Minutes

Project/Activity Number: NCCC42 Committee on Swine Nutrition
S-1081 Nutritional Systems for Swine to Increase Reproductive Efficiency
Project/Activity Title: Committee on Swine Nutrition
Period Covered: May 2024-January 2025
Date of This Report: February 13, 2025
Annual Meeting Date: January 6-7, 2025
Meeting Location: Virtual (Microsoft Teams)

Day 1 Morning Session: Thursday, January 6, 2025
Joint Session (NCCC42 & S-1081)

NCCC42 Members in Attendance:
Tom Crenshaw (tdcrensh@wisc.edu) – University of Wisconsin;
Jason Woodworth (jwoodworth@ksu.edu) – Kansas State University;
Laura Greiner (greinerl@iastate.edu) – Iowa State University;
Sung Woo Kim (sungwoo_kim@ncsu.edu) – North Carolina State University;
Young Dal Jang (youngdal.jang@uga.edu) – University of Georgia;
Kwangwook Kim (kkim@msu.edu) – Michigan State University
Amy Petry (amypetry@missouri.edu) – University of Missouri;
Marie-Pierre Létourneau-Montminy (marie-pierre.letourneau-montminy.1@ulaval.ca) – Laval University.

NCCC42 Members listed in NIMSS, but not in attendance:
Yanhong Liu (yahliu@ucdavis.edu) – UC Davis;
Shengfa Liao (s.liao@msstate.edu) – Mississippi State University;
Phillip Miller (pmiller1@unl.edu) – University of Nebraska;
Hans Stein (hstein@uiuc.edu) – University of Illinois.

S-1081 Members in Attendance:
Robert Dove (crdove@uga.edu) - University of Georgia;
Katelyn Gaffield (gaffield@ksu.edu) – Kansas State University;
Crystal Levesque (crystal.levesque@sdstate.edu) – South Dakota State University;
Merlin Lindemann (Merlin.Lindemann@uky.edu) – University of Kentucky;
Charlie Maxwell (cmaxwell@uark.edu) – University of Arkansas;
Amy Petry (amypetry@missouri.edu) – University of Missouri;
Eric van Heugten (eric_vanHeugten@ncsu.edu) – North Carolina State University.
Eric Weaver (eric.weaver@sdstate.edu) - South Dakota State University;
Tsung Cheng Tsai (ttsai@uark.edu) – University of Arkansas;
Jason Woodworth (jwoodworth@ksu.edu) – Kansas State University.

S-1081 Members listed in NIMSS, but not in attendance:
Lee Chiba (chibale@auburn.edu) – Auburn University;
Joel DeRouchey (jderouch@ksu.edu) – Kansas State University;
Mark Estienne (mestienn@vt.edu) – Virginia Polytechnic Institute and State University (VA Tech);
Robert Goodband (goodband@ksu.edu) – Kansas State University;
Mark Estienne (mestienn@vt.edu) – Virginia Polytechnic Institute and State University;
Brian Richert (brichert@purdue.edu) – Purdue University;
Michael Tokach (mtokach@ksu.edu) – Kansas State University.

Committee Officers:
NCCC-042: Laura Greiner, Chair; Young Dal Jang, Vice Chair; Kwangwook Kim, Secretary
S-1081: Mark Estienne, Chair; Tsung Cheng Tsai, Vice Chair; Eric Weaver, Secretary

Guests:
Robert Godfrey, NIFA
Jon Bergstrom, DSM
Gorden Spronk, Pipestone
Dean Boyd, Animal Nutrition Research LLC
Chris Hostetler, National Pork Board
Paul Davis, AFIA
Surendranath, Suman, University of Kentucky

Introduction of officers, and guests (9:06 ET):
The meeting was officially opened by Laura Greiner (Chair), who introduced the officers and administrative advisors.

Comments from Administrative Advisors (9:11 AM):
Merlin Lindemann introduced the Administrative Advisors, Jane Schuh for NCCC-042 and James Mathews for S-1081, who were unable to attend. Surendranath Suman joined the meeting.

