved from a life-threatening situation."[4] If witnessed on farm, it will result in an automatic audit failure. The CSIA recommends that non-ambulatory pigs can be moved using a drag-mat. One study by Akin et al[5] investigated the use of a wean-to-finish mat to move finisher pig cadavers. The researchers assessed factors including ease of use, durability, cost, force required to drag the handling

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tool carrying three sizes of pig cadavers a typical distance in the barn, the resulting impact on employee heart rate, and overall employee satisfaction. They concluded that this mat was not suitable for manually moving non-ambulatory grow-finish pigs, and that further mat modifcations could improve ease of movement and postioning to keep the pig secured. Therefore, the objective of this project was to test a sked, deer sled, and modified deer sled (MDS) as handling tool options for non-ambulatory grow-finish pigs.

## Materials and methods

All research was approved by Iowa State University Institutional Review Board for Human Subject Research (Approval No. 18-003). On-farm testing was accomplished using a pig cadaver model rather than live animals for ethical reasons. Therefore, Institutional Animal Care and Use Committee approval was not needed.

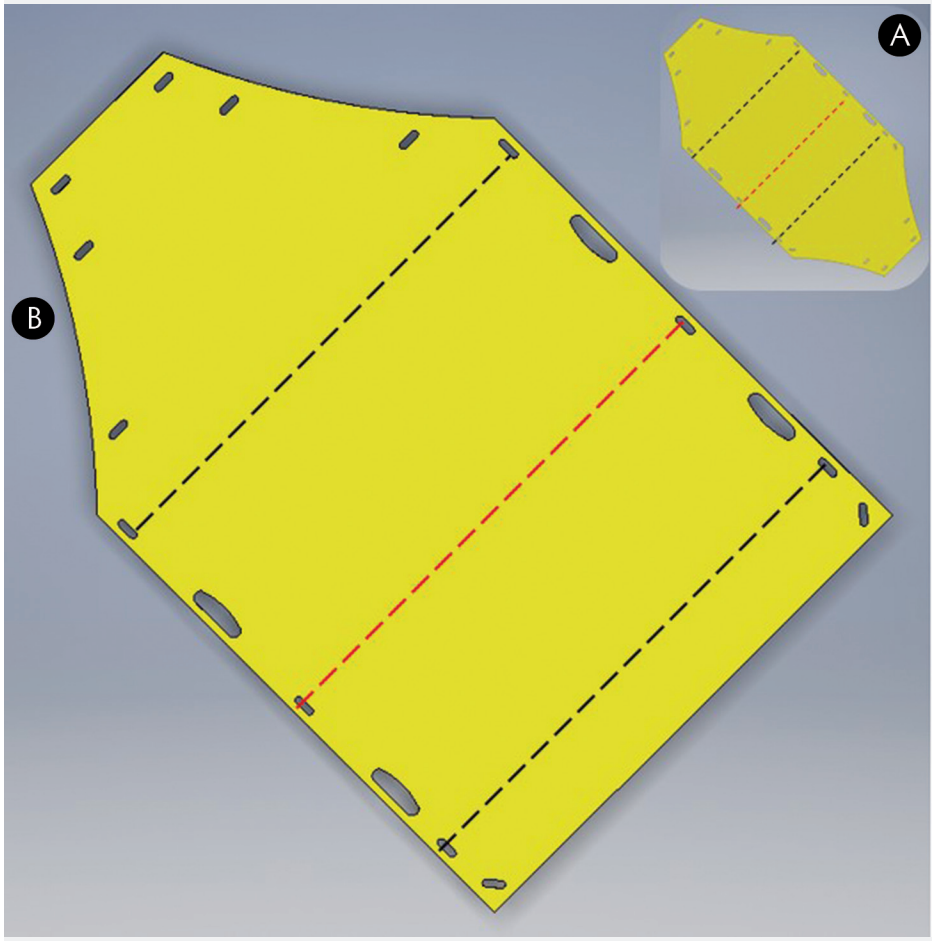
### Handling tools and modifications

Three identical HMH Skeds (sk-250; Skedco) were purchased. Each sked weighed 5.0 kg, measured 2.4 m long × 91.4 cm wide × 0.3 cm deep and were made of medium-density polyethylene plastic (Figure 1A). Modifications were performed to reduce the length to make transitioning between the pens and alleyways possible. For each sked, all straps were removed except 3 side release plastic buckle restraint straps (5.08 cm wide polypropylene straps) used to secure the cadaver to the sked. Across the width on the foot-end, a 31.1 cm line was drawn, and a hacksaw was used to cut across the line. The final sked dimensions were 1.9 m long × 91.4 cm wide (Figure 1B). Each sked cost $327 with $0 for modifications.

Six identical Magnum Deer Sleigh'r Game Sleds were purchased from Sportman's Guide (Item No.: 138755). Each deer sled weighed 2 kg, measured 1.8 m long × 91.8 cm wide × 0.2 cm deep, and was made of slick polymer construction. Three of the deer sleds had 2 strings (1.83 m × 0.76 cm) provided by the manufacturer to secure the animal to the sled. A handle was created by inserting and knotting a 2.4 m polypropylene rope on the upper surface (Figure 2).

Three of the deer sleds were further modified to reduce the width to fit inside alleys. On each MDS, the final width was 50.8 cm and was achieved by removing 20.3 cm from each side. The final MDS dimensions were 1.8 m long × 50.8 cm wide (Figure 3). Each deer sled cost $30 plus modification costs of $0.90 for a total cost of $30.90 per deer sled.

**Figure 1:** The HMH sked rescue system was modified to move grow-finish pig cadavers from the home pen to the hospital pen. A) Original sked dimensions were 2.4 m long × 91.4 cm wide × 0.3 cm deep. B) All straps were removed except 3 side release plastic buckle restraint straps (5.08 cm polypropylene straps). Across the width on the foot-end, a 31.1 cm line was drawn, and a hacksaw was used to cut across the line. The final sked dimensions were 1.9 m long × 91.4 cm wide.



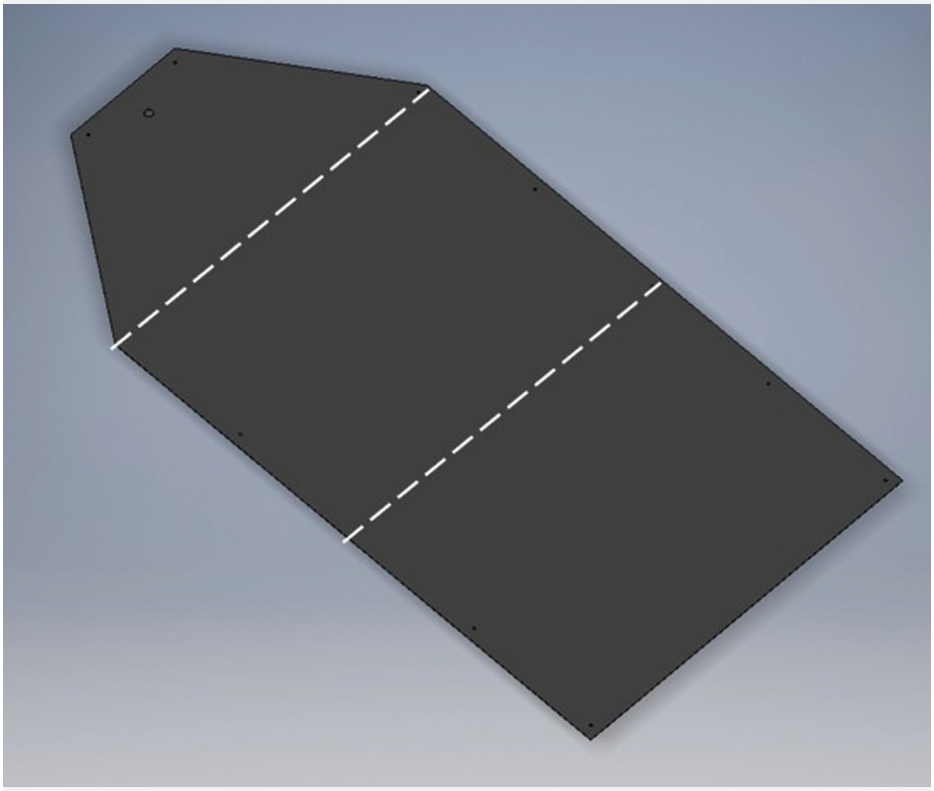

### Animals and facilities

The study was conducted on 3 commercial grow-finish sites in central Iowa. Fifteen commercial crossbred pigs were selected from the hospital pen by the company veterinarian. The fifteen compromised pigs were identified as euthanasia candidates and euthanized according to company protocols, which were consistent with industry guidelines.[6] Prior to euthanasia, pigs were able to individually walk to a weigh scale (Raytec WayPig 300; AGRIsales Inc) where body weights were collected and rounded up to the nearest tenth; mean (SD) body weight was 89.1 (5.3) kg (range: 59-134 kg). Pig weight determined pig order for movement by handling tool. The weight order was rotated on each farm so that the heaviest or lightest cadaver was not always pulled first.

### Handling tool securing process

A pig cadaver was rolled onto the sked so it was in lateral recumbency with the back aligned inside the sked's edge to ensure the entire cadaver remained on the sked. The cadaver was secured by 3 buckle restraints. This methodology was also used for placement on the sled with the exception that the cadaver was secured by knotting one string end in the first hole, moving the string across the cadaver and knotting the other end in the first hole on the opposite side. The same knotting process was completed with a second string using the third hole. As for the MDS, no restraints were added to secure the pig cadaver.

**Figure 2:** The deer sled used to move grow-finish pig cadavers from the home pen to the hospital pen. The sled dimensions were 1.8 m long × 91.8 cm wide × 0.2 cm deep. One string was placed across the pig cadaver and the ends tied to the first hole on both sides. A second string was placed across the pig cadaver and the ends tied to the third hole on both sides. A 1.4 m polypropylene rope was inserted and knotted on the front of the deer sled as a handle for employees.



## Employee enrollment

Four English-speaking male employees were enrolled in the study by the company veterinarian. The employees comprised members of the production well-being team and the engineering team. These employees were selected as a convenience sample, which took into consideration limited biosecurity risk, represented typical employees within a wean-to-finish production system, and were physically fit enough to work within a wean-to-finish barn. Employees had mean (SD) age of 37 (16.1) years (range: 23-60 years), height of 185 (7.1) cm (range: 180.3-195.6 cm), weight of 99.8 (14.7) kg (range: 83.9-113.4 kg), and on-farm experience of 16.5 (12.1) years (range: 1-30 years). On the day of the study, each employee was asked to complete a demographics questionnaire prior to completing the cadaver movement using the handling tools.

## Cadaver movement

Two empty pens were designated as the home pen (start) and hospital pen (end). Facility details are described in Table 1.

Each cadaver was positioned inside the home pen 2.9 m from the alleyway gate and 2.3 m from the right pen divider for farm 1. For farm 2, each cadaver was positioned 3.5 m from the alleyway gate and 2 m from the right pen divider. For farm 3, each cadaver was positioned 3.6 m from the alleyway gate and 2 m from the right pen divider. Pig cadavers were oriented with the head towards the alleyway at all farms. At the start of each cadaver movement, the employee was asked to roll the cadaver onto the handling tool (sked, sled, or MDS) and move it from the home pen to the hospital pen.

Time to complete cadaver tasks was measured at 4 time points by one researcher using a stopwatch: 1) Duration to roll cadaver from home pen floor onto the handling tool. 2) Duration to secure cadaver on the handling tool. 3) Duration to move handling tool and cadaver from home pen into the alleyway, defined as the handling tool being entirely inside the alley and oriented towards the hospital pen. 4) Duration to move handling tool and cadaver along the alleyway and into the hospital pen, defined as handling tool being entirely inside the hospital pen.

## Peak force

An FGV-HXY High Capacity Digital Force Gauge (Nidec-SHIMPO America Corporation) was attached to the handling tool handle to record peak force applied by the employee while moving the cadaver. Each employee held his arms with the force gauge positioned at waist height and pulled for 5 continuous seconds. Peak force was collected during cadaver movement in 2 locations: in the alleyway immediately outside of the home pen and inside the hospital pen.

## Employee physiologic measures

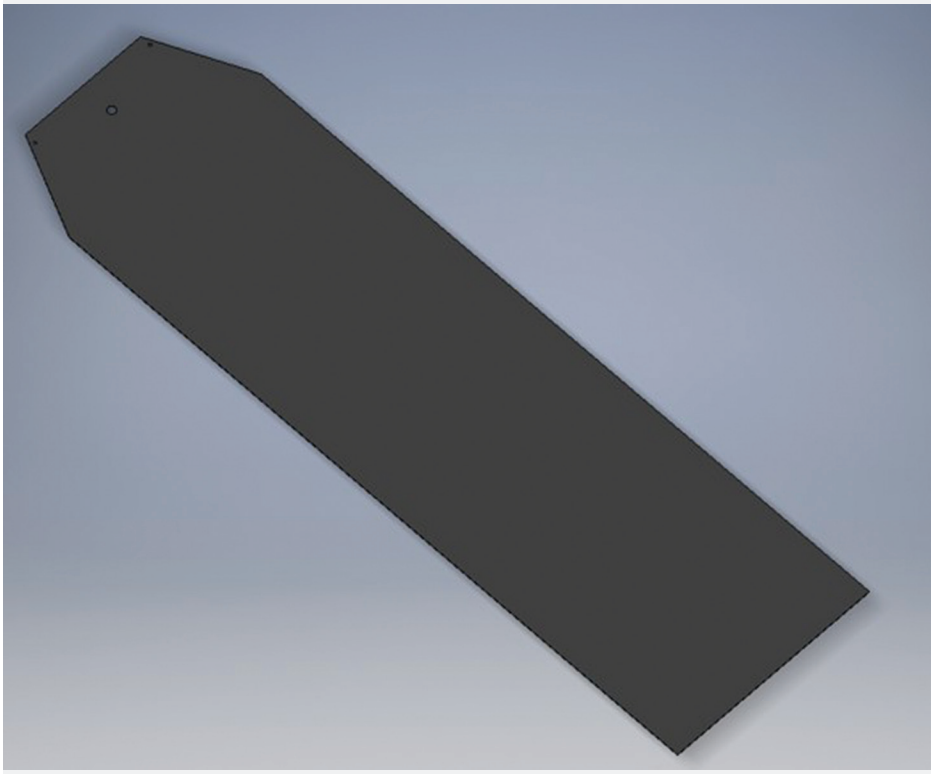
One researcher collected each employee's physiologic measures at 2 different time points: baseline resting levels in the home pen and post exertion levels collected immediately after moving each cadaver. A pulse oximeter (Pulse Oximeter 50DL; Clinical Guard) was placed onto the employee's index finger to collect heart rate and oxygen saturation. Consistent with other studies,[7,8] a minimum 5-minute resting period was provided between movement of each cadaver to allow physiologic measures to return to baseline levels.

## Employee evaluation and handling tool durability

During each resting period, employees were asked to evaluate the handling tools using the survey described in Table 2. On each farm, the handling tool was moved 3 times per employee resulting in the handling tool survey being completed 180 times (60 surveys per handling tool). Comments were also solicited for each question to collect qualitative data.

Durability of handling tools were evaluated by one of the researchers for presence of holes, rips, and creases at the conclusion of each cadaver movement. If observed, these were counted, measured, and photographed.

**Figure 3:** The modified deer sled (MDS) used to move grow-finish pig cadavers from the home pen to the hospital pen. The deer sled was modified by removing 20.3 cm from each side. The final MDS dimensions were 1.8 m long × 50.8 cm wide × 0.2 cm deep. A 1.4 m polypropylene rope was inserted and knotted on the front of the MDS as a handle for employees.



### Statistical analysis

The handling tool survey was evaluated by simple means and standard deviation of four employees. Whereas, handling tool durability was evaluated by counting and measuring holes, rips, and creases after movement from home pen to hospital pen. Two new variables were created for employee heart rate and oxygen saturation:

**Change in employee heart rate (bpm)** = hospital pen heart rate – baseline resting heart rate

**Change in employee oxygen saturation (%)** = hospital pen post exertion oxygen saturation – baseline resting oxygen saturation

The distribution of the peak exertion force, cadaver movement duration, change in employee heart rate, and change in employee oxygen saturation were evaluated using the PROC UNIVARIATE procedure (SAS v 9.2, SAS Institute, Inc). Data met the assumption of normality and were analyzed using mixed model methods (PROC MIXED) for parametric data. The statistical design was a complete randomized design with the statistical model including the fixed effect of employee (n = 4), handling tool (n = 3), and farm (n = 3) with cadaver (kg) as a linear covariate. Employee within farm was included as a random effect in the model. A $P \leq .05$ was considered significant and PDIFF option was used to separate means when fixed effects were a significant source of variations.

## Results

### Duration of cadaver movement

Total duration was affected by handling tool and farm ($P < .001$; Table 3). Total duration was affected by cadaver, such that a 0.64 second increase occurred with each 1 kg increase in weight ($P < .001$). The MDS was quicker to move than the sked and sled. Mean (SE) total durations were 67.1 (3.0) seconds for sked, 107.5 (3.0) seconds for sled, and 63.0 (3.0) seconds for MDS ($P < .001$). Employee was not a source of variation ($P = .24$).

Duration to move the cadaver onto the handling tool was affected by cadaver, such that a 0.05 second increase occurred with each 1 kg increase in weight ($P < .001$; Table 3). Handling tool, farm, and employee were not sources of variation ($P > .05$). Duration to secure the cadaver was affected by handling tool and cadaver such that a 0.15 second increase occurred with each 1 kg increase in weight ($P < .01$). Farm and employee were not sources of variation ($P > .05$). Duration to move from home pen into the alley was affected by farm and cadaver such that a 0.16 second increase occurred with each 1 kg increase in weight ($P < .01$). Handling tool and employee were not sources of variation ($P > .05$). Duration to move from the alley into the hospital pen was affected by handling tool, farm, and cadaver such that a 0.33 second increase occurred with each 1 kg increase in weight ($P < .001$). Employee was not a source of variation ($P = .86$). When moving through the alley, farm 1 took twice as long (55 seconds) to move cadavers using all handling tools than farm 2 (29 seconds) and farm 3 (21 seconds). The deer sled was the fastest (38 and 19 seconds) to move through the alley on farms 1 and 3 respectively, followed by the sked (40 and 21 seconds) and MDS (63 and 23 seconds). On farm 2, the sked was the fastest to move through the alley (24 seconds) followed by the deer sled (30 seconds) and MDS (34 seconds).

### Peak force

At the start of the alley peak force was affected by handling tool, farm, and cadaver such that a 2.3 N increase in peak force occurred with each 1 kg increase in weight ($P < .001$; Table 4). The sked had a higher coefficient of friction than the sled or MDS. Mean (SE) peak force at the start of the alley was 256.3 (7.1) N for the sked, 202.2 (7.1) N for the sled, and 205.3 (7.1) N for the MDS ($P < .001$). Employee was not a source of variation ($P = .09$). At the end of the alley peak force was affected by handling tool, farm, and cadaver such that a 2.2 N increase occurred with each 1 kg increase in weight ($P < .01$). More force was required to move cadavers on the sked than the sled or MDS. Mean (SE) exertion force in the hospital pen was 228.3 (5.8) N for the sked, 181.1 (5.8) N for the sled, and 191.5 (5.8) N for the MDS ($P < .001$). Employee was not a significant source of variation ($P = .27$).

**Table 1:** Buildings and production specifications of central Iowa commercial grow-finish sites where handling tools were evaluated to move grow-finish pig cadavers

| | Farm | | |
|---|---|---|---|
| **Specification** | **1** | **2** | **3** |
| Site capacity, No. of pigs | 5350 | 2400 | 2400 |
| Barn capacity, No. of pigs | 1783 | 2400 | 2400 |
| Projected market weight, kg* | 127 | 127 | 127 |
| No. of barns | 3 | 1 | 1 |
| Rooms per barn | 1 | 2 | 2 |
| Barn width, m | 12.5 | 15.5 | 15.5 |
| Barn length, m | 115.8 | 118.3 | 118.3 |
| Pen width, m | 3.06 | 2.6 | 2.7 |
| Pen depth, m | 5.8 | 7.03 | 7.2 |
| Pens per barn | 64 | 78 | 78 |
| Space allowance, $m^2$ | 0.6 | 0.7 | 0.7 |
| No. pigs per pen | 20-30 | 20-30 | 20-30 |
| Pen flooring | Fully slatted | Fully slatted | Fully slatted |
| Slat width, cm | 12.7 | 15.2 | 15.2 |
| Slot width, cm | 2.5 | 2.5 | 2.5 |
| Alley flooring | Partially slatted | Partially slatted | Partially slatted |
| Alley width, cm | 53.3 | 63.5 | 66 |
| Alley concrete center, cm | 30.3 | 13.9 | 15.2 |
| Gate width, cm | 82.6 | 85.1 | 86.4 |
| Gate length, m | 2.7 | 2.7 | 2.7 |
| Distance of cadaver movement, m | 57.9 | 59.2 | 59.2 |

* Projected pig market weight ranged between 125 and 136 kg.