Introduction of committee member (9:14 AM):
Laura Greiner asked attendees to introduce themselves by research station as they joined the meeting.

Program Updates: NIFA: Robert Godfrey (9:26 AM):
Robert Godfrey gave an update on NIFA.

News and personnel updates from NIFA (https://nifa.usda.gov/newsroom)

1. NIFA has now ~370 employees and is fully staffed.

2. Dr. Venu "Kal" Kalavacharla has been appointed to serve as Deputy Director of the Institute of Food Production and Sustainability after serving previously as Deputy Director of NIFA's Institute of Youth, Family and Communities since 2021. He replaces Dr. Debora Hamernik who retired from NIFA on August 30, 2023.

3. Dr. Amber Campbell joined the Division of Animal Systems on May 19, 2024, as a new National Program Leader with expertise in beef production, grazing management and climate change. She was previously a Budget Analyst and Program Specialist with NIFA since January 2021. Prior to joining NIFA, she was on the faculty of Kansas State University from 2011 to 2021.

NIFA Budget
NIFA operated under a Continuing Resolution through December 20, 2024, limiting funds for AFRI program awards in early FY2025. In FY2024, three major AFRI RFAs were released:

- Foundational and Applied Science (AFRI-FAS): Published December 2023 with multiple deadlines.
- Sustainable Agricultural Systems (AFRI-SAS): $70 million allocated for 7 awards (February 2024).
- Education and Workforce Development (AFRI-EWD): Published March 2024.

Other opportunities include programs like OREI, BFRDP, BRAG, SBIR, and AG2PI, with emphasis on areas such as critical agriculture research, extreme weather response, data science, and small farms. Interagency collaborations, like the Ecology and Evolution of Infectious Disease program, continue, but the "Dual Purpose with Dual Benefit" program has been discontinued

Program Updates: ARS: Dr. Steven Moeller (9:36 AM):
Steven Moeller gave an update on research at the USDA-ARS.

News and personnel updates from USDA-ARS
The USDA-ARS provided updates on leadership changes within the Food Animal Production program. Dr. Simon Liu was introduced as the ARS Administrator, with Dr. Jeff Silverstein serving as Associate Administrator and Dr. Caird Rexroad as Acting Deputy Administrator for Animal Production and Protection (APP). Additional leadership appointments included Dr. Steve Moller as National Program Leader (NPL) for Food Animal Production, Dr. Roxann Motroni and Dr. Karyn Havas as NPLs for Animal Health, and Dr. Robert Miller as NPL for Entomology.

Food Animal Production FY24 background (Research)
The ARS allocated $62.57 million across 19 projects focused on beef, dairy, poultry, swine, and sheep research at multiple sites, supported by approximately 35 scientist years (SYs). Key research areas include nutrition, environmental impacts like greenhouse gases, antibiotic alternatives, microbiome studies, and precision animal management. Species-specific projects include beef (6.5 projects, 28 SYs), dairy (5 projects, 19 SYs), poultry (5 projects, 12 SYs), swine (4 projects, 19.5 SYs), and sheep (2 projects, 4 SYs). The economic impact of ARS NP101 funding as a percentage of 2023 U.S. animal cash receipts ($249.6B) highlights modest investment relative to sector revenues, ranging from 0.016% for beef to 0.055% for swine. ARS research supports sustainable innovations critical to advancing animal agriculture.

Sung Woo Kim inquired about the budget distribution among species. Steven Moeller explained that budget allocations are determined by priority areas and influenced by stakeholder input and congressional appropriations. Historically, pork, poultry, and dairy receive similar funding proportions, while beef tends to be underfunded relative to its high cash receipts. Steven Moeller acknowledged the complexity and historical nature of the process. Tom Crenshaw requested that the budget proportion be shared with the committee members for further understanding.

Station reports following this order (9:54 AM):
1. Sung Woo Kim/Eric van Heugten (NC State University)
2. Amy Petry (University of Missouri)
3. Crystal Levesque /Eric Weaver (South Dakota State University)
4. Merlin Lindemann (University of Kentucky)
5. Yong Dal Jang/Robert Dove (University of Georgia)
6. Jason Woodworth/Katelyn Gaffield (Kansas State University)
7. Tom Crenshaw (University of Wisconsin)
8. Marie-Pierre Létourneau-Montminy (Laval University)
9. Kwangwook Kim (Michigan State University)
10. Laura Greiner (Iowa State University)

Break (10:50 to 11:01 AM)

Break-out Sessions
NCCC42

Review and approve minutes of the 2024 minutes (11:03 AM):
Laura Greiner presented the minutes of the 2024 meeting. No changes or additional comments were made. Jason Woodworth moved to accept the minutes, and Sung Woo Kim seconded the motion. The minutes were unanimously approved as written.

Research Discussion (11:08 AM)
Review of past projects

a. Microbiome and protein source (Phil)
Phil Miller did not attend the meeting and did not share updates.

Jason Woodworth suggested reevaluating past projects considering the committee's renewed five-year plan, questioning whether they align with the committee's future objectives. He proposed using this evaluation to remove stagnant projects and refocus efforts. Laura Greiner agreed, emphasizing the importance of aligning projects with the committee's new goals. She suggested addressing this after the discussion of current projects to set priorities moving forward.

b. Intestinal integrity model (Ryan and Yanhong)
Ryan Dilger and Yanhong Liu did not attend the meeting and did not provide any updates.

c. Digestible Ca requirement (Layi)
Layi Adeola did not attend the meeting and did not provide any updates.

d. Cecal microbiome and energy contribution (Tom)
Tom Burkey did not attend the meeting and did not provide any updates.

Tom Crenshaw expressed the need to review and potentially remove inactive or stagnant projects from the committee's list. He supported Jason Woodworth's earlier suggestion, emphasizing that eliminating such projects would allow the group to focus on current priorities and future initiatives. Tom Crenshaw clarified that this would not permanently discard the projects, as they could be revisited if deemed important later. He advocated for making decisions to streamline efforts and direct attention to pressing and actionable goals.

e. **Reduce energy diets on growth** (Jason)
Jason Woodworth provided an update on the status of a project, acknowledging limited progress since last year. He noted challenges in communicating with government funding constraints and restrictions on his activities. Jason Woodworth explained that while the intent had been to address the topic during committee calls, scheduling conflicts prevented his participation. The project originally aimed to evaluate lower energy diet formulations, focusing on lysine-to-calorie ratios under reduced energy conditions. Although some related research has been conducted by other members, no formal trials have been initiated. Jason Woodworth recalled some diets being circulated for consideration about a year ago, but no further actions were taken.

f. Mycotoxin and soybean meal survey
Discussion on this project was previously addressed last year but was not assigned to any specific committee. It is scheduled to be revisited for further development.

g. Metabolism (Tom; Sub-committee updates)

Tom Crenshaw discussed the historical role and structure of subcommittees within the committee, emphasizing their past success in facilitating collaborative projects through focused groups like the metabolism subcommittee. These groups enabled stations to contribute different elements, such as DEXA scans, fecal sample analyses, and digestibility studies. However, logistical changes and shifting member dynamics have diminished their effectiveness. Tom Crenshaw highlighted challenges in maintaining collaboration, including the lack of convenient meeting opportunities and scheduling conflicts with other commitments. He noted that attempts to meet virtually have faced obstacles, such as overlapping schedules. To address these issues, Tom Crenshaw proposed formally re-establishing subcommittees for areas like sows, metabolism, and finishing pigs. He suggested assigning leadership to drive specific projects and encouraging broader participation.

Update on the NCCC42 proposal renewal (11:19 AM):

Laura Greiner reviewed the objectives, procedures, activities, and expected outcomes of the committee. During this review, Laura Greiner and Amy Petry proposed removing specific research projects from the NCCC-42 agenda due to a lack of progress or alignment with current committee priorities. The projects proposed for removal were:

a. Microbiome and protein source (Phil)
c. Digestible Ca requirement (Layi)
d. Cecal microbiome and energy contribution (Tom)

Tom Crenshaw seconded the motion, and the committee moved to officially remove these projects from the agenda.