## Employee physiologic measures

Change in heart rate after moving the cadaver from the home to hospital pen was affected by the handling tool used ($P = .04$). Change in heart rate was greater with the sked than MDS ($P = .01$); change in heart rate with the sled did not differ from the sked or MDS. Mean (SE) and range of change in employee heart rate was 62.7 (3.1) bpm for the sked (12-91 bpm), 56.4 (3.1) bpm for the MDS (15-104 bpm), and 60.3 (3.1) bpm for the sled (20-92 bpm). Change in heart rate was affected by cadaver such that a 0.22 bpm increase occurred with 1 kg change in cadaver weight ($P < .001$). Employee and farm were not sources of variation ($P > .05$). Change in oxygen saturation after moving the cadaver from the home pen to hospital pen was not affected by handling tool, cadaver weight, employee, or farm ($P > .05$).

## Employee evaluation and handling tool durability

Surveys were obtained from all 4 employees for all cadaver movements (Tables 5 and 6). Employees ranked rolling cadavers onto the MDS as very easy (32 of 60 scores), whereas sked (32 of 60 scores) and sled (33 of 60 scores) were ranked as easy. Securing cadavers onto the sked was very easy (31 of 60 scores), whereas the sled was ranked easy (20 of 60 scores). The MDS did not include restraints and therefore was not ranked. In the comments section, employees suggested replacing the sled's string restraints with the buckle restraints used on the sked. Additionally, employees recommended buckle restraints for the MDS.

Employees ranked positioning cadavers onto the MDS in the home pen and in the alley as very easy (home pen: 28 of 60 scores; alley: 23 of 60 scores). Employees ranked the sked (home pen: 33 of 60 scores; alley: 30 of 60 scores) and sled (home pen: 33 of 60 scores; alley: 27 of 60 scores) as easy to position. Employees commented on the importance of centering the cadaver head by the handle to limit risks of catching head and limbs on penning when moving down the alley. The sled (31 of 60 scores) and MDS (30 of 60 scores) were ranked as very easy to move from the home to the hospital pen, while sked (35 of 60 scores) was ranked as easy. Employees recommended adding a flexible PVC tube section to the sled and MDS polypropylene rope handle to prevent the rope from pinching employees' hands during movement. The MDS size (44 of 60 scores) and weight (45 of 60 scores) were ranked as very easy. The sled size (30 of 60 scores) and weight (35 of 60 scores) were ranked as easy. The sked's size was ranked as neutral (27 of 60 scores) and employees commented on

**Table 2:** Employee handling tool survey*

| Questions† | | | | | |
|---|---|---|---|---|---|
| 1) Rate the HT for: | | | | | |
| a) Rolling cadaver from home pen floor onto HT | 5 | 4 | 3 | 2 | 1 |
| b) Securing cadaver onto HT | 5 | 4 | 3 | 2 | 1 |
| 2) Positioning ease of cadaver onto HT‡: | | | | | |
| a) Home pen | 5 | 4 | 3 | 2 | 1 |
| b) Alley | 5 | 4 | 3 | 2 | 1 |
| 3) Rate the HT for: | | | | | |
| a) Moving HT in home pen towards pen gate | 5 | 4 | 3 | 2 | 1 |
| b) Moving HT out of home pen and into alley | 5 | 4 | 3 | 2 | 1 |
| c) Moving HT down the alley to hospital pen | 5 | 4 | 3 | 2 | 1 |
| 4) Rate the HT for: | | | | | |
| a) HT size to move cadaver§ | 5 | 4 | 3 | 2 | 1 |
| b) HT weight to move cadaver¶ | 5 | 4 | 3 | 2 | 1 |
| 5) Do you think the HT could easily be used to move a NA market-weight pig | | Yes | | No | |
| 6) Would you recommend this HT to other producers to move a NA market-weight pig | | Yes | | No | |

* During each resting period, employees were asked to evaluate the handling tools (sked, deer sled, and modified deer sled) using the handling tool survey. Each employee (n = 4) filled out 3 surveys, one per cadaver (n = 15), over 3 farm sites for a total of 180 surveys completed.
† Survey responses were scored on a 5-point scale (5 = very easy, 4 = easy, 3 = neutral, 2 = difficult, and 1 = very difficult) for questions 1 through 4. Questions 5 and 6 were scored as Yes or No.
‡ Positioning defined as cadaver head positioned toward handle and legs/body centered on the mat.
§ Handling tool size defined as whether the length and width affected movement ease.
¶ Handling tool weight defined as whether the weight affected movement ease.
HT = handling tool; NA = non-ambulatory.

the width, which periodically caught on penning during movement. However, the sked's weight was ranked as easy (35 of 60 scores).

The sked was the most durable with an 8.9 cm crease on the 9th drag and a rip (2.5cm long x 1.3 cm wide) on the side of one sked after the 11th drag. The sled was the least durable handling tool with multiple creases ranging from 1.3 to 11.0 cm in length, rips 2.5 to 35.6 cm in length, and holes 2.5 to 34.3 cm in length and approximately 0.6 cm in width. The holes, rips, and creases were not large enough to discard the handling tool or cause safety issues to the cadaver or employee.

## Discussion

Field expertise associated with moving non-ambulatory pigs has resulted in several guidance documents. The American Meat Institute recommends using slide boards, sleds, and cripple carts to move non-ambulatory pigs within meat processing plants.[9] Similarly, the Transport Quality Assurance program recommends stretchers, sleds, hand carts, and specialized skid loaders for moving non-ambulatory pigs.[3] When non-ambulatory pigs occur on farms, the Pork Quality Assurance Plus program recommends using plastic sleds or drag mats.[2] From the scientific perspective, only one publication has explored the use of modified mats to move non-ambulatory pigs but were not recommended for pig movement.[10]

Cadaver movement duration would change between farm sites due to barn layout, differing alleyway width and length, pen and alley flooring, percentage of dry vs wet manure covering the alley floor. When moving through the alley, farm 1 took twice as long to move cadavers using all handling tools, and the difference could be explained by the smaller alley width in farm 1, which could affect handling tool movement ease. The decrease in alley width could cause the pig cadaver limbs and head to catch in penning when moving from the home to hospital pen. It is suggested when conducting future research on handling tools for the grow-finish pig, an important measure to collect is the amount of manure on the pen and alley floor as this could factor into movement ease.

Future research should also evaluate whether the peak force changed based on where the handle was positioned, for example, if the handle was held more at shoulder height (75° angle) vs being pulled at waist height (45° angle). The combination of employee height and handle lengths could also affect overall force.

Furthermore, baseline physiological measures (ie, heartrate, respiratory rate) were obtained to evaluate the difference in these traits prior to and after use of tools to move cadavers. Rather than using the raw physiological measure from the employees, the difference between these values prior to using a cadaver moving tool and the values measured after moving a cadaver was used as the dependent variable in the statistical analysis. The actual time to move a cadaver on any one tool might differ based on the

**Table 3:** Time to move grow-finish pig cadavers from the home pen to the hospital pen using three handling tools by four employees on three commercial grow-finish sites

| | TOD | | TTS | | TTA | | MUA | | TD | |
|---|---|---|---|---|---|---|---|---|---|---|
| | LS Means* (SE), s | Range, s | LS Means* (SE), s | Range, s | LS Means* (SE), s | Range, s | LS Means* (SE), s | Range, s | LS Means* (SE), s | Range, s |
| Handling tools | | | | | | | | | | |
| Sked | 5.8 (0.4) | 1-13 | 19.0 (1.7)[a] | 9-47 | 12.5 (0.8) | 5-28 | 29.9 (2.5)[a] | 13-71 | 67.1 (3.0)[a] | 32-98 |
| Sled | 6.2 (0.4) | 2-14 | 57.9 (1.7)[b] | 27-100 | 11.5 (0.8) | 4-43 | 31.9 (2.5)[a] | 14-80 | 107.5 (3.0)[b] | 56-201 |
| MDS | 5.2 (0.4) | 1-13 | NA[†] | NA[†] | 14.1 (0.8) | 6-36 | 43.6 (2.5)[b] | 16-190 | 63.0 (3.0)[a] | 28-210 |
| Employee | | | | | | | | | | |
| 1 | 5.7 (0.4) | 1-13 | 41.2 (2.4) | 9-97 | 14.0 (1.1) | 5-43 | 36.4 (3.2) | 18-151 | 83.3 (3.4) | 28-201 |
| 2 | 6.6 (0.4) | 1-13 | 33.3 (2.4) | 9-100 | 11.8 (1.1) | 4-34 | 33.0 (3.2) | 12-190 | 73.7 (3.4) | 30-210 |
| 3 | 5.6 (0.4) | 2-14 | 41.6 (2.4) | 11-97 | 14.2 (1.1) | 7-29 | 34.9 (3.2) | 16-125 | 82.6 (3.4) | 33-154 |
| 4 | 5.1 (0.4) | 2-12 | 37.5 (2.4) | 13-87 | 10.8 (1.1) | 5-36 | 36.1 (3.2) | 19-127 | 77.2 (3.4) | 28-170 |
| Farm | | | | | | | | | | |
| 1 | 5.7 (0.4) | 1-13 | 39.5 (2.6) | 9-88 | 14.2 (1.1)[a] | 5-36 | 55.0 (3.3)[a] | 20-190 | 101.2 (3.7)[a] | 44-210 |
| 2 | 6.0 (0.3) | 2-14 | 39.9 (1.9) | 11-100 | 14.4 (0.8)[a] | 6-43 | 30.1 (2.5)[b] | 13-127 | 77.02 (2.7)[b] | 28-170 |
| 3 | 5.5 (0.3) | 1-12 | 35.9 (1.9) | 11-97 | 9.5 (0.9)[b] | 4-28 | 20.4 (2.5)[c] | 15-63 | 59.3 (2.7)[c] | 28-127 |

* The LS means (SE) and range was derived from 15 cadavers (range: 59-134 kg) across three commercial farm sites.
† No results are available for restraining a cadaver onto the MDS, as the handling tool did not include restraints.
[a-c] LS Means within a column and each main effect with different superscripts differ ($P < .05$).
TOD = Duration to move cadaver from home pen floor onto the handling tool; TTS = Duration to secure cadaver on the handling tool; TTA = Duration to move handling tool and cadaver from home pen into the alleyway; MUA = Duration to move handling tool and cadaver along the alleyway and into the hospital pen; TD = Total duration to move cadaver from home to hospital pen (TOD+TTS+TTA+MUA); MDS = modified deer sled; NA = not applicable.

**Table 4:** Peak force to move grow-finish pig cadavers at the start and end of the alley using three handling tools by four employees on three commercial grow-finish sites

| | SOA | | EOA | |
|---|---|---|---|---|
| | LS Means (SE), N | Range, N | LS Means (SE), N | Range, N |
| Handling tools | | | | |
| Sked | 256.3 (7.1)[a] | 90-443 | 228.3 (5.8)[a] | 118-407 |
| Sled | 202.2 (7.1)[b] | 99-384 | 181.1 (5.8)[b] | 88-352 |
| MDS | 205.3 (7.1)[b] | 84-423 | 191.5 (5.8)[c] | 105-458 |
| Employee | | | | |
| 1 | 237.7 (10.9) | 122.8-428.9 | 184.4 (8.4) | 117.9-291.5 |
| 2 | 222.5 (10.9) | 90-384 | 207.5 (8.4) | 114-340 |
| 3 | 232.2 (10.9) | 132-443 | 207.5 (8.4) | 88-458 |
| 4 | 192.7 (10.9) | 84-325 | 201.9 (8.5) | 112-381 |
| Farm | | | | |
| 1 | 212.8 (10.4)[a] | 108-442 | 185.3 (8.2)[a] | 88-339 |
| 2 | 273.2 (9.1)[b] | 90-428 | 236.9 (6.9)[b] | 117-458 |
| 3 | 177.9 (9.1)[c] | 84-326 | 178.6 (6.9)[a] | 131-273 |

* The LS means (SE) and range was derived from 15 cadavers (range: 59-134 kg) across three commercial farm sites.
[a-c] Means within a column within each main effect with different superscripts differ ($P < .05$).
SOA = start of alley where peak force was measured immediately outside of the home pen; EOA = end of alley where peak force was measured inside the hospital pen; MDS = modified deer sled.

physical fitness for each employee. However, that was not the goal of the present study. The goal was to evaluate the duration difference required to perform the same task between varying cadaver weights using 3 handling tools. The employees enrolled in the study would represent similar range in fitness of barn workers that might eventually use the handling tools to move pig cadavers. In effect, the employees represent a nuisance variable that should be accounted for in the statistical model that evaluated the dependent variable of interest in this study.

Although there were no significant differences in oxygen saturation between employees, the health status of employees was unknown at the time of enrollment. It should be noted that if these tools are considered for use on farm, then caretaker health status should be discussed to make sure that the recommended tool is safe for the animals and employee health.

Throughout the handling tool survey, the MDS was ranked similarly to the sked and sled. However, when employees were asked about the MDS ease of movement and if they would recommend this handling tool, all employees said no because the MDS did not have restraint straps. After conclusion of the study, restraints similar to the sked's were affixed to the MDS and taken on-farm to be tested on a pig cadaver. Even with restraints, the pig cadaver continually slid off the backside and had to be repositioned multiple times. Therefore, even with inclusion of restraints, the MDS would not be a suitable handling tool to move a non-ambulatory pig.

Future research should test whether different cadaver positioning on handling tools could affect movement ease. For example, positioning the cadaver with the tail closest to the handle vs head closest to the handle and cadaver in lateral recumbence vs laying on back with limbs in the air. Handling tools should be tested on varying farm site layouts as movement ease could differ between farm sites and handling tools. Furthermore, testing should occur when a pig becomes non-ambulatory inside the alley or the chute.

**Table 5:** Frequency of employee responses to the handling tool survey*

| | Score frequency (%) | | | | |
|---|---|---|---|---|---|
| **Question**† | **1** | **2** | **3** | **4** | **5** |
| **Sked** | | | | | |
| 1. Rate the HT for: | | | | | |
| a) Rolling cadaver from home pen floor onto HT | 0 (0) | 1 (1.7) | 7 (11.7) | 32 (53.3) | 20 (33.3) |
| b) Securing cadaver onto HT | 0 (0) | 0 (0) | 6 (10.0) | 23 (38.3) | 31 (51.7) |
| 2. Positioning ease of cadaver onto HT: | | | | | |
| a) Home pen | 0 (0) | 0 (0) | 5 (8.3) | 33 (55.0) | 22 (36.7) |
| b) Alley | 0 (0) | 0 (0) | 15 (25.0) | 30 (50.0) | 15 (25.0) |
| 3. Rate the HT on: | | | | | |
| a) Moving HT in home pen towards pen gate | 0 (0) | 0 (0) | 4 (6.7) | 39 (65.0) | 17 (28.3) |
| b) Moving HT out of home pen and into alley | 0 (0) | 0 (0) | 12 (20.0) | 32 (53.3) | 16 (26.7) |
| c) Moving HT down the alley to hospital pen | 0 (0) | 3 (5.0) | 8 (13.3) | 34 (56.7) | 15 (25.0) |
| 4. Rate the HT on: | | | | | |
| a) HT size to move cadaver | 0 (0) | 0 (0) | 27 (45.0) | 26 (43.3) | 7 (11.7) |
| b) HT weight to move cadaver | 0 (0) | 0 (0) | 14 (23.3) | 40 (66.7) | 6 (10.0) |
| **Sled** | | | | | |
| 1. Rate the HT for: | | | | | |
| a) Rolling cadaver from home pen floor onto HT | 0 (0) | 0 (0) | 3 (5.0) | 33 (55.0) | 24 (40.0) |
| b) Securing cadaver onto HT | 0 (0) | 16 (26.7) | 19 (31.7) | 20 (33.3) | 5 (8.3) |
| 2. Positioning ease of cadaver onto HT: | | | | | |
| a) Home pen | 0 (0) | 1 (1.7) | 5 (8.3) | 33 (55.0) | 21 (35.0) |
| b) Alley | | 0 (0) | 4 (6.7) | 11 (18.3) | 27 (45.0) |
| 3. Rate the HT on: | | | | | |
| a) Moving HT in home pen towards pen gate | 0 (0) | 0 (0) | 2 (3.3) | 26 (43.3) | 32 (53.3) |
| b) Moving HT out of home pen and into alley | 0 (0) | 2 (3.3) | 6 (10.0) | 22 (36.7) | 30 (50.0) |
| c) Moving HT down the alley to hospital pen | 0 (0) | 1 (1.7) | 1 (1.7) | 26 (43.3) | 32 (53.3) |
| 4. Rate the HT on: | | | | | |
| a) HT size to move cadaver | 0 (0) | 0 (0) | 8 (13.3) | 30 (50.0) | 22 (36.7) |
| b) HT weight to move cadaver | 0 (0) | 0 (0) | 0 (0) | 35 (58.3) | 25 (41.7) |

**Table 5:** Continued

| Question[†] | Score frequency (%) | | | | |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 |
| **MDS** | | | | | |
| 1. Rate the HT for: | | | | | |
| a) Rolling cadaver from home pen floor onto HT | 0 (0) | 0 (0) | 4 (6.7) | 24 (40.0) | 32 (53.3) |
| b) Securing cadaver onto HT[‡] | NA | NA | NA | NA | NA |
| 2. Positioning ease of cadaver onto HT: | | | | | |
| a) Home pen | 0 (0) | 2 (3.3) | 6 (10.0) | 24 (40.0) | 28 (46.7) |
| b) Alley | 1 (1.7) | 6 (10.0) | 16 (26.7) | 14 (23.3) | 23 (38.3) |
| 3. Rate the HT on: | | | | | |
| a) Moving HT in home pen towards pen gate | 0 (0) | 1 (1.67) | 4 (6.7) | 20 (33.3) | 35 (58.3) |
| b) Moving HT out of home pen and into alley | 0 (0) | 4 (6.7) | 10 (16.7) | 21 (35.0) | 25 (41.7) |
| c) Moving HT down the alley to hospital pen | 0 (0) | 6 (10.0) | 9 (15.0) | 15 (25.0) | 30 (50.0) |
| 4. Rate the HT on: | | | | | |
| a) HT size to move cadaver | 0 (0) | 0 (0) | 1 (1.7) | 15 (25.0) | 44 (73.3) |
| b) HT weight to move cadaver | 0 (0) | 0 (0) | 0 (0) | 15 (25.0) | 45 (75.0) |

* Four employees completed a combined total of 180 surveys.
[†] Questions 1 through 4 were scored using a 5-point scale: 5 = very easy, 4 = easy, 3 = neutral, 2 = difficult, and 1 = very difficult.
[‡] No results are available for securing cadavers onto MDS, as the handling tool did not include restraints.
HT = handling tool; MDS = modified deer sled; NA = not applicable.

**Table 6:** Mean employee responses to the handling tool survey*

| Question[†] | Sked | Sled | MDS |
|---|---|---|---|
| | Mean (SD)[‡] | Mean (SD)[‡] | Mean (SD)[‡] |
| 1. Rate the HT for: | | | |
| a) Rolling cadaver from home pen floor onto HT | 4.2 (0.7) | 4.4 (0.6) | 3.2 (0.9) |
| b) Securing cadaver onto HT | 4.4 (0.7) | 4.5 (0.6) | NA[§] |
| 2. Positioning ease of cadaver onto HT: | | | |
| a) Home pen | 4.3 (0.6) | 4.3 (0.8) | 3.9 (0.9) |
| b) Alley | 4.2 (0.7) | 4.0 (0.7) | 3.9 (1.1) |
| 3. Rate the HT for: | | | |
| a) Moving HT in home pen towards pen gate | 4.2 (0.6) | 4.5 (0.6) | 4.5 (0.7) |
| b) Moving HT out of home pen and into alley | 4.1 (0.7) | 4.3 (0.8) | 4.1 (0.9) |
| c) Moving HT down the alley to hospital pen | 4.0 (0.8) | 4.5 (0.6) | 4.2 (1.0) |
| 4. Rate the HT for: | | | |
| a) HT size to move cadaver | 4.0 (0.7) | 4.2 (0.7) | 4.7 (0.5) |
| b) HT weight to move cadaver | 4.0 (0.6) | 4.4 (0.5) | 4.8 (0.4) |

* Four employees completed a combined total of 180 surveys.
[†] Questions 1 through 4 were scored using a 5-point scale: 5 = very easy, 4 = easy, 3 = neutral, 2 = difficult, and 1 = very difficult.
[‡] The mean (SD) was compiled from 15 cadavers (range: 59-134 kg) across three commercial farm sites.
[§] No results for securing cadavers onto MDS, as the handling tool did not have restraints.
HT = handling tool; MDS = modified deer sled; NA = not applicable.

It is important to test potential on-farm handling tools for ease of use, employee safety,[11] and pig welfare.[12,13] To ensure pig and caretaker safety, it is important to have facilities with wide enough alleys and pen openings, appropriate and durable handling equipment, and correctly trained employees.[14] The purpose of this study was to determine if the sked, sled, and MDS could be suitable handling tools for live non-ambulatory pigs on-farm. The 3 handling tools were selected due to durability, ability to move across a variety of terrain, large enough to withstand heavy weights, and can be rapidly deployed by one employee. These handling tools were chosen because they ranged in price, which would allow producers to have options when implementing these handling tools on farm. If producers have multiple farm sites, they may not be able to afford the sked ($327), but could afford the sled ($30) across multiple sites. These handling tools can be bought online and are relatively economical to modify.