The intestinal integrity model project (Ryan and Yanhong) will be updated by reaching out to Yanhong Liu for clarification and progress. It was noted that Ryan Dilger may have transferred the project's knowledge to Yanhong Liu, who was expected to lead its further development after Ryan Dilger stepped away from the committee. This approach aligns with the understanding shared by multiple members during the discussion.

Discussion of new projects (11:30 AM):

a. Optimizing multi-station collaboration:
   The committee discussed the challenges and opportunities in fostering effective multi-station collaboration. Amy Petry proposed revisiting identified research areas after completing the current needs chapter, focusing on low-hanging fruit projects that leverage collaborative synergies in ongoing research. She raised concerns about the traditional multi-station model under objective, noting the diversity in genetics, facilities, and methodologies across stations as barriers to standardization. Laura Greiner supported this perspective but highlighted that metabolism studies, particularly with commercial genetics, still offer potential for multi-station efforts. She suggested leveraging shared resources, such as blood samples or soybean meal, for specific collaborative initiatives. Jason Woodworth acknowledged past criticisms of multi-station research due to station effects and emphasized the importance of securing funding to reduce variability and enhance collaboration. Laura Greiner proposed a modular approach where different stations contribute unique expertise, such as housing animals, conducting analyses, or managing data, to facilitate meaningful collaboration and maximize efficiency. The committee agreed on the need to identify key projects suitable for this collaborative model to ensure engagement and productivity.

b. Revision of Swine Nutrition book
   The committee discussed revising the outdated *Swine Nutrition* book to ensure it remains a valuable reference for the industry, particularly for foundational knowledge used by students and professionals. Sung Woo Kim highlighted the historical impact of the book and its recognition in the global swine nutrition community. Laura Greiner emphasized the need to determine if revisions are permissible and suggested contacting original editors to explore options for creating a updated edition.

Tom Crenshaw noted that the original book was intended as a reference text with a physiological focus, distinct from practical guides, and pointed out that many chapters are now outdated. The committee debated the relevance of a physical book in today's digital age. Jason Woodworth questioned its practicality given modern access to online resources, while Amy Petry suggested using alternative formats, such as review papers or digital versions, to disseminate updated knowledge effectively. Concerns were raised about potential overlap with the updated NRC, and members suggested waiting for its release before proceeding. Ultimately, Tom Crenshaw volunteered to investigate the permissions and logistical considerations for revising the book, including exploring new formats and funding opportunities.

c. AI tools in swine nutrition
The committee also explored the role of AI tools like ChatGPT in swine nutrition research and education. Sung Woo Kim emphasized the need for guidelines to ensure ethical and accurate use of AI-generated content, noting that the current lack of direction could lead to misuse. Amy Petry shared her experience using AI tools in research and teaching, highlighting the importance of transparency and establishing ethical protocols. She suggested that the committee could create a document outlining best practices for using AI in swine nutrition. Members discussed the potential for AI to enhance research efficiency, such as tools like LitMap for literature reviews, but noted challenges like incorrect references generated by AI. Yong Dal Jang highlighted the need for peer-reviewed AI guidelines to help students and researchers navigate these tools responsibly. To advance this initiative, Yong Dal Jang volunteered to lead the development of an AI guideline document, supported by insights from existing academic and industry standards. The committee agreed that this effort could position the group as a leader in establishing ethical AI practices in swine nutrition.

d. Mycotoxin soybean meal survey
The committee discussed leveraging existing soybean meal samples collected over multiple crop years to conduct a comprehensive mycotoxin survey. These samples, representing various regions and processing plants, have undergone nutrient and fiber analysis, with plans to include amino acid and trypsin inhibitor assessments. The goal is to differentiate this survey from industry efforts, such as those by Alltech and DSM, by exploring lab variability through ring tests and addressing specific research questions related to mycotoxins' impact on swine productivity. The committee emphasized the importance of understanding regional differences, agronomic factors, and the interaction of mycotoxins with various feed components. Funding challenges were highlighted, with suggestions to seek support from industry partners or state soybean associations. The committee agreed to revisit the project after ongoing data collection and analysis, allowing time to refine objectives and methodologies before proceeding.