This research would not support the MDS in its current form as a handling tool due to no restraints. No restraints caused pig cadavers to slide off the end and cadaver head and legs to get caught in the alleyway gates. This research does support the use of the sked and sled as practical handling tools to move grow-finish pig cadavers and show promise as useful handling tools to move non-ambulatory pigs on-farm.

## Implications

Under the conditions of this study:

- The sked and sled were suitable for moving non-ambulatory grow-finish pigs.
- The MDS was not a suitable tool for moving non-ambulatory grow-finish pigs.
- More research on the sked and sled is needed for commercial farm application.

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## Conflict of interest

None reported.

## Disclaimer

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Production tool

# Calculating breeding herd feed usage and cost in commercial production systems

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## Summary

The objective of this paper is to describe a production tool for swine producers, veterinarians, and nutritionists to benchmark feed usage and feed cost within gestation, lactation, and gilt development phases of a production system. The model was developed using Microsoft Excel (version 16.0.11328.20438) and includes key variables within the breeding herd affecting feed usage. Data from a commercial production system was used to determine model accuracy as well as demonstrate its use. The results from this production tool provide estimates for feed usage and feed cost within each subpopulation of animals in the breeding herd.

**Key words**: swine, breeding herd feed usage, breeding herd feed cost

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**Resumen - Cálculo del uso y costo del alimento del hato reproductor en sistemas de producción comercial**

El objetivo de este documento es describir una herramienta de producción para productores porcinos, veterinarios y nutriólogos para comparar el uso de alimento y el costo del alimento en las fases de gestación, lactancia y primerizas en desarrollo en un sistema de producción. El modelo fue desarrollado usando Microsoft Excel (versión 16.0.11328.20438) e incluye variables clave dentro del hato de cría que afectan el uso de alimento. Se utilizó la información de un sistema de producción comercial para determinar la precisión del modelo y demostrar su uso. Los resultados de esta herramienta de producción proporcionan estimaciones para el uso y el costo del alimento dentro de cada subpoblación de animales en el hato de reproducción.

**Résumé - Calcul de l'utilisation et du coût des aliments d'un élevage de reproducteurs dans un système commercial de production**

L'objectif de cette publication est de décrire un outil de production pour les producteurs porcins, les vétérinaires et les nutritionnistes afin d'avoir un point de référence pour l'utilisation et le coût des aliments lors des périodes de gestation, lactation et développement des cochettes dans un système de production. Le modèle fut développé en utilisant Microsoft Excel (version 16.0.11328.20438) et inclut des variables clés à l'intérieur du troupeau de reproducteurs qui affectent l'utilisation des aliments. Les données en provenance d'un système commercial de production furent utilisées afin de déterminer la précision du modèle aussi bien que de démontrer son utilisation. Les résultats issus de cet outil de production fournissent des estimés pour l'utilisation et le coût des aliments à l'intérieur de chacune des sous-populations d'animaux dans le troupeau de reproducteurs.

Feed cost in the swine industry has historically encompassed 65% to 75% of variable costs of production, and as a result, swine producers continually seek ways to reduce feed cost. Although the breeding herd represents a numerically small fraction of the total swine herd, they consume approximately 20% of the total feed produced and can have a large impact on the profitability of a production system.[1] In contrast to other phases of production where body weight is used to derive cost and revenue, breeding herd revenue and production costs are commonly calculated per weaned pig.[2]

Historically, the emphasis in reducing feed cost per weaned pig has been focused around the factors that increase the number of pigs weaned. Previous literature has developed detailed productivity trees displaying the relationships between factors influencing pigs weaned per female per year and models have been developed to quantify changes.[3-5] However, little emphasis has been placed on examining factors affecting feed usage and cost in gilt development, gestation, and lactation.

Feed cost per weaned pig is affected by feed cost (ingredient cost as influenced by diet composition), feed usage, and the number of pigs weaned. Each variable is influenced by numerous factors, many of which are interrelated within the breeding herd. It is typical for producers to calculate feed cost per weaned pig based on gestation and lactation feed usage and generally do not include feed costs in the gilt development unit (GDU). When farms continue to have replacement rates exceeding 50%, capturing gilt development feed usage and cost is imperative to minimizing feed cost per weaned pig. Therefore, the purpose of this paper is to describe a model that serves as a production tool to internally evaluate factors affecting

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feed usage per weaned pig, and subsequently feed cost per weaned pig. Specifically, this model partitions feed usage within the breeding herd among the different female populations allowing for the isolation of feed cost per weaned pig within each population and benchmark or diagnose differences among breeding herds. The model also calculates feed usage and feed cost per inventoried sow as another way to report breeding herd feed cost, offering a second means of comparison. Our specific aim was to develop a learning tool to stimulate the complexities of breeding herd feed cost, aside from the factors affecting the number of pigs weaned, through a commercial production system.

## Materials and methods

### Model description

The model was designed with the intent of being used within commercial swine production systems as a form of benchmarking among different breeding herds within and across production systems, as well as individual farms over time. This approach allows the producer to enter production data from one or several breeding herds into the model and compare feed usage and cost on a weaned pig and inventoried sow basis for each subpopulation within the breeding herd. For most producers, feed usage and feed cost for each subpopulation within the breeding herd has not been reported in this fashion, but instead as one value for gestation and one value for lactation. The use of this model allows for not only within system farm comparisons, but also quantifies feed usage within each subpopulation and includes GDU.

The mathematical model is reflective of current US swine production practices and is easily expandable to different production systems, assuming continuous mating within the breeding herd. For simplification and demonstration purposes, the time interval used in the model is reported on a weekly and annual basis.

Data from a commercial production system with multiple individual sow farms was collected to provide model inputs and validate calculations. The model was developed using the Open Source Optimization Solver for Excel[6] in Microsoft Excel (version 16.0.11328.20438). The model can be found at: **https://www.asi.k-state.edu/research-and-extension/swine/calculators.html**.

### Determining feed usage

The breeding herd is composed of 3 primary areas: 1) gestation, 2) lactation, and 3) gilt development (Figure 1). Each of these areas are occupied by females in different stages of their reproductive cycle, and because of this, exhibit differences in feed usage. The model herein is designed to isolate each subpopulation of females and determine feed usage specific to each one.

To do this, the model requires a series of inputs based on annual production records and current farm practices. The model estimates feed usage for subpopulations within gestation, lactation, and GDU in one of two ways (Figure 2).

The first method is to estimate and enter individual average daily feed intake (ADFI) for each subpopulation of animals within gestation, lactation, and GDU (Figure 2). For example, within gestation, the user will enter estimated ADFI values for mated females, females to be serviced within the wean-to-estrus interval, cull sows, and boars. The second and recommended option for estimating feed usage for each subpopulation is with actual feed delivery reports for gestation, entry-to-first-service interval, lactation, and GDU feed (Figure 2). The model allows for gilts within the entry-to-first-service interval to be fed the same gestation diet as the remaining gestation herd population or a separate diet. If fed a separate diet, the model will estimate feed usage for gilts within the entry-to-first-service interval based on actual feed delivery. However, if gilts are consuming gestation feed, the model requires the user to enter estimated ADFI for gilts within the entry-to-first-service interval. In addition, the model will require the user to enter estimated ADFI values for females in the wean-to-estrus interval, boars, and cull sows within gestation, as well as pre-farrow females in lactation (only if pre-farrow females are limit fed). These estimated ADFI values are needed to partition feed appropriately to the respective subpopulation. Without providing any estimated ADFI values, the model would produce ADFI identical for each subpopulation within the barn, which we know is not correct. If ADFI for the required subpopulations are unknown, default values can be used and are discussed in detail within each subpopulation.

### Gestation

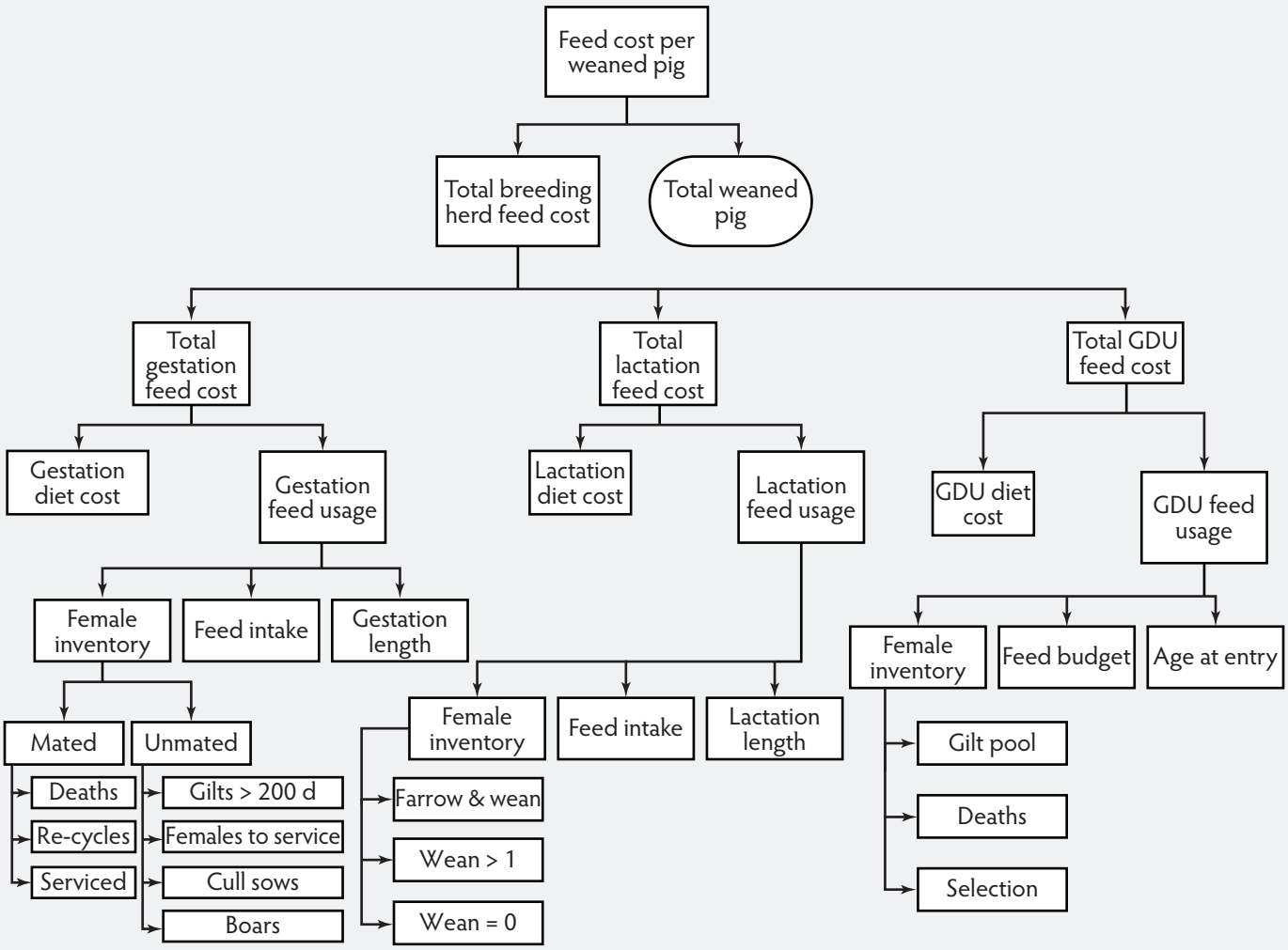
In the model, gestation feed usage is determined separately for each subpopulation of females within the gestation barn (Table 1). Female populations in gestation are divided into 1) mated females, 2) unmated females, and 3) boars used for heat-detection or semen collection. Subpopulations of mated females in gestation include females who were serviced and died during gestation (mortality), females who were serviced and re-cycled during gestation (re-cycles), and females who were serviced and will farrow (gestating sows).

The mean day of death is required to estimate feed usage for the mortality subpopulation. If the mean day of death is unknown, the default value assumes gestating females died on day 58 (midpoint) of gestation. Because females spend more time in gestation compared to lactation, and deaths occurring in lactation occur in early lactation, the model assumes mortality occurs only within the mated female gestation population. Female re-cycles are a function of female services, farrowing rate, and female deaths. Like mortality, the mean day of re-cycle detection is required to estimate feed usage, and if the mean day is unknown a default value assumes re-cycles were found on day 58 of gestation. Gestating sows are a function of female services and farrowing rate. The model assumes continuous mating within the gestation population. For example, as females are serviced and enter the gestation mated population, pregnant females in the gestation mated population enter the farrowing house.

The second division in the gestating category is the unmated female population. This further subdivides to gilt entry-to-first-service interval and nonproductive sows. The unmated gilts within the entry-to-first-service interval captures the cost associated with these females as they enter the breeding herd. The model assumes the population of unmated gilts within the entry-to-first-service interval are eligible for breeding (> 200 days of age). From this population, gilts are subdivided into: gilts serviced and entering the mated population (serviced gilts), gilts who skip a heat and are serviced 21 days later before entering the mated population (skipped gilts), and gilts culled and removed from the breeding herd (culled gilts).

The unmated nonproductive sow population includes all remaining sows consuming gestation feed. The 2 unmated nonproductive sow populations include sows yet to be serviced (weaned females and re-cycles to be serviced) and sows to be culled (culled sows).

**Figure 1:** Representation of the feed cost per weaned pig separated into gestation, lactation, and GDU subpopulations. Within each area of the breeding herd, feed cost is composed of diet cost and feed usage. Feed usage is further divided among female populations, feed allowance, and days on feed. GDU = gilt development unit.




The model requires an input for ADFI for nonproductive sows to be serviced and nonproductive cull sows. If ADFI values are unknown, default values of 3.6 and 5.2 kg are used.[7-10] The model assumes unmated nonproductive sows to be serviced are within the wean-to-estrus interval and include sows weaned from the farrowing house as well as re-cycles to be serviced. Total nonproductive cull sow inventory is a function of annual culling rate. Lastly, in addition to entering nonproductive cull sow intake, the mean number of cull sow days on the farm is needed to estimate feed usage for this population.

## Lactation

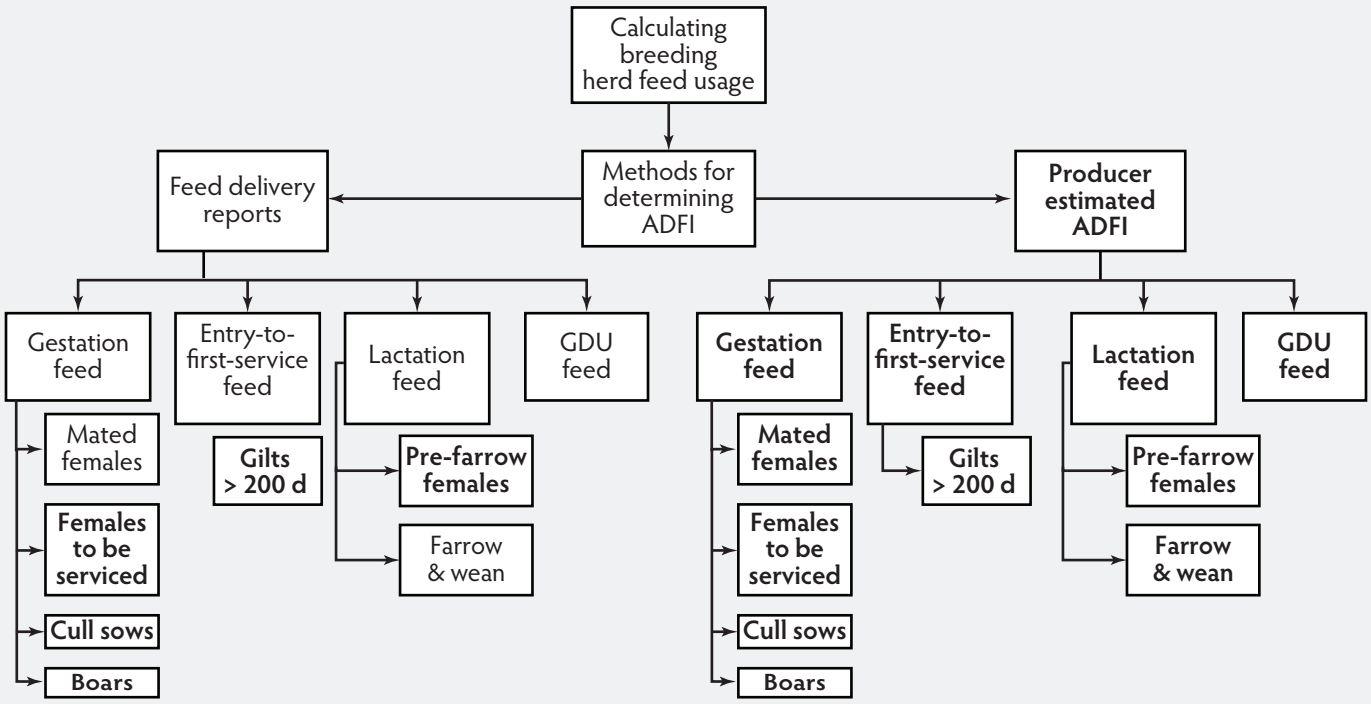
Lactation feed usage is determined separately for each subpopulation of females within the farrowing house. Female populations in lactation include pregnant females who have not yet farrowed (pre-farrow sows), females that farrow and wean a litter (normal lactating sows), females that farrow and wean > 1 litter (nurse sows), and females that farrow but do not wean a litter of pigs, ie, females that farrow and pigs are transferred onto another sow (weaned without a litter sows).

Pregnant females loaded into the farrowing house that have not yet farrowed is estimated based on female services and farrowing rate. The same calculation is used to estimate the number of normal lactating females while also accounting for nurse sows and those farrowed but did not wean a litter of pigs (weaned without a litter sows). The model allows for pregnant females loaded into the farrowing house that have not yet farrowed to be fed ad libitum, in which ADFI will be determined using the model, or the user can input estimated ADFI if they are not on full-feed. The model also has an option for lactation feed being fed to unmated nonproductive sows to be serviced (wean-to-service interval).

## Gilt development unit

The model is designed to capture gilt development feed usage, and the associated feed cost, starting at entry into the breeding herd. For producers purchasing or producing weaned replacement gilts, nursery feed usage and the associated feed cost, mortality, and selection rates should be included with GDU inputs. The user enters the annual mean days gilts are in the GDU before entering the breeding herd population (mean days in GDU). For example, if replacement gilts are purchased at weaning, the mean days entered would include days from purchase

**Figure 2:** Two different methods for determining feed usage. Regardless of method, the model requires (bold text) estimated ADFI values for females to be serviced, cull sows, gilts > 200 days of age (only if consuming gestation feed), and boars consuming gestation feed and pre-farrow females consuming lactation feed (only if pre-farrow sows are limit fed). ADFI = average daily feed intake; GDU = gilt development unit.




to entry into the breeding herd population (nursery + GDU). If females are purchased at selection (> 200 days of age) and thereafter directly enter the breeding herd, the resulting days in the GDU would be zero. Thus, the model allows for flexibility among productions systems to tailor GDU inputs specific to their system.

Female populations within the GDU include replacement gilts eligible to enter the gilt pool (replacement gilt pool), gilt mortality (GDU mortality), and non-select gilts (GDU non-selects).

Replacement gilt inventory is a function of replacement rate and total female inventory (> 200 days of age) accounting for gilt death loss and selection rate in the GDU. Gilt mortality is a function of GDU mortality rate. If the mean day of death within the GDU is unknown, a default value equivalent to half the days in GDU is used to determine how much feed was consumed before death. Non-select gilts are a function of GDU selection rate and if the mean days of feed consumed before non-select females are removed from the herd is unknown, a default value equivalent to half the days in the GDU is used.

## Practical application

The utility of the model was determined using data from a large commercial production system with multiple sow farms. Data was compiled from production records and farm managers based on current farm practices. The model calculates feed usage and feed cost per weaned pig and per inventoried sow for each subpopulation within gestation, lactation, and GDU. In addition, the model also calculates a system weighted mean (weighted by breeding herd female inventory) that can be used to help with benchmarking and identify farms that are greater than 1 SD from the mean.

Annual breeding herd productivity records were obtained (Porcitec; Agritec Software) from 4 breeding herds within a large production system to evaluate the model (Table 2). All 4 farms house gestating females in conventional gestation stalls and are fed via feed drops. Females across all 4 farms were fed in gestation stalls during the wean-to-estrus period and provided feed ad libitum. Cull sows were housed in pens or gestation stalls and provided feed ad libitum before being sold. Upon moving into the farrowing house (day 113 of gestation) females were limit fed until farrowing. Thereafter, the feeders in lactation allowed for ad libitum feed intake during lactation. Replacement gilts entered an off-site nursery at weaning, spent 50 days in the nursery, and were then transported to the GDU. Gilts entered the unmated breeding herd population at approximately 200 days of age. Gilts were provided feed ad libitum in the nursery and GDU.

Model calculated mated female (gestation) ADFI for farms 1, 2, 3, and 4 were 2.2, 2.1, 2.3, and 2.4 kg, respectively (Table 3). The producer estimated mated female ADFI at 2.0 kg which was 0.2 kg less feed per day than consumed. The mated female population consumes the greatest quantity of feed among female subpopulations within gestation. Thus, discrepancies between model calculations and producer estimates can have a large financial impact and it is important to understand why differences exist. Factors possibly contributing to the increase in ADFI for mated females could be feed wastage, thin females requiring more feed, or inaccurate feed drops.

Model calculated lactation ADFI for farms 1, 2, 3, and 4 were 5.6, 6.6, 6.4, and 6.2 kg, respectively, compared to the producer's

**Table 1:** Equations used in the estimation of female inventories per week for each breeding herd population*

| Population | Equation |
|---|---|
| Gestation | |
| Mated females | |
| Mortality† | = (total female inventory × avg mortality rate, %) (365.25/7) |
| Re-cycles | = (avg services per wk × (1 – avg farrowing rate, %)) – mortality per wk |
| Gestating sows | = avg services per wk × farrowing rate, % |
| Unmated females | |
| Entry-to-first-service interval‡ | |
| Serviced gilts | = (gilts available per wk × gilts bred, %) |
| Skipped gilts§ | = (gilts available per wk - gilts serviced per wk) × gilts skipped, % |
| Culled gilts¶ | = (gilts available per wk - gilts serviced per wk) × (1 – gilts skipped, %) |
| Nonproductive sows | |
| Weaned females to be serviced** | = (females that farrow and wean per wk + nurse sows weaned per wk) × weaned females bred, % |
| Weaned without a litter to be bred†† | = weaned zero females per wk × weaned zero females bred, % |
| Re-cycles to be serviced | = re-cycles per wk × re-cycles bred, % |
| Culled sows | = (total female inventory × avg culling rate, %) (365.25/7) |
| Lactation | |
| Pre-farrow sows | = avg services per wk × farrowing rate, % |
| Normal lactating sows | = (avg services per wk × farrowing rate, %) × (1 – nurse sow, % + weaned zero females, %) |
| Nurse sow | = (avg services per wk × farrowing rate, %) |
| Weaned without a litter sows†† | = (avg services per wk × farrowing rate, %) × nurse sow, % × weaned zero females, % |
| GDU | |
| Replacement gilt pool | = **[(**{(total female inventory × replacement rate, %) + [(total female inventory × replacement rate, %) × avg GDU mortality rate, %] + [(total female inventory × replacement rate, %) × (1 – avg GDU selection rate, %)]} / 365.25**)** × 7**]** – (GDU mortality – GDU selection) |
| GDU mortality | = {[(total female inventory × replacement rate, %) × avg GDU mortality rate, %] / 365.25} × 7 |
| GDU non-selects‡‡ | = {[(total female inventory × replacement rate, %) × (1 – avg GDU selection rate, %)] / 365.25} × 7 |

* The model was designed assuming farrowings are uniformly distributed through the week (continuous mating).
† The model assumes mortality occurs within the gestation population to mated females only.
‡ Gilts available per week are defined as gilts > 200 days of age, within the entry-to-first-service interval, and eligible to bred.
§ Gilts skipped are defined as gilts who skip a heat and are serviced 21 days later.
¶ The model assumes if the eligible gilt is not bred or skipped, she is culled.
** Weaned females to be serviced includes females that farrow and wean a litter and females that farrow and wean > 1 litter (nurse sow).
†† Females who weaned without a litter are defined as females who farrow and pigs are transferred to another sow.
‡‡ GDU non-selects is defined as gilts not selected to enter the replacement gilt pool and are removed from the breeding herd.
GDU = gilt development unit.

**Table 2:** Selected model inputs from 4 sow farms to demonstrate model use*

| Input variable | Farm 1 | Farm 2 | Farm 3 | Farm 4 |
|---|---|---|---|---|
| Female inventory† | 1583 | 4109 | 2772 | 1480 |
| Boar inventory | 3 | 10 | 17 | 4 |
| Avg services (sows & gilts)/wk | 80 | 213 | 142 | 77 |
| Re-cycles serviced, % | 43 | 63 | 99 | 70 |
| Avg days found open, d‡ | 40 | 58 | 37 | 42 |
| Wean-to-estrus interval, d | 5.9 | 6.8 | 7.7 | 6.9 |
| Avg farrow rate, % | 87.6 | 80.1 | 79.0 | 85.8 |
| Avg culling rate, % | 46.4 | 48.0 | 35.3 | 40.5 |
| Avg cull sow days, d§ | 24 | 27 | 24 | 22 |
| Avg mortality rate, % | 9.9 | 12.8 | 16.0 | 10.6 |
| Entry-to-first-service interval, d | 23.4 | 15.3 | 46.7 | 21.7 |
| Entry-to-removal interval, d | 41 | 51 | 71 | 11 |
| Avg lactation length, d | 20.1 | 21.6 | 24.6 | 18.9 |
| Avg nurse sows weaned, %¶ | 3.5 | 5.0 | 8.5 | 3.8 |
| Avg sows weaned zero, %** | 0.3 | 7.4 | 3.6 | 4.3 |
| Avg number of pigs weaned/wk | 818 | 1929 | 1156 | 789 |
| Avg replacement rate, % | 58.6 | 62.3 | 49.4 | 45.7 |
| Unmated females to be serviced ADFI, kg†† | 3.4 | 3.4 | 3.4 | 3.4 |
| Unmated cull sows ADFI, kg†† | 3.0 | 3.0 | 3.0 | 3.0 |
| Boar ADFI, kg†† | 2.0 | 2.0 | 2.0 | 2.0 |
| Unmated gilts entry-to-first-service interval ADFI, kg†† | 3.0 | 3.0 | 3.0 | 3.0 |
| Pre-farrow ADFI, kg†† | 2.7 | 2.7 | 2.7 | 2.7 |

* Averages are reported on an annual basis unless otherwise specified.
† Total female inventory includes gilts > 200 days of age and sows.
‡ Average days from first service to found open.
§ Average days cull sows remain on the farm after classified as a cull sow.
¶ Females that farrow and wean > 1 piglet.
** Females that farrow but wean zero piglets.
†† Producer estimated ADFI based on farm observations.
ADFI = average daily feed intake.

**Table 3:** Model calculated ADFI for each sow farm*

| Input variable | Farm 1 | Farm 2 | Farm 3 | Farm 4 |
|---|---|---|---|---|
| Calculated mated female ADFI, kg | 2.2 | 2.1 | 2.3 | 2.4 |
| Calculated lactation ADFI, kg† | 5.6 | 6.6 | 6.4 | 6.2 |
| Calculated GDU ADFI, kg‡ | 2.0 | 2.0 | 3.3 | 1.8 |

* Model calculated ADFI was derived from feed delivery inputs for females in gestation and lactation (using the optimization tool to separate deliveries to gestation, entry-to-first-service interval, and lactation), and feed budget inputs for GDU.
† Females are provided with ad libitum feed at farrowing.
‡ Gilts are produced internally and enter the breeding herd population at 200 d of age.
ADFI = average daily feed intake; GDU = gilt development unit.

estimate for lactation feed intake at 5.9 kg (Table 3). Lactating females consumed 0.3 kg more per day than the producer estimated. Within this production system, pre-farrow females in a lactation stall were provided 2.7 kg of feed per day until farrowing, after which females were provided with ad libitum feed. Speculation for differences in model calculated and producer estimated lactating female ADFI could be that pre-farrow females received more than the allotted 2.7 kg per day. Other possibilities include poor feeder management (wastage) or differences in parity structure.

Model calculated ADFI for GDU (from weaning to 200 days) using feed delivery for farms 1, 2, 3, and 4 were 2.0, 2.0, 3.3, and 1.8 kg, respectively (Table 3). Feed delivery records included nursery and GDU. Within this system, nursery and GDU sites commonly supplied gilts for multiple sow herds. Therefore, nursery and GDU feed deliveries were partitioned appropriately to accurately reflect gilt flow among the breeding herds.

Model calculated feed usage and feed cost per weaned pig are presented in Figures 3 and 4 and per inventoried sow in Figures 5 and 6. Gestation, lactation, and GDU diet costs differ among the breeding herds due to different feed mills manufacturing the feed. Gestation, lactation, and GDU feed usage and feed cost per weaned pig for all 4 farms were 54.3 kg and $10.71. Similarly, gestation, lactation, and GDU feed usage and feed cost per inventoried sow for all 4 farms were 1336 kg and $263.76.

The use of this model within this production system highlights differences in feed usage and feed cost between the 4 farms. Weaned pig feed usage and feed cost were greatest on farm 3 and lowest on farm 4 (Figures 3 and 4). These differences were influenced by the number of pigs weaned as well as differences in feed usage in gestation, lactation, and GDU, with farm 3 feed usage being the greatest in almost all subpopulations. When evaluating differences in feed usage and feed cost per inventoried sow, farm 3 was the greatest, however the magnitude of differences in feed usage and feed cost within each subpopulation were smaller. This showcases the reduction in the number of pigs weaned on farm 3 compared to remaining farms.

The model calculated notable differences in feed usage, and in turn feed cost, in gestating females, re-cycles, serviced gilts, weaned females to be serviced, and cull sow subpopulations within gestation. Gestation diet cost was $0.18/kg for farms 1 and 2 and $0.17/kg for farms 3 and 4. Based on delivery data, estimated ADFI for gestating females on farm 4 was 0.2 kg greater than the remaining 3 farms, contributing to the $12.77 increase in feed cost per inventoried sow (Table 4). Gestating females on farm 2 had the lowest feed cost per inventoried sow; however, feed usage per inventoried sow for re-cycles was the greatest at 50.3 kg, compared to the mean of the other 3 farms at 27.1 kg. This can be partially explained by a lower farrowing rate and greater days from first service to found open for farm 2 compared to the mean of the other farms. This contributed to increased feed cost of $0.18/weaned pig and $4.37/inventoried sow for farm 2 compared to the mean of farms 1, 3, and 4 (Table 4). Similarly, farm 2 fed cull sows for an additional 4 days compared to other farms and had a higher culling rate, contributing to an increased feed cost of $0.09/weaned pig and $2.08/inventoried sow (Table 4). Lastly, serviced gilts from farm 3 had the greatest feed usage per weaned pig and per inventoried sow (Table 4). This can be partially explained by an increase in the entry-to-first-service interval for gilts on farm 3 by 27 days, contributing to an increase in feed cost of $0.30/weaned pig and $5.54/inventoried sow. Thus, within gestation, the model indicated there were numerous subpopulations of females with differences in feed usage and cost. Using the model allows for the user to further diagnose and understand where opportunities exist to reduce breeding herd feed usage and, subsequently, feed cost.

Differences in feed usage and feed cost were observed in lactation subpopulations as well. Lactation diet cost was $0.23/kg for farms 1, 2, and 3 and $0.22/kg for farm 4. In farm 3, feed cost increased by $0.80/weaned pig and $7.29/inventoried sow or normal lactating sows and $0.20/weaned pig and $3.79/inventoried sow for nurse sow subpopulations compared to the mean of the other farms (Table 4). These differences are attributed to numerous factors, including increased ADFI in lactation, increased lactation length, and increased percentage of nurse sows in farm 3.

In addition to gestation and lactation, the model also highlighted differences in feed usage and feed cost per weaned pig and per inventoried sow for GDU subpopulations. Within this system, diet cost was $0.21/kg for farms 1, 2, and 3 and $0.20/kg for farm 4. Feed cost for replacement gilts was $1.45/weaned pig and $23.99/inventoried sow more in farm 3 compared to the mean of the other farms (Table 4). Similarly, non-select gilt feed cost was $0.25/weaned pig and $4.20/inventoried sow more in farm 3 compared to farms 1, 2, and 4 (Table 4). These differences in feed cost can be explained by increased gilt ADFI in farm 3 compared to farms 1, 2, and 4 (Table 3), as well as difference in pigs weaned and female inventory.

## Conclusions

The purpose of this paper was to describe a production tool that can be used as a resource by swine producers to understand differences in feed usage and feed cost within the breeding herd. The model developed was successful at partitioning feed usage and feed cost among subpopulations within gestation, lactation, and GDU within multiple farms from a commercial swine production system.

When demonstrating model use, feed usage and subsequent feed cost per weaned pig and per inventoried sow was determined, illustrating the variability that can exist within systems and how to rationalize and make sense of these differences. Due to the complexity of the response variable, the model cannot quantify financial impacts of individual variables; however, the model remains useful for benchmarking and highlighting differences among the different farms.

## Implications

- Feed use and cost was determined for each subpopulation of females in the herd.
- The model shows the complexity of feed usage within the sow farm and GDU.
- In addition to number of weaned pigs, other factors also can reduce feed cost.


## Acknowledgments

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### Conflict of interest

None reported.

### Disclaimer

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

**Figure 3:** Model calculated annual feed usage per weaned pig for each breeding herd segment for each of the 4 farms.

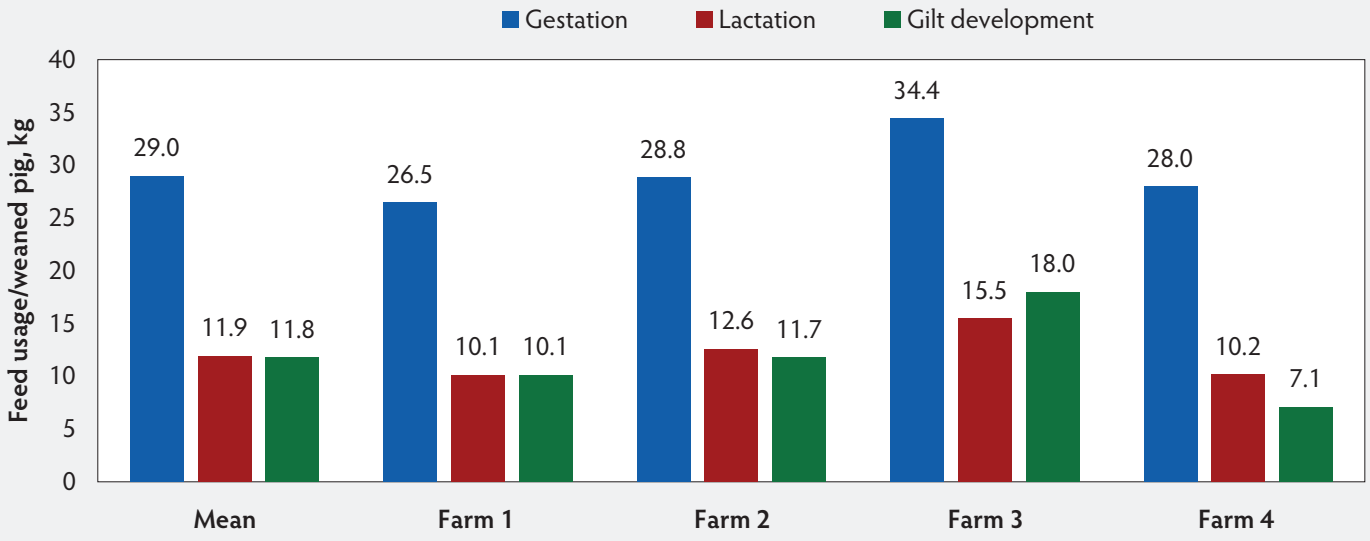
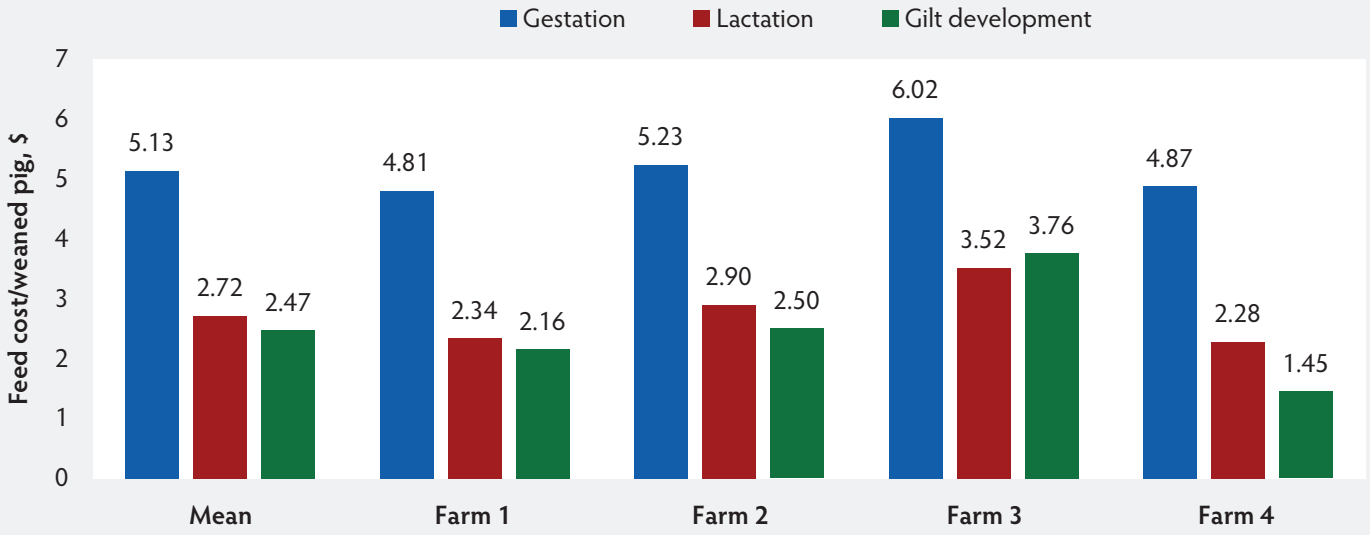



**Figure 4:** Model calculated annual feed cost per weaned pig for each breeding herd segment for each of the 4 farms.




be specific to the research or commercial 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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**Figure 5:** Model calculated annual feed usage per inventoried sow for each breeding herd segment for each of the 4 farms.

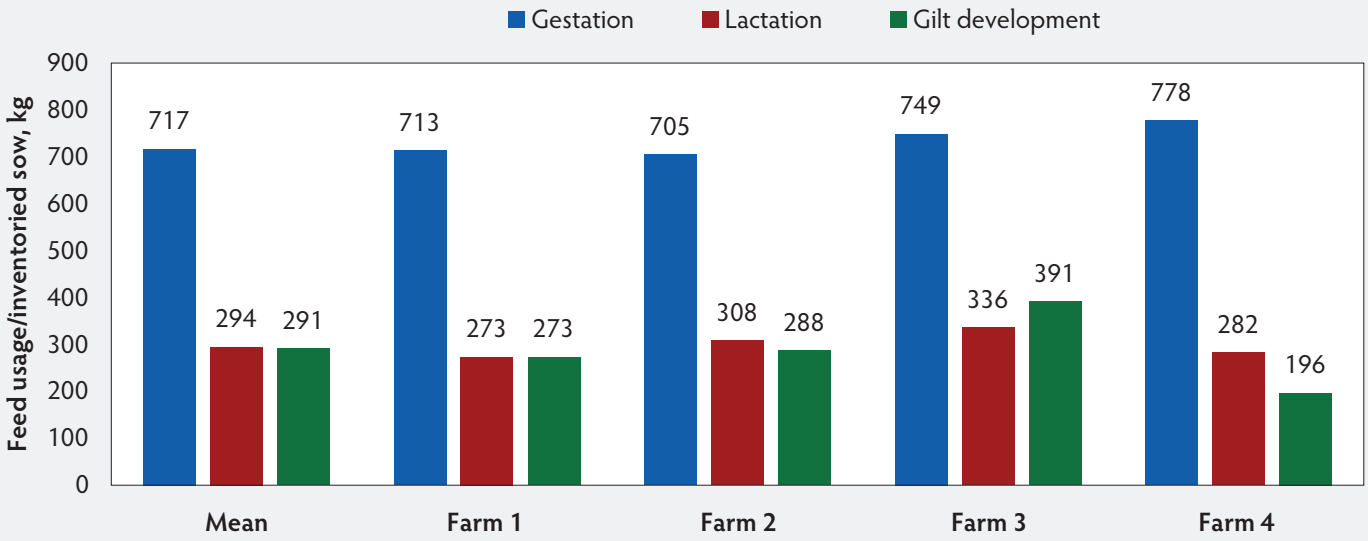


**Figure 6:** Model calculated annual feed cost per inventoried sow for each breeding herd segment for each of the 4 farms.