e. Low energy diet
The committee is pursuing a project to assess low energy diets to optimize growth performance and nutrient efficiency in swine. The discussion focused on evaluating whether modern dietary formulations meet the growth potential of current pig genetics while accounting for variability in genetics, feed intake, and environmental factors across research stations. The committee proposed utilizing existing metabolism study data to investigate nitrogen retention across production phases, with tools like DEXA scans and extended trial durations to measure protein deposition and energy utilization. Challenges, such as standardizing diet formulations and managing ingredient variability, were acknowledged. To overcome these, the committee plans to appoint leads to coordinate data collection, engage graduate students for data analysis and reporting, and design a collaborative study addressing these gaps. This project aligns with the committee's objectives of improving nutrient utilization, reducing environmental waste, and fostering collaboration within the swine nutrition research community.

Break-out Sessions
S-1081

Brief summary of minutes of annual meeting:
The progress of previous projects: copper supplementation (led by Merlin); phytogenics (led by ML), Phase feeding (led by CL), Histidine (RD), Water quality (ML), and Outcome(s) criteria for sows (EW) were discussed. The plan for new projects entitled Phytogenic feed additives (led by ML), Optimum Histidine (RD, KG), Iron level (CL, EW), Sow Metabolic status (EW) and Water Quality (ML) on sow reproductive performance was visited. Teams also brainstormed on new research projects to sustain sow longevity with the potential benefit of sodium salicylate supplementation, the relationship with drinking water quality, and the level of water intake. It was noted that recent data reported by SDSU indicates blood hemoglobin level declined during gestation, and lactation, and the hemoglobin restoration rate varied between parity, which warrants further research.

Accomplishments:
Short-term Outcomes: short term outcomes are reported within each research objective.

In the United States, sow mortality is a major concern in swine production. New genetic lines are selected to increase the number of pigs per year, but the culling rate remained around 50 to 60% after the primiparous cycle. The leading causes of euthanized sows are lameness and prolapses, while the top causes of sudden death loss remained unknown as is the contribution of nutritional status. In addition, nonintentional culls are found in reproductive inefficient females. As such, short term outcomes are related to investigation of nutritional tools to enhance sow health and productivity.

1. **Iron.** Previously, sow blood hemoglobin (Hb) as an indicator of iron status was reported to decline with progressing pregnancy and into lactation with some recovery within the first 30 d of the subsequent pregnancy but the ability to recover declined with each pregnancy. In the most recent work, a relationship between Hb and farrowing duration and increased still born pigs has been determined. Extended farrowing duration is a risk factor for sow removal. Hb has promise as a bio-marker for both iron status and sow health.

2. **Supplement Histidine:** No specific outcomes related to this objective were reported. Activities completed and/or planned for this objective are reported under "Activities".

3. **Sow metabolic status: Inflammatory status of sows;** In prior research, gilts fed sodium salicylate 3 days before farrowing, displayed reduces savage behavior in gilts. Sodium salicylate is an antagonist of PGF-2α and has an anti-inflammatory effect, which might alter the gilt's behavior during induction and/or farrowings. As opposed to Hb, inflammatory cytokines were found to increase with each parity.

4. W**ater Quality:** No new activities reported

5. **Sensory additives**: No outcomes on this objective during this reporting period.

Outputs: Outputs reported are from the previous approved project objectives related to 1) copper supplementation, 2) phytogenics, and 3) phase feeding..Performance data from the copper supplementation project were collected, and the manuscript is being prepared. Milk samples collected from the copper project have been assayed, and results will be compiled into another paper. Results from the essential oil, boron, and phase feeding projects were summarized and are proceeding for manuscript preparation.

A**ctivities:** activities reported are specific to current project objectives on 1) iron, 2) histidine, 3) sow metabolic status, and 4) sensory additives

The team will discuss the procedures and traits to be measured in each of the projects proposed above. In addition, the project will evolve to investigate responses at the molecular level as a means to identify the biomarkers associated with reproductive performance, and our committee is looking forward to seeking federal funding to support the project. To approach this goal, the team will search for collaboration with molecular geneticists and reproductive physiologists.