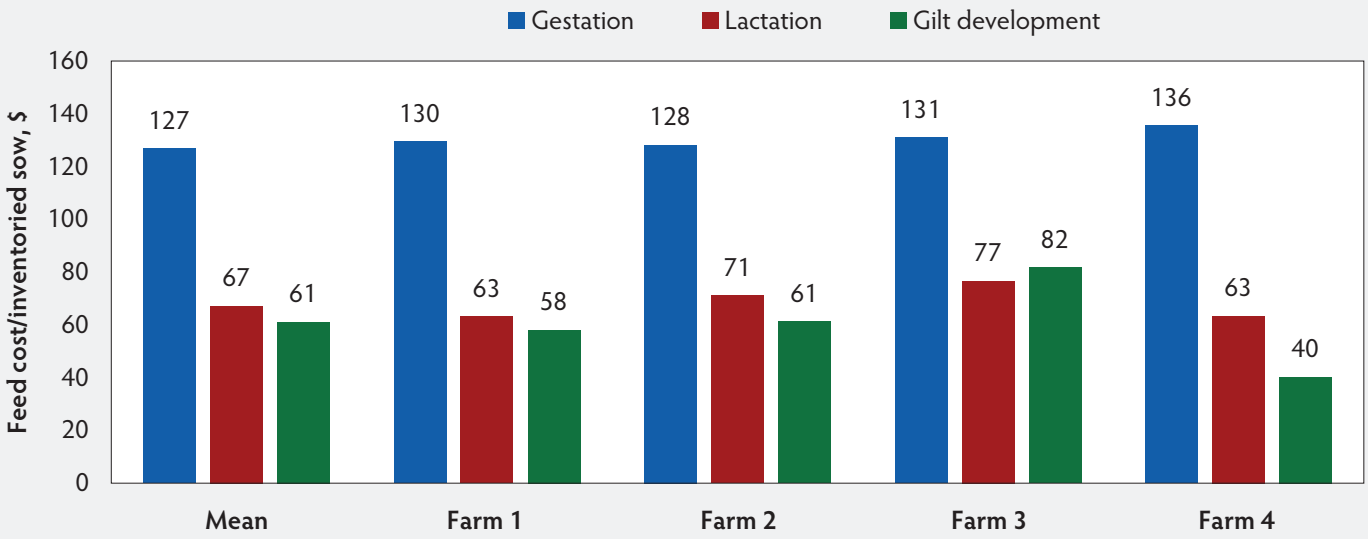

**Table 4:** Feed usage and cost per weaned pig and per inventoried sow by subpopulation on 4 sow farms*†

| Parameter | Farm 1 | Farm 2 | Farm 3 | Farm 4 |
|---|---|---|---|---|
| Gestation | | | | |
| Gestating sows | | | | |
| Days on feed, d | 114 | 113 | 113 | 114 |
| Annual inventory | 3649 | 8885 | 5834 | 3444 |
| Annual intake, metric ton | 894 | 2136 | 1510 | 9366 |
| Annual feed cost, $ | 162,484 | 388,153 | 264,194 | 163,185 |
| Feed usage/weaned pig, kg | 21.0 | 21.2 | 25.0 | 22.8 |
| Feed cost/weaned pig, $ | 3.81 | 3.86 | 4.38 | 3.97 |
| Feed usage/inventoried sow, kg | 565 | 520 | 545 | 633 |
| Feed cost/inventoried sow, $ | 102.64 | 94.46 | 95.32 | 110.25 |
| Re-cycles | | | | |
| Days on feed, d | 40 | 58 | 37 | 42 |
| Annual inventory | 360 | 1,681 | 1,107 | 413 |
| Annual intake, metric ton | 31 | 207 | 93 | 42 |
| Annual feed cost, $ | 5654 | 37,602 | 16,195 | 7275 |
| Feed usage/weaned pig, kg | 0.7 | 2.1 | 1.5 | 1.0 |
| Feed cost/weaned pig, $ | 0.13 | 0.37 | 0.27 | 0.18 |
| Feed usage/inventoried sow, kg | 20 | 50 | 33 | 28 |
| Feed cost/inventoried sow, $ | 3.57 | 9.15 | 5.84 | 4.91 |
| Serviced gilts, > 200 days | | | | |
| Days on feed, d | 23 | 15 | 47 | 22 |
| Annual inventory | 835 | 2304 | 1232 | 609 |
| Annual intake, metric ton | 59 | 106 | 173 | 40 |
| Annual feed cost, $ | 10,652 | 19,221 | 30,204 | 6905 |
| Feed usage/weaned pig, kg | 1.4 | 1.1 | 2.9 | 1.0 |
| Feed cost/weaned pig, $ | 0.25 | 0.19 | 0.50 | 0.17 |
| Feed usage/inventoried sow, kg | 37 | 26 | 62 | 27 |
| Feed cost/inventoried sow, $ | 6.73 | 4.68 | 10.90 | 4.67 |
| Females culled | | | | |
| Days on feed, d | 24 | 27 | 24 | 22 |
| Annual inventory | 735 | 1972 | 978 | 599 |
| Annual intake, metric ton | 53 | 161 | 70 | 39 |
| Annual feed cost, $ | 9609 | 29,261 | 12,183 | 6880 |
| Feed usage/weaned pig, kg | 1.2 | 1.6 | 1.2 | 1.0 |
| Feed cost/weaned pig, $ | 0.23 | 0.29 | 0.20 | 0.17 |
| Feed usage/inventoried sow, kg | 33 | 39 | 25 | 27 |
| Feed cost/inventoried sow, $ | 6.07 | 7.12 | 4.40 | 4.65 |
| Annual feed cost, $ | 90,921 | 256,119 | 182,896 | 83,397 |
| Feed usage/weaned pig, kg | 9.2 | 11.0 | 13.3 | 9.0 |

**Table 4:** Continued

| Parameter | Farm 1 | Farm 2 | Farm 3 | Farm 4 |
|---|---|---|---|---|
| Lactation | | | | |
| Normal lactating sows | | | | |
| Days on feed, d | 20 | 22 | 25 | 19 |
| Annual inventory | 3511 | 7878 | 5125 | 3165 |
| Annual intake, metric ton | 394 | 1110 | 804 | 372 |
| Annual feed cost, $ | 90,921 | 256,119 | 182,896 | 83,397 |
| Feed usage/weaned pig, kg | 9.2 | 11.0 | 13.3 | 9.0 |
| Feed cost/weaned pig, $ | 2.13 | 2.54 | 3.03 | 2.03 |
| Feed usage/inventoried sow, kg | 249 | 270 | 290 | 251 |
| Feed cost/inventoried sow, $ | 57.4 | 62.3 | 66.0 | 56.3 |
| Nurse sows | | | | |
| Days on feed, d | 26 | 27 | 28 | 26 |
| Annual inventory | 127 | 443 | 498 | 130 |
| Annual intake, metric ton | 18.1 | 77.5 | 87.3 | 20.6 |
| Annual feed cost, $ | 4172 | 17,889 | 19,852 | 4615 |
| Feed usage/weaned pig, kg | 0.4 | 0.8 | 1.5 | 0.5 |
| Feed cost/weaned pig, $ | 0.10 | 0.18 | 0.33 | 0.11 |
| Feed usage/inventoried sow, kg | 11 | 19 | 31 | 14 |
| Feed cost/inventoried sow, $ | 2.64 | 4.35 | 7.16 | 3.12 |
| GDU | | | | |
| Replacement gilt pool | | | | |
| Days on feed, d | 199 | 199 | 199 | 199 |
| Annual inventory | 928 | 2560 | 1369 | 676 |
| Annual intake, metric ton | 363 | 994 | 912 | 245 |
| Annual feed cost, $ | 77,383 | 211,800 | 190,563 | 50,136 |
| Feed usage/weaned pig, kg | 8.5 | 9.9 | 15.1 | 5.9 |
| Feed cost/weaned pig, $ | 1.81 | 2.10 | 3.16 | 1.22 |
| Feed usage/inventoried sow, kg | 229 | 242 | 329 | 165 |
| Feed cost/inventoried sow, $ | 48.88 | 51.54 | 68.76 | 33.87 |
| GDU non-selects | | | | |
| Days on feed, d | 99.5 | 99.5 | 99.5 | 99.5 |
| Annual inventory | 325 | 896 | 479 | 237 |
| Annual intake, metric ton | 64 | 174 | 160 | 43 |
| Annual feed cost, $ | 13,542 | 37,065 | 33,349 | 8774 |
| Feed usage/weaned pig, kg | 1.5 | 1.7 | 2.6 | 1.0 |
| Feed cost/weaned pig, $ | 0.32 | 0.37 | 0.55 | 0.21 |
| Feed usage/inventoried sow, kg | 40 | 42 | 58 | 29 |
| Feed cost/inventoried sow, $ | 8.55 | 9.02 | 12.03 | 5.93 |

* Diet cost for gestation, lactation, and GDU were the same across farms.
† Inventory, intake, and feed costs are reported on an annual basis unless otherwise specified.
GDU = gilt development unit.

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# Checkoff's National Swine Disease Council meets, sets key ASF objectives

As part of that National Pork Board's new operating structure, the first face-to-face meeting of the National Swine Disease Council (NSDC) was held in February. The 14-member group, made up of producers, veterinarians, packers, and allied industry, officially made African swine fever (ASF) the top priority for 2020 and spelled out key recommendations to keep it from reaching the United States while making contingency plans for a worst-case scenario.

Although the council's members serve as the decision-making body, day-to-day work is overseen by staff representing Pork Checkoff, the National Pork Producers Council, the American Association of Swine Veterinarians, the Swine Health Information Center, and the North American Meat Institute.

"The structure of the National Swine Disease Council will allow us to be quicker in what we deliver to producers than the old swine health committee structure would allow," said National Pork Board member, Russ Nugent, director of technical services at Tyson Foods. "It's all about building trust and adding value today. We have to focus on the areas that we can control and keep moving."

The main ASF focus areas for the NSDC this year include:

- Feed restriction and mitigation strategies to prevent ASF entry.
- Identification and research of additional exposure pathway risks of ASF entry.
- Review biosecurity gaps for research needs for ASF prevention and preparedness.
- Research the effectiveness of commonly used disinfectants on the ASF virus
- Work with key groups to further support ASF vaccine development.
- Fund studies needed for detection of ASF, effective and alternative samples for surveillance, and focus on oral fluids implementation for national surveillance.
- All efforts supporting, but not solely limited to, prevention of ASF entry.

"Let's remember that we control our own destiny," said Dr Jeff Kaisand, Iowa's state veterinarian and NSDC member. "We can't just rely on state and federal government for answers. We need producers to take charge of what they can on their farms to stay ASF-free. This is definitely an all-out team effort."

In other council actions, Al Wulfekuhle, a producer from Quasqueton, Iowa, was elected to serve as chair of the NSDC while Dr Matthew Turner, a veterinarian and head of pork live operations at JBS USA, was nominated to serve as co-chair.

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

# National Pork Board provides COVID-19 producer resources

As the COVID-19 crisis became clear this spring, staff at the National Pork Board began their response by offering information and resources to all segments of the pork chain with an emphasis on producer and public health and overall business continuity. David Newman, president of the National Pork Board, emphasized that the Checkoff always is actively promoting pork, making real-time adjustments to messages in the marketplace, and putting extra resources behind making sure consumers have simple and easy pork preparation top of mind.

To achieve a comprehensive approach to COVID-19, the National Pork Board continues to:

- Provide producers tools to stay informed, keep their people healthy, and care for their pigs.
- Be a resource for consumers as they prepare more meals at home.
- Stand ready to assist our packer, grocery store, and restaurant partners.
- Partner with our state pork associations to provide localized assistance.

"By implementing the Pork Checkoff's new strategic vision, our organization has been able to quickly adapt to the changing global situation caused by COVID-19," Newman said. "With our producer-led focus, we are providing America's pig farmers with resources and tools that will allow them to care for their people and pigs with the goal of minimal business disruption."

For more information, visit **pork.org/COVID-19**.

*NPB news continued on page 149*

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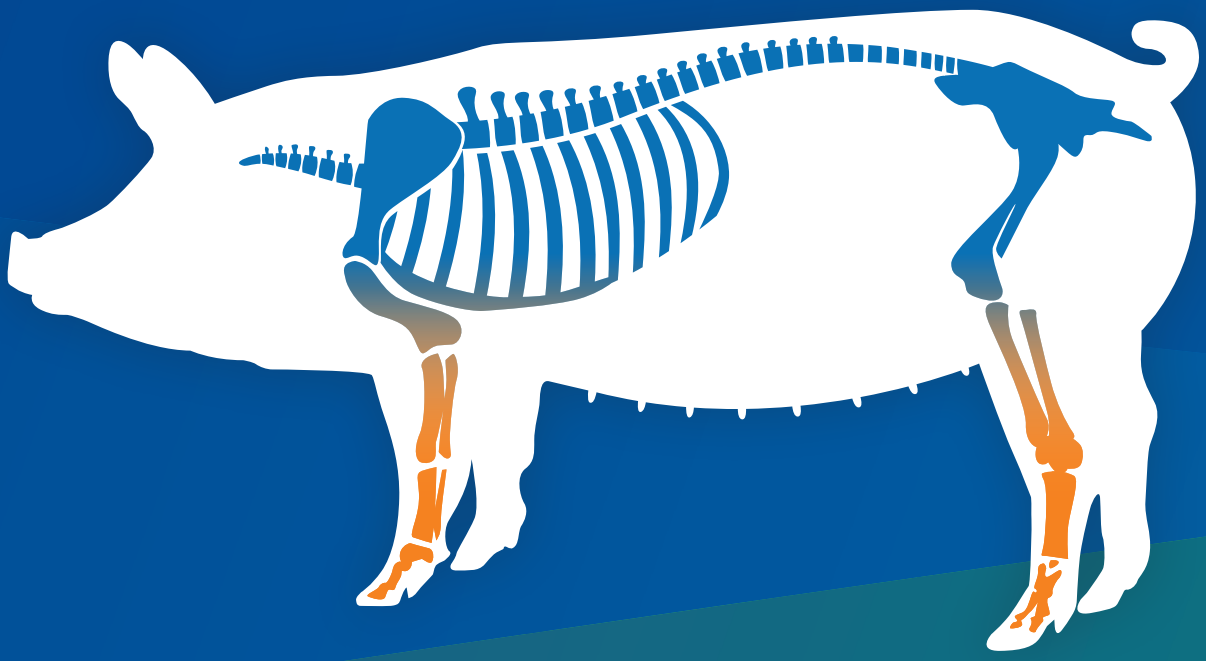

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*NPB news continued from page 147*

# Checkoff applauds USDA's ASF action plan

In March, US Department of Agriculture's (USDA) Under Secretary for Marketing and Regulatory Programs Greg Ibach announced a plan to protect the pork industry should African swine fever (ASF) be detected in the country.

"It's our full intent at USDA to make sure we do everything we can to keep ASF out of the United States. But in the event that does not happen, we want to be prepared and we want to have the industry prepared for how we move forward," Ibach said.

This plan will give the pork industry the ability to have uniformity between states in how they manage the disease. The USDA is working in cooperation with the state veterinarians and the US pork industry to lay the groundwork for the plan.

The USDA is prepared to implement the following measures to help ensure an immediate and effective response if ASF is detected in the United States:

- The Secretary would immediately take necessary steps to declare an "extraordinary emergency" establishing USDA as the leader of a coordinated national approach to control and eradication and ensuring the availability of funding and additional resources necessary for the response.
- The USDA would issue a national standstill of at least 72 hours to prohibit all movement of swine increasing USDA's ability to stop disease spread and to act quickly to restore movement on a regionalized basis.
- For the depopulation of infected and exposed animals, USDA would work with states and industry to utilize the most efficient and effective depopulation methods approved by the American Veterinary Medical Association that are appropriate for the affected premises.
- To prevent virus from leaving infected premises, USDA will work proactively with industry and states to ensure producers have herd plans to deal with carcass disposal in line with regional and local requirements, supporting composting and burial in place as preferred options.
- To reduce paperwork, USDA plans to pay for virus elimination at a uniform, flat rate, based on the size of affected premises.

"In today's pork industry, we've got producers who work in and have farms in multiple states," said Dr Dave Pyburn, chief veterinarian for the National Pork Board. "Having different guidelines in different states is very confusing, so this is great that USDA is responding to what they saw in the exercise last fall as a need for our industry and figuring out a way to get it done."

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

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# AASV NEWS

## AASV installs 2020 officers

Dr Jeffrey Harker was installed as president of the American Association of Swine Veterinarians on March 10, 2020 during the association's 51st Annual Meeting in Atlanta, Georgia. He succeeds Dr Nathan Winkelman, who is now immediate past president. Dr Mary Battrell has ascended to president-elect. The newly elected vice president is Dr Michael Senn.

AASV officers (left to right) Dr Jeff Harker (President), Dr Mary Battrell (President-elect), Dr Michael Senn (Vice President), and Dr Nathan Winkelman (Past President).

**AASV President Dr Jeffrey Harker** (Purdue '94) grew up on a diversified livestock and grain farm near Waldron, Indiana. Active in 4-H and FFA as a youth, he received his American Farmer degree from FFA in 1989. Since graduation from veterinary school, Dr Harker has worked exclusively in swine practice. He first joined Dr Max Rodibaugh at Swine Health Services as an associate veterinarian and then became a partner in 2001. Their practice (now AMVC Swine Health Services) is dedicated to swine and serves a very diverse swine clientele ranging from small show pig herds to contract growers in integrated production. Dr Harker has served on the AASV Board of Directors, has represented AASV in the American Veterinary Medical Association's House of Delegates, has served on the AASV Annual Meeting Planning Committee, and was the Indiana Pork Producers Association president. Dr Harker has also been involved with the National Pork Board's Operation Main Street program since it began several years ago. Dr Harker was the 2017 recipient of the AASV Meritorious Service Award. He lives in rural Clinton County, Indiana, with his wife Traci and the younger two of their four children; their older two daughters live nearby, each with daughters of their own.

When asked to comment on his thoughts about the future of AASV and his tenure as president, Dr Harker said, "I am looking forward to working with the AASV Board, members, and staff on solving the challenges as they arise over the next year. Considering the current poor market situation along with the increased threat of foreign animal disease, the AASV will need to continue to provide the best scientific information to the swine industry. I hope that I can help maintain AASV's past success in navigating through these challenges."

**AASV President-elect Dr Mary Battrell** (ISU '95) was born and raised on a diversified crop and livestock family farm in Albany, Ohio. She earned a BS from The Ohio State University, an MS from the University of Tennessee, and her DVM and an additional MS from Iowa State University in 1995. She began her veterinary career in North Carolina working for Dr Fred Cunningham, followed by Brown's of Carolina, and then Pharmacia as a technical service veterinarian. Since 2000, Dr Battrell has worked for Smithfield Hog Production, where she is currently the staff veterinarian for Smithfield Hog Production's Central Region and is responsible for the health and well-being of 92,000 sows farrow-to-finish. She has been actively involved in the development of the Smithfield Animal Care Program and their contingency plan for a foreign animal disease. Dr Battrell has served on the AASV Pig Welfare and Pharmaceutical Issues Committees and was the 2018 recipient of the AASV Swine Practitioner of the Year Award.

**AASV Vice President Dr Michael Senn** (KSU '91) was involved in agriculture as a youth and raised on a diversified livestock and crop farm in Kansas, where he continues as the 4th generation operating the farm. Dr Senn credits his participation in 4-H and FFA as a youth with his passion for volunteerism and leadership. He has served AASV with two terms on the Board of Directors, as a committee member, as chair of the Foreign Animal Disease Committee (now Committee on Transboundary and Emerging Diseases), and as a student presentation judge. During his nearly 20-year career as a technical services veterinarian, he provided technical support for products and focused on clinical

research, antimicrobial resistance monitoring, antibiotic regulatory issues, and emerging infectious disease surveillance. He continues to work as an independent consultant.

Commenting on his upcoming vice-presidency, Dr Senn said, "I look forward to the opportunity to serve the passionate members of AASV, and working closely with the Board of Directors and staff to continue to provide science-based information to address the health and well-being of the animals that we work with, as well as public health. With the ever-changing challenges and opportunities we face, I'm optimistic about developing and enhancing relationships between AASV, allied industry groups, and regulatory agencies to proactively address each one."

Dr Senn lives in Newton, Kansas with his wife, Stephanie, and children Annika and Jakob.

**AASV Past President Dr Nathan Winkelman** (UMN '84) was raised on a diversified crop and livestock farm near St James, Minnesota. He received a BS degree in animal science and DVM from the University of Minnesota. Upon graduation, he joined a swine-exclusive veterinary practice in Morris, Minnesota, with Drs Rod Johnson and Tony Scheiber. Currently, Dr Winkelman is a partner with Dr Adam Mueller in Swine Services Unlimited, Inc, a swine research and consulting practice in Rice, Minnesota. He has served on the AASV Board of Directors and currently sits on the AASV Foundation Board. In addition, Dr Winkelman is an active participant in the National Pork Board's Operation Main Street program giving presentations to various groups to raise awareness about modern pork production.

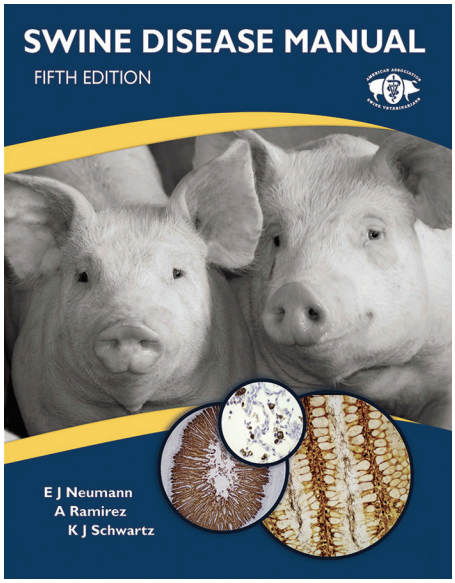
# AASV publishes Swine Disease Manual, 5th edition

The American Association of Swine Veterinarians is pleased to announce the publication of the 5th edition of the Swine Disease Manual, edited by Drs Eric Neumann, Alex Ramirez, and Kent Schwartz.