Impacts: In general, primary impacts of the project research are expected to alter sow management (nutritional and daily care) during gestation and lactation when research results are shared with commercial swine nutritionists and production managers. The current approved project is still in its first year, thus specific impacts are limited.

1. **Iron:** Results of completed study were presented at the Leman Conference and additional research submitted to Midwest ASAS meeting where commercial production nutritionists will be in attendance. ML and RD shared ideas on assessment of iron and trace minerals status. EW discussed idea of using farrowing duration as an indicator of sow health. FD is expected to be highly variable across herds and stations. Injectable iron studies were also discussed as a means of improving iron status. Trace mineral supplementation to maintain sow nutritional status with high late gestation fetal demand (Mahan et al, 2009). Need a list publications that were also influenced by work.

   More than a single trace mineral is needed by developing litter. Proposal for evaluation of farrowing duration and stillborn pigs after two levels of trace mineral supplementation in late gestation: Is funding available?

   Design a proposal with trace mineral supplementation levels to meet fetal demand. What to measure and how to fund? Consider submission to Pork Board.

2. **Supplemental Histidine**: Lactation study discussed from D110 to weaning. The protocol for His study will be shared with participating stations. Briefly, sows will be allotted to their treatments at d 110 of gestation. Colostrum will be collected at farrowing, and milk will be collected during the lactation. In addition to milk, the collection of other biomarkers was considered, including immunocrit and cortisol.

   CJ Bio may have some His set aside-ML will check. Likely dependent variables measured: Sow productivity and litter, milk yield, pre-weaning mortality. Potential diet His levels: 0 or 0.1 % (39% to 49%). NR in recent KSU study provided (KG). Ratio study (1.05% SID at KSU) planned at 0.97% (NRC).

3. **Sow metabolic status:** Results of the sodium salicylate and inflammation results were presented at the Leman Conference and also submitted to 2024 Midwest ASAS meeting where commercial production nutritionists will be in attendance.

   Potential project: Obtaining serum samples from gestating sows at D110 for relationship to Hb status and farrowing duration was discussed.

   i. 9 Analyte Multiplex Assay: $2,300 per plate.
   ii. Analytes: IL-1β, IL-6, IL-4, IL-8, IL-10, IL-12, IFN-α, IFN-γ, TNF-α
   iii. Sample storage req. (-20° C)

4. **Sensory additives:** The preliminary study on sensory additives demonstrated their benefit on sow lactation intake during summer and promoted nutrient utilization during winter seasons. This effect on intake can help sows restore their body condition for subsequent cycles. It would be interesting to evaluate their impact on sow longevity and intergenerational effect on progeny. Sow groups available for each station needs to be determined. ? To test TC and CM (Lucta) product. 2 groups – increased feed intake. Stations on phytogenic protocol?

5. **Water quality and analysis.** Analysis of water? Mineral levels? Technical notes paper – follows up on sow study. Salt study location explained difference. KSU: KG will provided report of water assessment (for acidification)? High (>0.25 mg Fe/L; SDSU 0.05 mg/L; ML will look at pricing. If regulatory services, no charge if it is an official project.

Indicators: The 3 publications related to iron status in sows and piglets are indicators that specific goals/achievements were accomplished during this reporting period. Also, an abstract of histidine evaluation in lactating sows (KSU) was submitted.

Publications:

McClellan K, Levesque C, Weaver E. Evaluating point-of-care testing for anemia diagnosis in pigs: Blood collection location disparities, repeatability, and validity. J Swine Health Prod. Published online November 27, 2024. https://doi.org/10.54846/jshap/1402

McClellan K, Lindemann M, Levesque C. Assessment of hemoglobin concentration in sows and their offspring over consecutive reproductive cycles. J Swine Health Prod. 2024;32(6):248-257. https://doi.org/10.54846/jshap/1399

T.B. Chevalier, O. Adeola, S.D. Carter, C.R. Dove, M.J. Estienne, C.L. Levesque, C.V. Maxwell, T. Tsai, and M.D. Lindemann. 2024. A cooperative study assessing the effects of a second iron injection administered before weaning on growth performance, hematological status, and tissue mineral concentrations of nursery pigs. Applied Animal Science 40:112-123. https://doi.org/10.15232/aas.2023-02480

The break-out meeting was adjourned by 12:58 PM.
Lunch break (12:58-14:00 PM)

Afternoon Session
Joint Session (NCCC42 & S-1081)

Laura Greiner officially declared the meeting open at 14:01 PM ET.