As in the previous edition, the book provides a concise overview of diseases and syndromes affecting swine. It serves as an informative reference for students, practitioners, producers, and others working in the swine industry. The new publication reflects the many changes that have occurred in the 10 years since the 4th edition was released, including updated information on African swine fever, Senecavirus A, and swine enteric coronavirus diseases.

The softcover book is 191 pages of text, indexed, and includes a section on swine industry terminology and a chart of common abbreviations. A concluding section of tables serves as a valuable resource to identify and compare possible disease agents affecting a specific body system.

The Swine Disease Manual, 5th edition is available for $30.00 per copy, plus shipping and handling. Orders may be placed online at **ecom.aasv.org/sdm**.




# ABVP certifies Dr Neumann in Swine Health Management

Dr Eric Neumann, DVM MS PhD, of Mosgiel, New Zealand, has been certified as a Diplomate of the American Board of Veterinary Practitioners (ABVP) specializing in Swine Health Management.

Dr Neumann mastered a rigorous application process and certification examination in order to obtain Diplomate status. Neuman earned an MS and DVM from the University of Illinois and a PhD from Massey University, Institute of Veterinary, Animal, and Biomedical Sciences. He has been trained and has provided training in numerous topics including emerging diseases, epidemiology, foreign animal disease diagnosis, continuous quality improvement, and many more. Dr Neumann is licensed to practice veterinary medicine in the United States and New Zealand. He has taught at the University of Illinois and is currently an adjunct professor at Massey University. He has served on the *Journal of Swine Health and Production* Editorial Board and has been published more than 250 times in a variety of media and venues. Most recently, he led editing of the Swine Disease Manual, 5th edition. Dr Neumann is the owner and director of Epi-Insight Limited.

The ABVP, established in 1978, is one of twenty-one veterinary specialty groups accredited by the American Board of Veterinary Specialties, a division of the American Veterinary Medical Association. Today, over 900 veterinarians worldwide are certified in one of ABVP's 10 practice categories: Avian, Beef Cattle, Canine and Feline, Dairy, Equine, Exotic Companion Mammal, Feline, Food Animal, Reptile and Amphibian, Shelter Medicine, and Swine Health Management. Please visit **abvp.com** for more information.

# SWINE DISEASE MANUAL

## 5TH EDITION

EJ Neumann, A Ramirez, KJ Schwartz

*Fully revised!*

An informative reference for students, instructors, practitioners, technicians, producers, and anyone working in the swine industry

Provides a concise overview of bacterial, viral, parasitic, nutritional, and other diseases and syndromes affecting swine

Information for each etiologic agent includes alternate names, definition, occurrence, history, etiology, epidemiology, pathogenesis, clinical signs, lesions, diagnosis, and control

Includes a section on swine industry terminology and a handy chart of common abbreviations

Updated information on African swine fever, Senecavirus A, swine enteric coronavirus diseases, and more

191 pages of text; indexed

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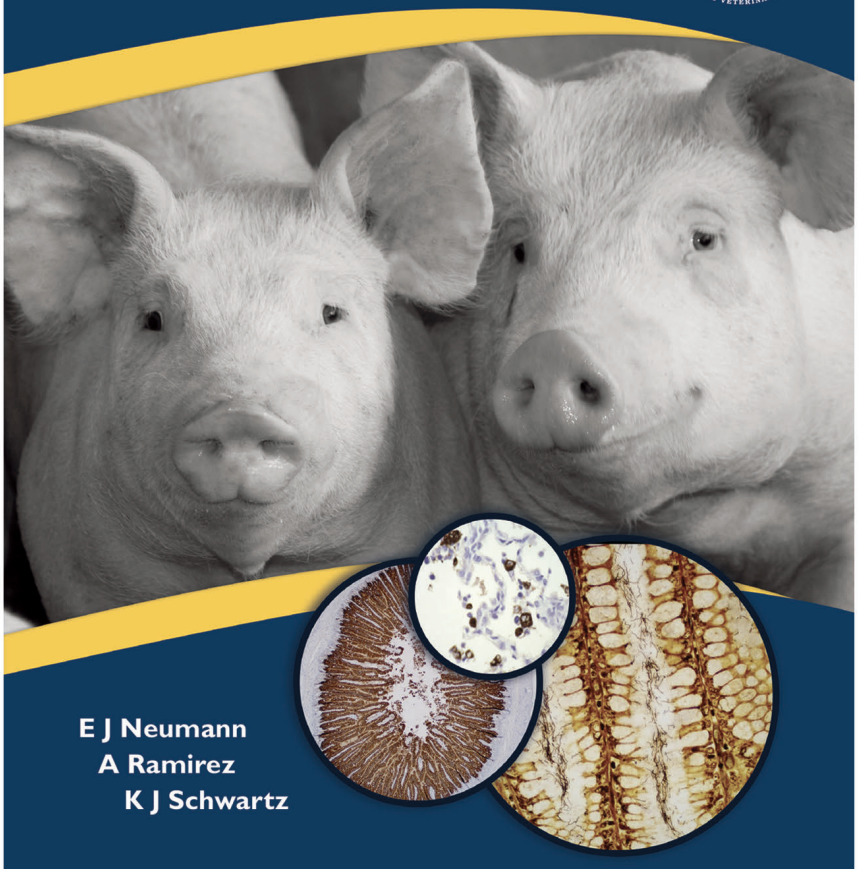


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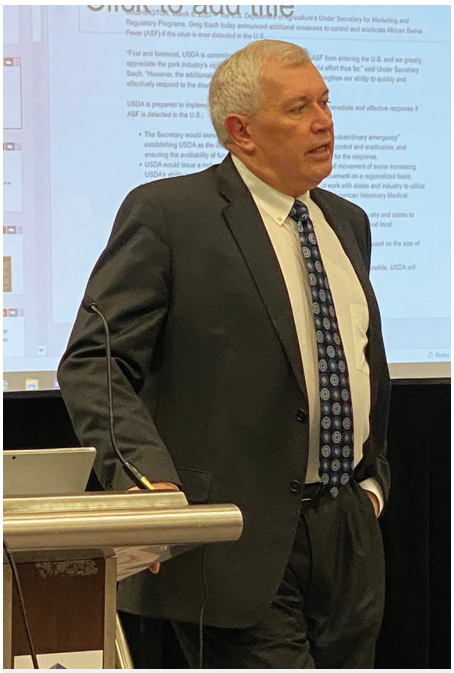
# AASV holds its 51st annual meeting in Atlanta with a 20/20 vision for the future

The American Association of Swine Veterinarians (AASV) held its 51st Annual Meeting in Atlanta, Georgia, March 7-10, 2020 at the Hyatt Regency Atlanta.

The meeting participants enjoyed the opportunity to attend numerous educational sessions, including 11 preconference seminars, 2 general sessions, 3 break-out sessions, 1 research topic session, 3 industrial partners sessions, the student seminar, and a poster session featuring posters from students, researchers, and industrial partners. Saturday's Emerging Technologies for the Swine Industry preconference seminar drew the most preregistered attendees. Discussions About How to Succeed Against the Flu seminar garnered the most attention from veterinarians on Sunday morning, while the Swine Medicine for Students preconference seminar was well attended by veterinary students. Sunday afternoon, veterinary students highlighted their research and experience to a large crowd during the student seminar.

Dr Jack Shere, US Department of Agriculture (USDA) Animal and Plant Health Inspection Service's Associate Administrator in charge of emergency planning and response, held a special Wake up with USDA session early Monday morning to answer questions and hear concerns about emergency response. This new and late-breaking addition to the meeting was well-received; approximately 100 members attended, asking questions related to indemnity and national stop movements, among others.



Dr Jack Shere answered questions during the early-morning Wake Up with USDA session.

Dr Bret Marsh, Indiana State Veterinarian, opened the Monday general session with the Howard Dunne Memorial Lecture. During his presentation, titled "Trust the people", he told attendees that government can work for the people. Describing foreign animal disease threats and the future of pork production in the United States, Dr Marsh emphasized that the US pork industry, with veterinary input, must determine its own fate.

Dr Bill Hollis, 2019 AASV Swine Practitioner of the Year, presented the Alex Hogg Memorial Lecture titled "Choosing a pathway forward in practice." He described his vision on where the US pork industry may be going and how we might help along the way. He encouraged attendees to continue to build relationships with influential people and offered many suggestions on how to keep learning.

Dynamic speaker Dr Betsy Charles, from the Veterinary Leadership Institute, tied the Monday morning general session together with her presentation titled "Reset to positive." In her talk, she described life as the navigation of good and terrible. She encouraged all attendees to focus on increasing their optimism levels, embracing their social support networks, and strengthening one's ability to see stress as a challenge instead of a threat.

The Monday afternoon concurrent sessions encouraged veterinarians to consider disease control and elimination, biosecurity, and pharmaceutical issues. The Tuesday general session focused on two critical areas: swine welfare and foreign animal disease prevention.

In addition, 14 AASV committees met during the annual meeting to discuss important issues in swine health, public health, animal well-being, and membership. A new committee, established by the AASV Board of Directors at their October 2019 meeting, focused their discussions on identifying resources needed by early career swine veterinarians.

Drs Megan Nickel (left) and Kate Dion attend the meeting of the new AASV Early Career Committee.

New to the meeting this year was an AASV Veterinarian Well-being Center. The center offered American Veterinary Medical Association (AVMA) Wheels of Well-Being, interactive displays, tips to support a culture of well-being, hand sanitizers donated by Apiam Solutions, Camfil, and Newport Laboratories, and other well-being resources.

A social media booth sponsored by Elanco Animal Health encouraged and provided tips for members to stay connected with AASV and other industry partners on social media. They displayed the live #AASV2020 conversation in real-time.

The AASV Awards Reception was held Monday night, followed by the AASV Foundation's annual fundraising auction. Dr George Charbonneau, 2016 AASV president and 2020 AASV Awards Selection Committee chair, introduced the recipients of the Swine Practitioner of the Year Award (Dr Joel Nerem), the Howard Dunne Memorial Award (Dr Glen Almond), the Meritorious Service Award (Dr Lisa Tokach), the Young Swine Veterinarian of the Year Award (Dr Wesley Lyons), and the Technical Services/Allied Industry Veterinarian of the Year Award (Dr Jer Geiger).

## Swine Practitioner of the Year

Dr Joel Nerem was named the 2020 Swine Practitioner of the Year by the American Association of Swine Veterinarians. The award is given to the swine practitioner who has demonstrated an unusual degree of proficiency and effectiveness in the delivery of veterinary service to clients.

A West Union, Iowa native, Dr Nerem received his BA from Luther College in Decorah, Iowa, and his DVM from Iowa State University. Dr Nerem began his career as a mixed-animal veterinarian at the Postville Veterinary Clinic in Postville, Iowa in 1996 before joining the Harmony Veterinary Clinic in Harmony, Minnesota. He recognized a passion for swine veterinary medicine and in 2001 went to work for Christensen Family Farms in Sleepy Eye, Minnesota. In 2006, he joined Pipestone Veterinary Services where he currently serves as the Chief Veterinary Officer, instilling a culture of veterinary leadership and service to the 46 veterinarians he leads.

Many recognize Dr Nerem's proficiency and effectiveness in his delivery of veterinary services. He is well respected by both colleagues and clients. Dedicated to the profession, he is frequently sought after for idea-generating discussions, collaboration, and second opinions. Listening carefully, asking questions, and communicating effectively to reach goals ensures Dr Nerem builds and establishes trust with everyone he works with. He uses critical thinking to make evidence-based and data-driven decisions to provide the best outcome for pig and producer, always considering the well-being of both.


Dr Joel Nerem, recipient of the AASV Swine Practitioner of the Year Award.

Dr Nerem exhibits a passion for key issues facing the swine industry and an unmatched ability to transform those issues into new initiatives to address animal and public health concerns. For example, Dr Nerem is a strong voice in promoting responsible antibiotic use in swine and decreasing antimicrobial resistance. He oversees the Pipestone Antimicrobial Resistance Tracker initiative, which was developed to engage the Pipestone System and Pipestone Veterinary Services customers in the areas of antimicrobial resistance surveillance and antibiotic use.

Asked to comment about receiving this award, Dr Nerem replied, "I am truly humbled and honored to be named the 2020 Swine Practitioner of the Year. This award is reflective of the great people who have invested in me throughout my career: mentors, farmer clients, business partners, colleagues, family, and friends. I am truly blessed by the opportunity to do what I do every day, and I would not be the person I am today were it not for the impact these people have had on my life."

Dr Nerem lives in Edgerton, Minnesota with his wife, Denise, and their three children: Emily, Hannah, and Maren.

## Howard Dunne Memorial Award

Dr Glen Almond received the American Association of Swine Veterinarians' 2020 Howard Dunne Memorial Award. The award recognizes an AASV member who has made important contributions and provided outstanding service to the association and the swine industry.

With a personal mission of improving pig health and production through education, research, and service, Dr Almond has provided outstanding service to the AASV and the entire swine industry for decades.

He has been a member of the AASV Program Planning Committee, helping to prepare the educational program for at least seven annual meetings. An active member of the AASV Collegiate Activities Committee, he continues to advocate for swine curriculum and students with swine interest. Dr Almond's efforts to enhance the knowledge of swine veterinarians are evident through his service on the *Journal of Swine Health and Production* editorial board, his participation on the Pig Welfare Symposium Steering Committee, and the countless scientific abstracts, journal articles, and book chapters he has authored.


Dr Glen Almond, recipient of the Howard Dunne Memorial Award.

Dr Almond has participated on the North Carolina Pork Producers Council's Board of Directors and the National Pork Board's Welfare Committee. His service as a veterinary consultant, ad hoc reviewer for numerous international scientific journals and institutional publications, and a member of service committees within his department, college, and university help describe his commitment to the industry.

Perhaps Dr Almond's most notable contribution to AASV and the swine industry is his commitment to swine-interested students worldwide. He is a professor of pig health and production medicine at North Carolina State University's College of Veterinary Medicine and advises veterinary students, summer interns, international students, and graduate students. Extremely generous of his time devoted to students, his open-door policy demonstrates his drive to help others succeed. As a mentor, he is highly supportive of students and continues to advocate for their success.

Dr Almond credits his own success to the success of his students. "Perhaps the most important individuals who contributed to my career are my current and past students. Their success is my success. I am genuinely proud of their success and contributions to the AASV and the pork industry." Today, his mentees provide care to one-third of the US swine breeding herd.

Dr Almond holds a BS from the University of Guelph, a DVM and an MS from the Ontario Veterinary College, and a PhD in reproductive physiology and immunology from North Carolina State University. He also thanks his wife, Dr Judith McLaren, and son Christopher.

## Meritorious Service Award

Dr Lisa Tokach was named the 2020 recipient of the American Association of Swine Veterinarians' Meritorious Service Award. The award recognizes individuals who have provided outstanding service to the AASV.

Originally from Barnesville, Minnesota, Tokach grew up with beef cattle, Quarter Horses, and a few pigs raised for home consumption, with the understanding that animals were a priority and must be cared for first. Milking dairy cows through high school and college, she expected she would become a dairy veterinarian. She has been ever passionate about production agriculture, but it was a swine research project at North Dakota State University (NDSU) that sparked her interest in swine production.


Dr Lisa Tokach, recipient of the AASV Meritorious Service Award.

Dr Tokach completed her undergraduate studies in animal science at NDSU. She received her doctor of veterinary medicine degree from the University of Minnesota in 1990. In 2001, Dr Tokach was certified as a diplomate in Swine Health Management to the American Board of Veterinary Practitioners and recertified in 2011.

Dr Tokach's early service to AASV began at the encouragement of her mentor, Dr Steve Henry. In her first year after graduation from veterinary school, she joined the Public Relations Committee. Dr Tokach has served on the Pig Welfare Committee and represented AASV on the AVMA's Animal Welfare Committee. Dr Tokach has been integral in AASV's progress as a professional organization. She helped form new committees, including the Human Health and Safety Committee and the Student Recruitment Committee, helped establish the AASV Foundation, and continues to connect AASV with members by chairing the AASV Annual Meeting Social Media Center. She served two terms on the AASV Board of Directors representing District 7 and was the 2002 AASV president.

She continues to support AASV through all endeavors that help support the pig, the producer, and the swine veterinarian, even joining a new committee and chairing the Foundation Board this year. She has been a mentor to countless students early in their veterinary medicine paths trying to understand the balance of a successful professional career and happy and rewarding life.

Grateful for the association, Tokach stated, "I am extremely honored and humbled by this award. The AASV has given me so much in terms of learning opportunities, networking, and friendships. My involvement is only a small payback for everything I get out of it."

Dr Tokach lives in Abilene, Kansas, where she is a veterinary clinician in general practice at Abilene Animal Hospital, PA. She specializes in swine population medicine and was named AASV Swine Veterinarian of the year in 2008. She attributes her success to her family – husband Mike; three children Sage, Rogan, and Fiona; her parents; two sisters; and her team at Abilene Animal Hospital.

In her spare time, she enjoys backpacking, beekeeping, riding mules, and serving organizations that work to solve world hunger.

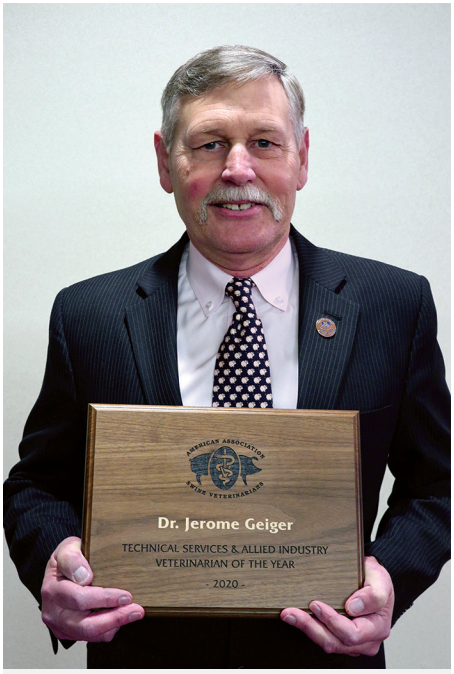
## Technical Services/Allied Industry Veterinarian of the Year

Dr Jer Geiger received the American Association of Swine Veterinarians' Technical Services/Allied Industry Veterinarian of the Year Award. Established in 2008, the award recognizes swine industry veterinarians who have demonstrated an unusual degree of proficiency and effectiveness in delivery of veterinary service to their companies and their clients, as well as given tirelessly in service to the AASV and the swine industry.

Geiger is the product of a small family farm near Alhambra, Illinois. In addition to six children, the farm also raised purebred Durocs and Holsteins. Involved in selling breeding stock all his life, a career in veterinary medicine seemed like a natural evolution for Dr Geiger.

With two bachelor of science degrees, a master of science degree, and a doctor of veterinary medicine degree all from the University of Illinois, Dr Geiger is currently a Health Assurance Veterinarian for PIC North America and resides in Tennessee.

Dr Geiger worked as a private veterinary practitioner for eight years, but since then has served small producers, large producers, and corporate pork production systems. He has consulted in more than 20 countries around the globe.




Dr Jerome Geiger, recipient of the AASV Technical Services/Allied Industry Veterinarian of the Year Award.

Described by peers and mentees as a true servant leader, Dr Geiger has provided decades of service to the AASV. He represented District 10 on the AASV Board of Directors, volunteered as a member of the Program Planning Committee for three annual meetings, served as a member of the Swine Welfare Committee, and chaired the ad hoc Audit Committee. He represented AASV on the AVMA's Welfare Committee and helped draft the AVMA euthanasia guidelines as a member of the AVMA's Panel on Euthanasia Food and Fiber Animals Working Group.

With each day's motivation to both learn and teach, Dr Geiger instilled his mantra to many students and early career veterinarians: "What do pigs need? Feed, water, air, and comfort!"

Upon acceptance of the award, Dr Geiger commented, "This would not happen without the support of a global health team and my family. It means a great deal to us; we are grateful for the recognition."

Dr Geiger considers his greatest accomplishment to be his family – his wife Becky, daughter Rachael, son Nick, and Nick's wife Kaitlynn.

## Young Swine Veterinarian of the Year

The American Association of Swine Veterinarian's Young Swine Veterinarian of the Year Award was presented to Dr Wesley Lyons. The award is given annually to an AASV member five or less years post graduation who has demonstrated the ideals of exemplary service and proficiency early in his or her career.

From Paris, Tennessee, Lyons grew up in a mixed-animal veterinary life. The son of a mixed-animal veterinarian, Lyons knew early on that he wanted to be a veterinarian. Showing Romagnola beef cattle across the United States, showing livestock in 4-H and FFA, and serving as the Tennessee State FFA Treasurer helped to shape his life and career.

Dr Lyons received a bachelor of science degree in animal science (2010) and his doctor of veterinary medicine degree (2014) from the University of Tennessee. A member of the Pipestone Veterinary Services team since 2016, he is currently the regional health director and oversees health and production recommendations for managed sow herds in Illinois, Indiana, and Michigan.

An emerging leader in swine health and production, Dr Lyons has served on the National Pork Board's Animal Welfare Committee since 2015, participated in the National Pork Producers Council Veterinary Public Policy and Advocacy Program, served as a member of the 2019 Pig Welfare Symposium Steering Committee, and completed the Illinois Pork Producers Association's Future Leaders Program.

During October 2019, Dr Lyons shared his story of pork production and delivered the historic 10,000th Operation Mainstreet presentation to nurses at the Northern Illinois Chapter of the American Association of Critical Care Nurses Fall Forum in Rockford, Ill.

Dr Lyons has been an AASV member since 2011 when he joined as a student. He continues to serve the organization in leadership roles, first as a member of the AASV Swine Health Committee and now vice-chair of the Committee on Transboundary and Emerging Diseases. He has a special interest in pig welfare and survivability.

Nominated for this award by mentors, colleagues, and clients, all considered Dr Lyons's commitment to clients and veterinary skillset to be exceptional and enhanced by his personality and ability to form lasting relationships. Not only is Dr Lyons an outstanding veterinarian striving to make evidence-based decisions for the best interest of animal and public health, he forms strong connections with clients and colleagues, making everyone feel valued. A client described Dr Lyons as, "A very fine veterinarian, but even better human being."

Upon acceptance of the award, Dr Lyons commented, "I am both humbled and grateful to be selected for this honor. Being a swine veterinarian and getting the opportunity to work with family farmers has been fulfilling beyond expectation. Five years has flown by, and we're just getting started!"

Dr Lyons lives in Dekalb, Illinois, with his husband, Preston.


Dr James Wesley Lyons, recipient of the AASV Young Swine Veterinarian of the Year Award.

## Annual Business Breakfast

American Association of Swine Veterinarians President Dr Nathan Winkelman reported on the association's membership and activities during the annual breakfast meeting on Tuesday, March 10th. The 2020 AASV officers, Drs Jeffrey Harker, president; Mary Battrell, president-elect; Mike Senn, vice president; and Nathan Winkelman, past president, were installed. The board welcomed newly elected district directors: Drs Sara Dillon Hough (District 2), Attila Farkas (District 5), Chase Stahl (District 9), and Susan Detmer (District 11). Dr Winkelman also welcomed Amanda Anderson (Iowa State University, class of 2022), as incoming Alternate Student Delegate to the AASV Board of Directors, and thanked outgoing Student Delegate Jonathan Tubbs (Auburn University, 2020). Jamie Madigan (North Carolina State University, 2021) assumes the role of Student Delegate. Honored guests at the business breakfast included Drs John Howe (AVMA president), Chuck Lemme (AVMA Executive Board liaison to the AASV), Dave Pyburn (NPB), Liz Wagstrom (NPPC), Yannin Rivas (Asociación Mexicana de Veterinarios Especialistas en Cerdos, AMVEC president), and Jose Antonio Padilla (AMVEC president-elect).

# AASV Foundation announces student scholarships

The American Association of Swine Veterinarians Foundation awarded scholarships totaling $25,000 to 15 veterinary students.

Nathan Fanzone, University of Pennsylvania, received the $5000 scholarship for top student presentation. His presentation was titled "Causes of lameness in sows euthanized for lameness." Zoetis provided the financial support for the Top Student Presenter Award.

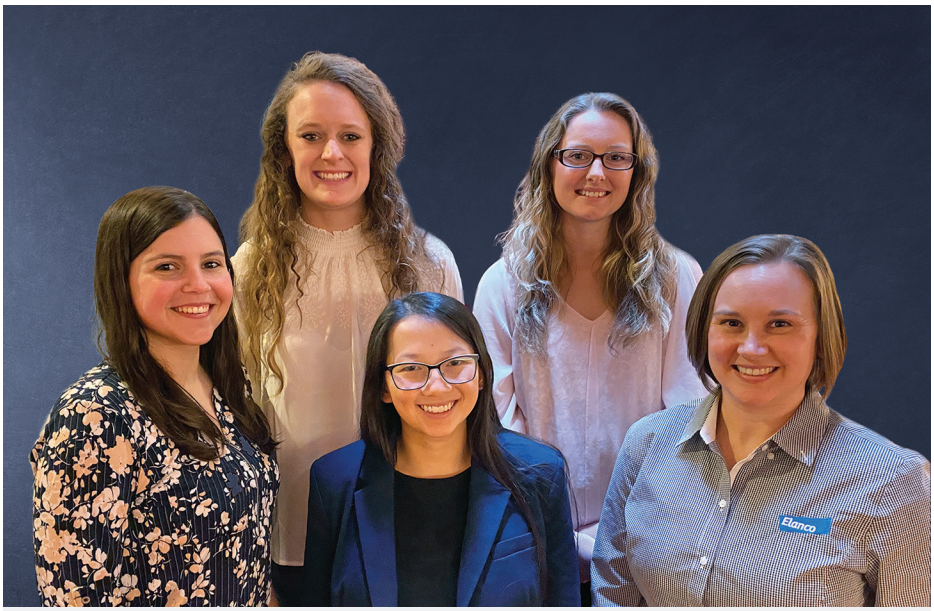
Additional scholarships totaling $20,000 were funded by Elanco Animal Health.

Four veterinary student presenters received $2500 scholarships: Melissa Hermes, University of Illinois; Kelly Hewitt, Iowa State University; Jamie Madigan, North Carolina State University; and Sabra McCallister, North Carolina State University.

Five veterinary student presenters received $1500 scholarships: Dayna Kinkade, University of Illinois; Jessica Kordas, University of Illinois; Kristen Leuck, University of Illinois; Megan McMahon, University of Minnesota; and Rebekah Schultz, University of Illinois.

Those student presenters receiving $500 scholarships were: Gabrielle Fry, Purdue University; Kathleen Kalbian, University of Pennsylvania; Broc Mauch, Iowa State University; Molly Neiley, University of Illinois; and Alexia Riley, University of Minnesota.

Fifty-six veterinary students from 13 universities submitted abstracts for consideration. From those submissions, 15 students were selected to present during the annual meeting. Zoetis, sponsor of the Student Seminar, provided a $750 travel stipend to each student selected to participate.




Dr Jessica Risser (far right) presented scholarships sponsored by Elanco Animal Health. Recipients of the $2500 AASV Foundation scholarships were (from left): Jamie Madigan, North Carolina State University; Sabra McCallister, North Carolina State University; Kelly Hewitt, Iowa State University; and Melissa Hermes, University of Illinois.

Recipient of the $5000 scholarship for Best Student Presenter during AASV's Student Seminar: Nathan Fanzone, University of Pennsylvania. Pictured with Nathan is Dr Lucina Galina (right) of Zoetis, sponsor of the Student Seminar and Best Student Presenter Award.

## SAVE THE DATE

**The 2021 Annual Meeting will be held February 27 - March 2 at the San Francisco Marriott Marquis in San Francisco, California.**

Dr Jessica Risser (far right) presented scholarships sponsored by Elanco Animal Health. Recipients of the $1500 AASV Foundation scholarships were (front row from left): Dayna Kinkade, University of Illinois; Kristen Leuck, University of Illinois; (second row from left): Jessica Kordas, University of Illinois; Megan McMahon, University of Minnesota; and Rebekah Schultz, University of Illinois.

Dr Jessica Risser (far right) presented scholarships sponsored by Elanco Animal Health. Recipients of the $500 AASV Foundation scholarships were (front row from left): Gabrielle Fry, Purdue University; Kathleen Kalbian, University of Pennsylvania; (second row from left): Molly Neiley, University of Illinois; Broc Mauch, Iowa State University; and Alexia Riley, University of Minnesota.

# Student Podcast Award

Sam Baker, a second-year student in the College of Veterinary Medicine at Iowa State University, was awarded the Student Podcast Award for the most accessed podcast from the 2019 AASV Annual Meeting. Sam interviewed Dr Montse Torremorell about her presentation, "Influenza: Herd immunity and transmission," which was accessed 24 times. Dr David Nolan announced Sam as the winner of the $400 award, sponsored by Huvepharma, during the 2020 AASV Annual Meeting.

Each year, 30 AASV student members select a speaker to interview during the AASV Annual Meeting for a podcast. The podcasts are then posted to the AASV website and promoted by the students in a friendly competition to gain the most traffic leading up to the following year's annual meeting. This is a great networking opportunity for students that also helps develop a wonderful AASV member resource. We would like to thank AASV student members for their continued involvement and Huvepharma for their continued support of the Student Podcast Award.

These and other podcasts can be found in the AASV Podcast Library at **aasv.org/podcast/**.

# AASV announces student poster competition awardees

The American Association of Swine Veterinarians provided an opportunity for 15 veterinary students to compete for awards in the Veterinary Student Poster Competition. United Animal Health sponsored the competition, offering awards totaling $4000.

Based on scores received in the original judging of abstracts submitted for the AASV Student Seminar, the top 15 abstracts not selected for oral presentation at the annual meeting were eligible to compete in the poster competition. A panel of three AASV practitioners interviewed the competing students and scored their posters to determine the scholarship awards.

United Animal Health announced the following awards during the AASV Luncheon on March 9th.

**$500 scholarship:** Amanda Anderson, Iowa State University – Top student poster titled "Analysis of porcine parvovirus maternal antibody decay in replacement gilts by hemagglutinin inhibition and enzyme-linked immunosorbent assays."

**$400 scholarships:** Sam Baker, Iowa State University; and Matthew Boulanger, University of Pennsylvania.

**$300 scholarships:** William Boyd, Virginia-Maryland College of Veterinary Medicine; Rachel Stika, Iowa State University; and Heather Walker, Ohio State University.

**$200 scholarships:** Nicholas Benge, Iowa State University; Krista Carroll, Iowa State University; Amberly Jergens, Iowa State University; Brian Johnson, University of Illinois; Kris Kovach, Iowa State University; Will Miller, Michigan State University; Calie Peterson, Iowa State University; and Tyler Pieper, University of Illinois.

In addition to the poster competition awards, each student poster participant received a $250 travel stipend from Zoetis and the AASV.

Recipient of the $500 prize for best poster was Amanda Anderson, Iowa State University (front left). Pictured with Amanda is (from left) Dr Adrienne Woodward, Jake Lee, and Dr Joel Spencer of United Animal Health, sponsor of the poster competition.

Jake Lee, Dr Adrienne Woodward, and Dr Joel Spencer (from left) presented scholarships sponsored by United Animal Health. The $400 poster competition winners were Matthew Boulanger (third from the left), University of Pennsylvania; and Sam Baker (not pictured), Iowa State University.

The $300 poster competition winners were (from left): William Boyd, Virginia-Maryland College of Veterinary Medicine; Heather Walker, Ohio State University; and Rachel Stika, Iowa State University. Dr Adrienne Woodward, Jake Lee, and Dr Joel Spencer (from left) presented scholarships sponsored by United Animal Health.

The $200 poster competition winners (from left) were Brian Johnson, University of Illinois; Amberly Jergens, Iowa State University; Tyler Pieper, University of Illinois; Krista Carroll, Iowa State University; and Calie Peterson, Iowa State University. Dr Adrienne Woodward, Jake Lee, Dr Joel Spencer (from left) presented the scholarships sponsored by United Animal Health. Not pictured: Nicholas Benge, Iowa State University; Kris Kovach, Iowa State University; and Will Miller, Michigan State University.

# AASV proceedings and videos online

Even if you missed the AASV Annual Meeting in Atlanta, you can still benefit from the many excellent presentations delivered at the meeting. The conference proceedings, including the pre-conference seminar booklets, are available for all AASV members to download at **aasv.org/library/proceedings/** or look under the "Resources" menu tab on the AASV website for "AASV Meeting Proceedings." All you need is your AASV member username and password with 2020 dues-paid status.

On the website you will find:

- The "big book" containing all the papers for the regular meeting sessions in a single PDF file with a hyperlinked table of contents,
- Seminar booklets–a PDF file for each seminar, and
- Individual papers for each presentation in the Swine Information Library (**aasv.org/library/swineinfo/**).

Members can also access the conference videos, including videos of the general sessions and disease control, prevention, and elimination breakout sessions, at **aasv.org/members/only/video**.

If you have forgotten your AASV username or password, select the "Reset Password" link in the upper right of the AASV website to have it emailed to you. Need to pay your 2020 AASV membership dues? Go to **ecom.aasv.org/membership**. Please allow a few days for your membership record to be updated.

*Photos are courtesy of Tina Smith*

# Thank you, AASV Annual Meeting sponsors!

Members of AASV attending the annual meeting make a substantial investment in the form of registration fees, travel, lodging, meals, and potential loss of income while away from work. However, the cost of attendance would be even greater – or the quality of the meeting experience reduced – if it were not for the financial support provided by corporate sponsors for refreshments, meals, social activities, as well as scholarships and travel stipends for veterinary students. The AASV extends its sincere appreciation for the sponsorship of meeting events by the following companies:

- Boehringer Ingelheim Animal Health USA (AASV Luncheon)
- Diamond V (Refreshment Break Co-sponsor)
- DSM Nutritional Products (Exercise Class)
- Elanco Animal Health (AASV Foundation Veterinary Student Scholarships, Social Media Center)
- Hog Slat (Refreshment Break Co-sponsor)
- Huvepharma (Student Podcast Award)
- Merck Animal Health (AASV Awards Reception, Student Swine Trivia Event, Student Reception, AASV Foundation Veterinary Student Scholarships)
- Newport Laboratories (Veterinary Student Travel Stipends)
- Quality Technology International (Refreshment Break Co-sponsor)
- Stuart Products (Praise Breakfast)
- United Animal Health (Veterinary Student Poster Awards)
- Zoetis (Welcome Reception, AASV Student Seminar and Student Poster Session, AASV Foundation Veterinary Student Scholarship)

The AASV is also grateful to the companies and organizations that provided support through their participation in the 2020 Technical Tables exhibit. **Thank you all!**


# 2020: A VISION FOR THE FUTURE






AMERICAN ASSOCIATION
EQUINE VETERINARIANS

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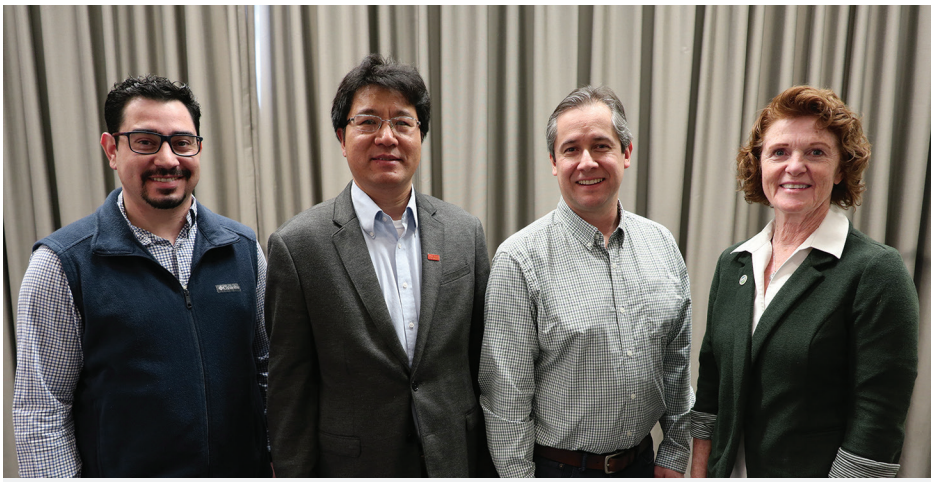
US-CRV-190800001

# FOUNDATION NEWS

## AASV Foundation funds three research proposals for 2020

Dr Lisa Tokach, chair of the AASV Foundation, announced the selection of three research proposals for partial funding during the foundation's annual luncheon on March 8th in Atlanta, Georgia. The foundation granted a total of $60,000 to support efforts by researchers at the University of Minnesota and Iowa State University.



AASV Foundation Chairman Dr Lisa Tokach with (from left) Drs Edison Magalhaes, Jianqiang Zhang, and Cesar Corzo, whose research proposals were selected for funding by the foundation.

The Foundation granted $18,372 to Dr Cesar Corzo and co-investigators from the University of Minnesota to fund the proposal, "Assessing time to negative processing fluids in breeding herds after a Senecavirus A (SVA) outbreak." The three objectives of the study are to estimate the time to negative after an SVA outbreak by using processing fluids, assess the role of heat-check boars in the perpetuation, persistence, and transmission of SVA within a farm, and estimate the production losses associated with an SVA outbreak. This project will lead to a better understanding of herd-level SVA epidemiology and implementation of aggressive programs for system-level elimination. Results will be shared as a summary in producer-oriented publications, in a peer-reviewed journal, and as oral presentations at swine veterinary conferences (eg, AASV Annual Meeting and Allen D. Leman Swine Conference).

Dr Jianqiang Zhang and co-investigators from Iowa State University received $18,372 to "Explore the unrecognized viruses potentially causing vesicular lesions in pigs." They plan to conduct follow-up testing on selected foreign animal disease (FAD) cases to explore the unrecognized agents potentially causing vesicular lesions in pigs and develop appropriate diagnostic assays for the identified agents. Investigators will share results at various swine meetings and expect one publication in a peer-reviewed journal.

Dr Edison Magalhaes and co-investigators at Iowa State University were awarded $23,256 to fund the project, "Measuring the effect of diseases on the productivity of growing pigs raised in field conditions." The overarching goal of this project is to develop an automated ongoing model to allow veterinarians to measure disease-associated determinants of swine wean-to-finish mortality. Results will be shared with the swine industry in the form of a scientific manuscript and submitted for consideration for presentation at swine conferences.

Dr Teddi Wolff chaired the scientific subcommittee responsible for reviewing and scoring the proposals received for consideration, and she joins the Foundation in thanking Drs Steve Henry, Brett Kaspers, Aaron Lower, Max Rodibaugh, and Barry Wiseman for their participation on this important subcommittee. Each of the 13 proposals submitted was given careful consideration.

An overview of past and current projects funded by the foundation is available at **aasv.org/foundation/research.htm**. The foundation will issue its next call for research proposals in the fall of 2020.

## Phibro Animal Health contributes $100,000 to AASV Foundation with its fourth endowment match

In the last of its 4-year commitment, Phibro Animal Health is contributing $25,000 to the AASV Foundation endowment, thanks in part to contributions by AASV members. In 2016, the company pledged to donate up to $100,000 over 4 years by matching $25,000 of the endowed contributions made by AASV members each year. Phibro's most recent match brings the company's total donation to $100,000.

AASV member contributions to the Leman, Heritage, and Legacy programs are endowed and count towards the match total. Please thank Phibro Animal Health for their ongoing commitment to support swine veterinarians and the AASV Foundation!

# Laura Carroll receives AASV Member Student Debt Relief Scholarship

Dr Laura Carroll, a 2016 graduate of North Carolina State University's College of Veterinary Medicine and continuous member of the American Association of Swine Veterinarians (AASV) since joining as a student, received the AASV Member Student Debt Relief Scholarship in Atlanta, Georgia, on March 9th during the association's 51st annual meeting.

The purpose of the $5000 scholarship is to help relieve the student debt of recent veterinary graduates engaged in swine practice who still have significant debt burden. Qualified applicants must have been engaged in private practice with at least 50% of their time devoted to swine, providing on-farm service directly to independent pork producers.

For the last four years, Dr Carroll has been a veterinarian at Four Star Veterinary Service in Elizabethtown, Pennsylvania, where she dedicates her entire time in practice to swine medicine. She oversees health on sow farms, grow-finish sites, and farrow-to-finish farms. Passionate about keeping small family farms alive and profitable, she serves a diverse clientele including niche-market farms, show pigs, and pet pigs. She enjoys spending time on farms and developing strong relationships with clients.

As an early career swine veterinarian, Dr Carroll regards AASV as a valuable resource. Opportunities for student and professional development, veterinary information, peer support, and mentorship offered through AASV have helped to increase her knowledge base and effectiveness as a practitioner.

The scholarship was initiated with a generous $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. As a long-time AASV member and animal industry supporter, it was 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." This is the second year this scholarship has been awarded to an AASV member veterinarian.

When asked to comment about receiving the scholarship, Dr Carroll replied, "I am honored to have been selected for the student debt relief scholarship. Like many new graduates, trying to manage educational debt while growing professionally can be a challenge. Receiving this scholarship will help to alleviate some of that burden, and I am truly grateful to the Schmidt family for their generous support."

Dr Laura Carroll, recipient of the AASV Member Student Debt Relief Scholarship.

# Inaugural David A. Schoneweis Scholarship presented at Annual Meeting

Karissa Frealy, a second-year student at Oklahoma State University's College of Veterinary Medicine, was awarded the inaugural David A. Schoneweis Scholarship during the American Association of Swine Veterinarians Annual Meeting in Atlanta, Georgia.

The children of the late Dr David Schoneweis established a scholarship in his memory to benefit swine-interested students from Kansas State University (KSU) and Oklahoma State University (OSU). The $1000 scholarship is awarded to a student or students from KSU or OSU who participate in the student oral or poster presentations during the meeting based upon a selection rubric prepared with the oversight and approval of the Schoneweis family.