Guest Presentation:
Vitamin availability for the US market – Jon Bergstrom, DSM (14:03 PM)

Jon Bergstrom emphasized the critical role of vitamins in human and animal nutrition and highlighted the U.S.'s heavy reliance on imported vitamins, with over 70% sourced from China, exposing supply chains to risks from geopolitical tensions and environmental policies. Key challenges discussed included past disruptions like China's "blue skies policy" and plant fires in Europe, leading to shortages and price volatility. Strategies to mitigate these risks include diversifying suppliers, increasing North American production, and public-private partnerships to enhance supply chain resilience. Concerns about the quality of imported vitamins and rising costs were also noted. The presentation called for proactive measures to ensure stable and reliable vitamin supplies.

Update on the swine industry – Gorden Spronk, Pipestone (14:32 PM)

Gorden Spronk highlighted critical challenges and opportunities for the livestock and nutrition industries, focusing on vitamin supply chains, disease management, production costs, trade competition, and innovation. The U.S. heavily relies on China for over 70% of its vitamins, posing risks from geopolitical and environmental factors, with diversification and domestic production identified as key mitigation strategies. Disease management remains a significant concern, with endemic diseases like PERS costing over $1 billion annually and transboundary threats like ASF affecting mortality and industry revenue. Production costs in the U.S. have decreased, but Brazil's competitive edge and sustainability claims challenge global trade dynamics. Consumer trends show declining pork demand among younger generations, while labor availability and costs strain operations. Innovations like gene editing promise solutions to disease challenges but raise trade and consumer concerns. The presentation emphasized strategic actions to secure supply chains, enhance biosecurity, address cost and labor issues, responsibly leverage innovation, and strengthen consumer engagement to sustain industry growth.

Update: National Pork Board - Chris Hostetler, Director of Animal Science (15:27 PM)

Chris Hostetler provided an update on the National Pork Board's strategic initiatives, consumer trends, sustainability efforts, and research opportunities. The board is finalizing its Strategic Plan 2025, focusing on adding value and building trust. A segmentation study highlighted declining pork consumption among younger generations, prompting a domestic marketing campaign. Sustainability initiatives include an upcoming updated Sustainability Report, a national Life Cycle Assessment (LCA) analyzing regional feed and manure practices, and a Sustainability Dashboard enabling producers to share data on antibiotic use and stewardship. Research opportunities, led by Chelsea Van Gendre, emphasize innovative knowledge dissemination and technological investments, despite a reduced sustainability budget of under $2 million. The presentation encouraged engagement with resources like the dashboard and research programs to address challenges and advance the pork industry.

Net energy and soybean meal – Dean Boyd (15:36PM)

Dean Boyd detailed research advancements on soybean meal’s net energy and its implications for swine nutrition, highlighting innovative findings, methodologies, and industry applications. A digital eBook published through a United Soybean Board initiative featured collaborative work from 18 public and private sector authors, challenging traditional views by emphasizing soybean meal’s value beyond basic nutrition. Key discoveries include updated net energy estimates that align with NRC standards but surpass older assumptions, highlighting soybean meal’s potential to conserve diet energy by reducing maintenance energy requirements and supporting growth. Research also revealed soybean meal’s anti-inflammatory properties, which mitigate immune challenges, enhancing energy efficiency and feed conversion rates in

commercial settings. Rigorous review processes and collaboration with institutions like Kansas State University and CP Group validated findings, demonstrating soybean meal's net energy values averaging 97–105% of corn. Practical applications include optimizing feed formulations to leverage these benefits and targeting health-compromised herds with soybean meal's immune-supportive properties. The presentation concluded with a call for further research to refine the concept of productive energy and integrate these findings into broader nutritional frameworks, emphasizing the transformative potential of soybean meal in swine nutrition.