Frealy presented her research poster, "Evaluating the use of processing fluids for sow herd monitoring of porcine circovirus type 2," during the Veterinary Student Poster Session March 8 and 9. She was one of 39 students presenting a poster.

Dr Schoneweis was born in Clay Center, Kansas and earned his doctor of veterinary medicine degree from KSU in 1956. He served two years in the Army Veterinary Corps before teaching clinical sciences at OSU for six years. After two years in private practice in Lawrence, Kansas, he joined the KSU 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.


Karissa Frealy, recipient of the first David A. Schoneweis Scholarship.

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 KSU and OSU.

Thankful for the scholarship, Frealy said, "I am so very excited and honored to be receiving the first David A. Schoneweis Scholarship. I am deeply appreciative to the family of Dr Schoneweis for generously providing this award, and I feel privileged to receive it. To the family of Dr Schoneweis, thank you."

# Legacy funds added to Foundation endowment

The American Association of Swine Veterinarians Foundation (AASVF) is committed to fund research, scholarships, externships, tuition grants, and other programs and activities that benefit the profession of swine veterinary medicine. The Foundation relies on the generous support of donors to fulfill this commitment.

During the recent AASV Foundation Luncheon in Atlanta, Georgia on March 8, 2020, AASVF Chair Dr Lisa Tokach announced the establishment of a new Legacy Fund. The Legacy Fund represents the highest level of the Foundation's triad of endowed giving programs (Leman, Heritage, and Legacy), with a minimum $50,000 contribution required to establish a named endowment.

This year, the John Waddell family contributed funds to establish the Waddell Family Legacy Fund. John Waddell and son Jess Waddell are both AASV members and were present to accept the Foundation's appreciation and recognition during the AASV Foundation Luncheon.

If you are ready to lend your support and help build the endowment to ensure future support of the swine veterinary profession, visit **aasv.org/foundation** or contact the foundation by phone, 515-465-5255, or email, **aasv@aasv.org**.

Drs Jess Waddell and John Waddell receive recognition from Dr Lisa Tokach during the AASVF Foundation Luncheon for establishing the Waddell Family Legacy Fund.

## AASV Foundation endowed giving programs

### Leman

Named for the late industry leader and former AASV president Dr Allen D. Leman, this giving program confers the title of Leman Fellow upon those who contribute $1000 or more to the foundation endowment.

### Heritage

The Heritage Fellow program recognizes contributions of $5000 or more. In addition to monetary donations, other giving options such as life insurance policies, estate bequests, and retirement plan assets may be used.

### Legacy

A donor, multiple donors, or a veterinary practice may establish and name a Legacy Fund with a gift of $50,000 or more. The fund may be named after the donor, another individual, or group. The donor designates which of three foundation mission categories the fund's proceeds will support: 1) research, 2) education, or 3) long-range issues.

# Auction raises $103,000 for AASV Foundation

The 2020 American Association of Swine Veterinarians Foundation (AASVF) held its annual fundraising auction on March 9th during the 51st AASV Annual Meeting in Atlanta, Georgia.

The funds raised during the auction support foundation programs including student travel stipends, research projects, scholarships, student externships, awards, support for veterinarians pursuing board certification in the American College of Animal Welfare, and other opportunities to enhance the personal and professional aspects of swine veterinary medicine.

Two silent auction attendees chose their favorite auction items.

Auctioneer Dr Shamus Brown called the auction assisted by Wes Johnson, who generously lent his capable clerking services. The exciting live auction raised $62,100 in addition to the $13,380 collected during the silent auction and cash donations of $23,550, including a $5000 donation by Four Star Veterinary Service, LLC, in honor of Dr Dale Hendrickson. As the fundraising ended at $99,030, Carthage Veterinary Services donated an additional $3970 to end the night with $103,000 to the AASVF. All bidding in the silent auction was paperless; bids were submitted electronically via ClickBid.

The foundation thanks all those who participated in the auction by bidding on or donating items, as well as those who served on the auction committee co-chaired by Drs Butch Baker and John Waddell. Visit **aasv.org/foundation/2020/auctionlist.php** to view auction results.

Special thanks goes to bid-takers Butch Baker, Joel Burkgren, Tom Gillespie, Jordan Graham, Jeff Harker, Terry Metcalf, Chase Stahl, Jess Waddell, and John Waddell who watched and encouraged bidders. The auction was a success because of the behind-the-scenes and front-end help from Miranda Ayers, Joel Burkgren, Kay Kimpston-Burkgren, David and Karen Menz,

Dr Shamus Brown, AASV Foundation auctioneer.

Karen Richardson, Lance Daharsh, Jenni Patience, Sherrie Webb, Lee and Sue Schulteis, Tina Smith, Abbey Canon, and Harry Snelson.

An extra-special thanks goes out to Lee Schulteis and David Menz for driving the truck and trailer containing all the auction items and meeting materials from Perry, Iowa, to Atlanta and back again.

# And the winners are…

Thank you to ALL who made a contribution or placed a bid on items in the live and silent auctions.

**Thanks to your generosity, the auction raised $103,000 for the AASV Foundation!**

**We are pleased to recognize the winning bidders who purchased one or more items at the auction:**

Matt Anderson
Paul Armbrecht
John E Baker
Mary Battrell
Lisa Becton
Stephanie Betbeze
Bob Blomme
Shamus Brown
Carthage Veterinary Service, Ltd
Joseph Connor
Todd Distad
Four Star Veterinary Service
Tom Gillespie
Christa Goodell
Douglas Groth
Dwain Guggenbiller
Daryl Hammer
Jeff Harker
Peggy Anne Hawkins
Daniel Hendrickson
Jeff Husa
Kerry Keffaber
Todd Kelly
Ross Kiehne
John Kolb
Justin Kuecker
Ron Lane
Sophia Leone
Tim Loula
Jim Lowe
Rodger Main
Dale Mechler
Michelle Michalak
Jason Miller
Bill Minton
Eric Moore
Brent Pepin
Phibro Animal Health
Michael Pierdon
Jessica Risser
Brian Roggow
Cameron Schmitt
Sue Schulteis
Kenny Seidel
Randy Simonson
Steven Stone
Amber Stricker
Swine Services Unlimited, Inc (Nate Winkelman and Adam Mueller)
Dennis Villani
Liz Wagstrom
Teddi Wolff
Paul Yeske

# Ten veterinary students receive $5000 scholarships

As part of its ongoing commitment to the next generation of veterinarians, Merck Animal Health, in partnership with the American Association of Swine Veterinarians Foundation (AASVF), announced the 2020 recipients of the AASVF/Merck Animal Health Veterinary Student Scholarships March 9, 2020, at the 51st Annual AASV Meeting.

"The AASV Foundation is grateful to Merck Animal Health for its continued support of the AASVF/Merck Animal Health Veterinary Student Scholarship program," said Dr Harry Snelson, AASV Executive Director. "Support of this program exemplifies Merck Animal Health's commitment to the swine veterinary profession by helping identify future swine veterinarians and assist with their educational expenses."

The recipients, who will each receive a $5000 scholarship, are:

- Amanda Anderson, Iowa State University, Class of 2022
- Sam Baker, Iowa State University, Class of 2022
- Nicholas Benge, Iowa State University, Class of 2022
- Valeria Johnson, Michigan State University, Class of 2022
- Brooke Kitting, University of Pennsylvania, Class of 2022
- Nikole Mader, University of Minnesota, Class of 2022
- Sabra McCallister, North Carolina State University, Class of 2022
- Megan McMahon, University of Minnesota, Class of 2022
- Svetlana Ponsin, University of Saskatchewan, Class of 2022
- Zoe Wolfe, North Carolina State University, Class of 2022

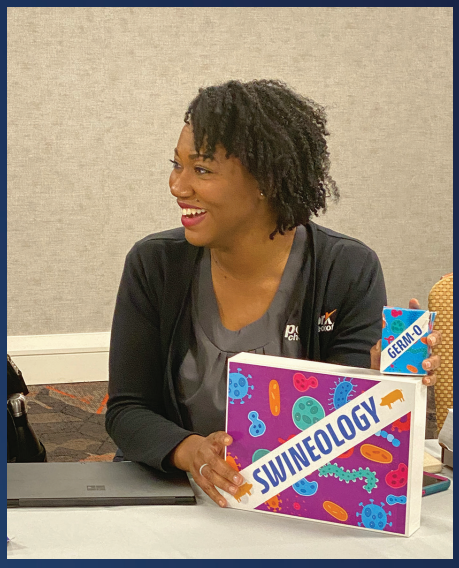
Dr Jack Creel (far left) and Jim Peterson (far right) of Merk Animal Health presented the $5000 AASVF-Merck Veterinary Student Scholarships to: (row 1 from left ) Nikole Mader, University of Minnesota; Amanda Anderson, Iowa State University; (row 2 from left) Megan McMahon, University of Minnesota; Brooke Kitting, University of Pennsylvania; (row 3 from left) Valeria Johnson, Michigan State University; Sabra McCallister, North Carolina State University; and Zoe Wolfe, North Carolina State University. Recipients not pictured: Sam Baker, Iowa State University; Nicholas Benge, Iowa State University; and Svetlana Ponsin, University of Saskatchewan.

The scholarship program, now in its fifth year, was funded by a generous $50,000 contribution from Merck Animal Health, assisting the foundation's mission to support the development and scholarship of students and veterinarians interested in the swine industry. Second- and third-year students enrolled in American Veterinary Medical Association-accredited or recognized colleges of veterinary medicine in the United States, Canada, Mexico, South America, and the Caribbean Islands are eligible for the scholarship. Learn more at **aasv.org/foundation**.


# Networking among the next generation of swine veterinarians








# Members learning from each other...



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[1] Intervention is approved under the EPA Emerging Pathogen Rule, refer to EPA List N: Disinfectants for use against SARS-CoV-2.

# AASV committees accomplish goals; plan work for 2020

Fourteen issue- and membership-based committees met during the 2020 American Association of Swine Veterinarians' (AASV) Annual Meeting in Atlanta, Georgia. The AASV Board of Directors establishes committees to address specific issues associated with swine veterinary medicine and provide recommendations for actions to the AASV leadership. The AASV committees are an integral part of the leadership structure within AASV and they also serve as a great way for members to participate in developing positions for the association, learn about critical issues, network with other members, and develop their own leadership skills. During 2019, more than 350 AASV members volunteered to serve on at least one committee, with many serving on multiple committees, providing expertise and valuable experience focused on swine health, public health, animal well-being, production, and member services.

The following are some highlights from the committee meetings:

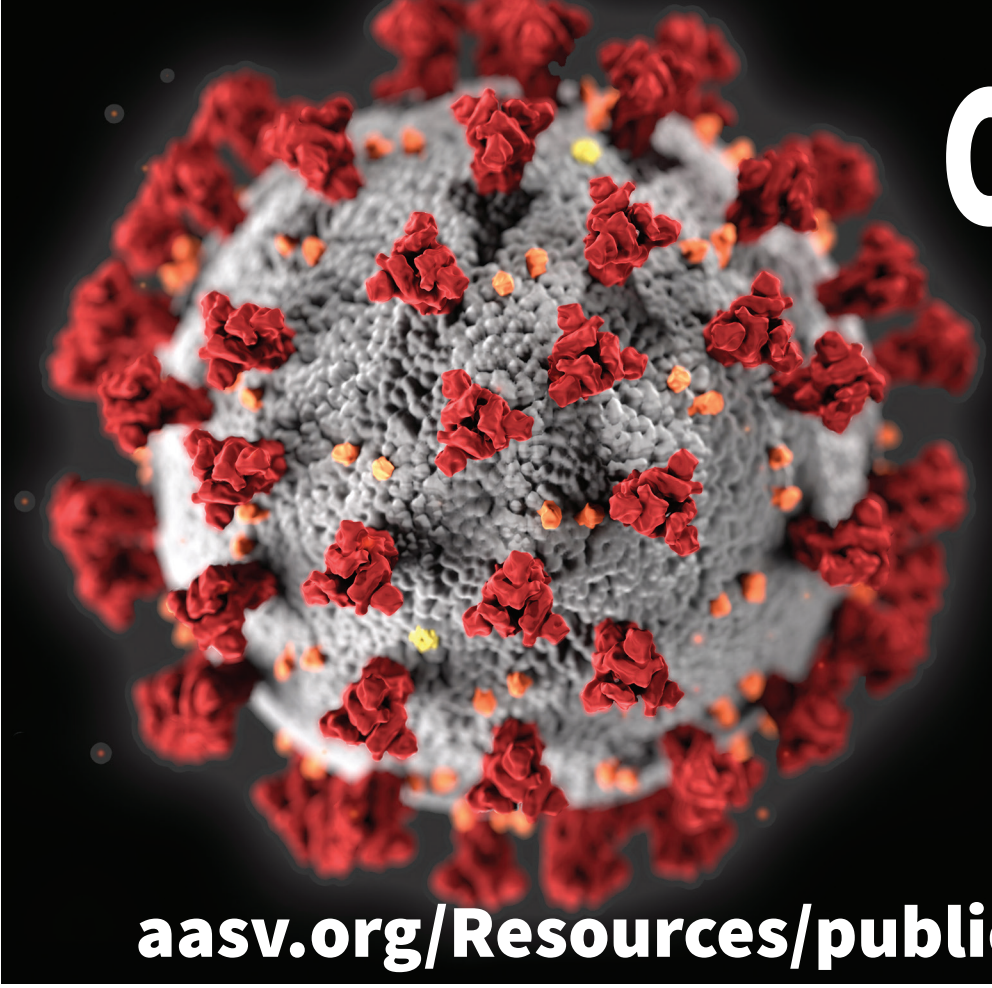
- The **AASV Porcine Reproductive and Respiratory Syndrome (PRRS) Task Force** recommended the AASV Board of Directors consider modifying the PRRS Elimination position statement. The PRRS Herd Classification Guidelines, an important document developed by the PRRS Task Force, is nearing completion.

- The **Boar Stud Biosecurity Committee** voiced their support of continued collaboration with the AASV Pig Welfare Committee and the National Pork Board to identify the best methods for large boar and sow euthanasia. Like other committees, the Boar Stud Biosecurity Committee is concerned with African swine fever (ASF) and other foreign animal diseases. The Committee stressed the importance of boar stud participation in the Secure Pork Supply Plan. They also requested the AASV Board of Directors support more research into the possible transmission of ASF via semen.
- During the well-attended **Committee on Transboundary and Emerging Diseases** meeting, the committee recommended modifications to the Premises Registration position statement and recommended reaffirmation of the Federal Funding for Swine Disease Research position statement. During 2020, the Committee will work with AASV staff to create a centralized location for ASF resources on the AASV website. They plan to develop a list of necessary items each production site should have to create a mini foreign animal disease investigation kit.
- The **Communications Committee's** discussions centered around member services, including the AASV website update and student-directed online resources (student-focused podcast series) and the e-Letter. The committee is also exploring ways to fill gaps in the AASV photo library.
- During their meeting at the faculty breakfast, the **Collegiate Activities Committee** discussed the AASV Annual Meeting General Session presentation, "Current and future vision of swine medicine education." They agreed to collect and discuss feedback from the presentation to develop recommendations for AASV.
- The newly established **Early Career Committee** meeting was full of enthusiastic early career veterinarians as well as a few more experienced veterinarians eager to offer support. Discussions during their meeting centered around identifying resources needed by early career veterinarians and how AASV can help fill those gaps. The committee's short-term goals include a more expedited and informal way for early career veterinarian peer communication, a podcast series highlighting topics for early career veterinarians beginning with financial literacy in 2020, a 2021 preconference session, and an early career board liaison. A long-term goal is an early career conference in conjunction with another swine conference, modeled after the American Association of Bovine Practitioners' early career conference. The committee formed subcommittees to further discuss a mentorship program and an easy access wallet-card of available members willing to serve as specialty-topic resources.
- The **Human Health and Safety Committee** requested AASV consider a podcast series for AASV members highlighting veterinarian well-being through stories of trials, triumphs, and tips for success offered by AASV member swine veterinarians.
- Following one of the best-attended preconference sessions, the **Influenza Committee** recommended continuing every other year influenza preconference sessions at the AASV Annual Meeting. The committee is working toward increasing participation in their influenza survey, and they intend to distribute a What's New with Flu quarterly article for members.
- Discussions of the **Nutrition Committee** centered around potential topics for a preconference session for the 2021 annual meeting.

- The **Operation Main Street (OMS) Committee** encouraged AASV to hold an OMS training preconference session at the 2021 Annual Meeting. The OMS program will once again try to reach every US veterinary school.
- The **Pharmaceutical Issues Committee** plans to review and update the Basic Guidelines of Judicious Use of Antimicrobials in Pork Production and submit for approval at the Board of Directors fall 2020 meeting. They updated the Disease Prevention Toolbox antibiotic preventative use document.
- The **Pig Welfare Committee** recommended a position statement addressing pig welfare during a stop movement situation. The Committee heard updates about the ongoing projects to identify best methods for large boar and sow euthanasia and pain mitigation in pigs.
- The **Pork Safety Committee** supports continued industry collaboration with the National Pork Board, National Pork Producers Council, North American Meat Institute, and others.
- The **Student Recruitment Committee** recommended AASV continue offering student activities during the Annual Meeting and recommended supporting The Swine Medicine Talks: An AASV and SMECast Series for Veterinary Students.

The committees are a critical part of the AASV leadership, and AASV members, leaders, and staff appreciate the efforts of the volunteer members. If you are interested in learning more about committee activities, visit the committee web pages at **aasv.org/members/only/committee**. Contact the committee chair or the AASV office to join a committee.

Abbey Canon, DVM, MPH, DACVPM
Director of Public Health
and Communications



# COVID-19

## AASV Resources for Swine Veterinarians

**aasv.org/Resources/publichealth/covid19**

## Swine veterinarians have an essential role in providing services that protect public health and swine health and welfare.

While there is no scientific evidence the COVID-19 pandemic is related to pigs or pork, the control measures designed to slow the spread of SARS-CoV-2 are impacting our practices, communities, clients, and families.

The American Association of Swine Veterinarians continues to work with industry and public health partners to ensure you have the important information you need to stay healthy and continue meeting a critical need in public and animal health.

**The AASV is committed to providing members with resources to promote and enhance well-being – the state of being comfortable, healthy, and happy.**

Visit AASV's Veterinarian Well-being webpage at **aasv.org/Resources/Wellbeing**

to find resources to assess and improve your own well-being and resources to help support colleagues, clients, friends, and family.

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Visit Uniferon.com to learn more.

[1] Radke, S.L., Olsen, C.W., Ensley, S.M., (2018) Elemental impurities in injectable iron products for swine. *The Journal of Swine Health and Production*, 26(3).

[2] Gaddy H et al. A review of recent supplemental iron industry practices and current usage of Uniferon® (iron dextran complex injection, 200 mg/mL) in baby pigs. *AASV*. 2012; 167–171.

[3] Haugegaard J et al. Effect of supplementing fast-growing, late-weaned piglets twice with 200 mg iron dextran intramuscularly. *The Pig Journal*. 2008. 61; 69–73.

[4] Olsen C and Fredericks L. Impact of iron dose and hemoglobin concentration on wean-finish weight gain. *IPVS*. 2018; 910.

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# Upcoming meetings

## World Pork Expo (Canceled)
June 3-5, 2020 (Wed-Fri)
Hosted by the National Pork Producers Council
Iowa State Fairgrounds
Des Moines, Iowa
For more information:
National Pork Producers Council
Tel: 515-278-8012
Fax: 515-278-8014
Web: worldpork.org

## Emerging Animal Infectious Disease Conference
August 25-27, 2020 (Tue-Thu)

State College, Pennsylvania
For more information:
Tel: 814-865-8301
Web: vbs.psu.edu/adl

## Allen D. Leman Swine Conference
September 19-22, 2020 (Sat-Tue)
Hosted by the University of Minnesota
Saint Paul River Centre
Saint Paul, Minnesota

For more information:
Email: vetmedccaps@umn.edu
Web: ccaps.umn.edu/allen-d-leman-swine-conference

## United States Animal Health Association 124th Annual Meeting
October 15-21, 2020 (Thu-Wed)
Gaylord Opryland Hotel
Nashville, Tennessee

For more information:
Web: usaha.org/meetings

## International Conference on Pig Survivability
October 28-29, 2020 (Wed-Thu)
Hosted by: Iowa State University, Kansas State University, and Purdue University
Omaha, Nebraska

Conference contact:
Joel DeRouchey
Email: jderouch@ksu.edu
Web: piglivability.org/conference

## 26th International Pig Veterinary Society Congress (New date)
November 3-6, 2020 (Tue-Fri)
Rio de Janeiro, Brazil

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

## ISU James D. McKean Swine Disease Conference
November 5-6, 2020 (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
Email: registrations@iastate.edu

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

## American Association of Swine Veterinarians 52nd Annual Meeting
February 27-March 2, 2021 (Sat-Tue)
San Francisco Marriott Marquis
San Francisco, California

For more information:
American Association of Swine Veterinarians
830 26th St
Perry, IA 50220
Tel: 515-465-5255
Email: aasv@aasv.org
Web: aasv.org/annmtg

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