Break (16:15 to 16:32 PM):

Update: AFIA – Paul Davis (16:32 PM)

Paul Davis offered a comprehensive overview of the American Feed Industry Association's (AFIA) role, initiatives, and challenges impacting the animal feed and nutrition industries. Representing 650 members responsible for 75% of compounded feed and 70% of non-whole-grain ingredients, AFIA highlighted the industry's $267 billion economic contribution and its sustainability focus, with 40% of feed ingredients derived from upcycled materials. Regulatory updates included shifts to risk-based FDA inspections, heightened scrutiny under FSMA, and evolving salmonella regulations. Proposed legislation, such as the Innovative Feed Act (I-Feed) and the PER Act, aims to enhance labeling uniformity and allow non-medicated feed additives to make claims for health, environmental, and productivity impacts, fostering U.S. competitiveness. Emerging challenges include the EPA's proposed ban on formaldehyde and increasing concerns over PFAS chemicals. AFIA emphasized education through Preventive Controls Qualified Individual (PCQI) courses and industry events like IPP in Atlanta. The session concluded with advocacy for regulatory reform, innovation, and collaboration to address evolving industry needs, followed by a Q&A to engage attendees on these critical issues.

Status of current committee members/new members and Open discussion (17:16 PM)

The committee reviewed updates to membership based on recommendations from the previous year. Marie-Pierre Létourneau-Montminy was added as a new member, while Ryan Dilger was removed. Sung Woo Kim suggested adding Ruurd Zijlstra from the University of Alberta and Martin Nyachoti from the University of Manitoba was also recommended. Jason Woodworth revisited the previous year's recommendations, expressing curiosity about whether Jane had contacted the proposed individuals. Laura Greiner confirmed she would follow up with Jane Schuh to circulate the list and reach out to those recommended.

The committee also discussed rebalancing membership, particularly addressing stations that have not submitted reports. Jason Woodworth recommended sending the previous year's list to Jane Schuh to streamline the process of contacting potential new members. These actions aim to ensure active participation and balanced representation in the committee.

Discussion of next year's meeting place and date (17:28 PM)

The committee discussed and finalized the date and location for the next meeting. Sung Woo Kim and Laura Greiner recommended retaining Nashville as the location, citing its well-organized facilities and ease of working with hotels. Young Dal Jang proposed Orlando to avoid potential weather issues, but Crystal Levesque and Robert Dove emphasized the challenges of working with Orlando, including difficulties with hotel coordination and cancellation fees. Eric Van Heugten supported sticking with Nashville if no significant issues were noted. Ultimately, the majority agreed to hold the meeting in Nashville for another year.

Regarding dates, the group voted on several options and concluded with a unanimous decision to travel to Nashville on January 7th, with the meeting scheduled for January 8th and 9th, 2026

The Day 1 meeting was officially adjourned at 17:52 PM (ET).

Day 2 Morning Session: Friday, January 7, 2025
Breakout sessions

NCCC42 (Breakout Session)
Committee Business meeting (9:02 AM ET)
A. Election of officers for the next year (Discuss the roles of officers).

- Chair: Young Dal Jang (previously Vice Chair).
- Vice Chair: Kwangwook Kim (previously Secretary).
- Secretary: Tom Crenshaw was nominated, motioned, seconded, and elected unanimously.
- Amy Petry will assume the Vice Chair position in 2027.

B. Other business

- Addition of Ruurd Zijlstra: Sung Woo Kim highlighted adding Ruurd Zijlstra from the University of Alberta to the committee but noted potential conflicts with other meetings.
- Annual Meeting Timing: Discussions centered on maintaining the annual meeting in early January, with alignment to the S-1081 group.
- Alternative Meeting Formats: Suggestions included hosting a breakfast meeting during the Midwest Conference, virtual call-ins for flexibility, and scheduling monthly meetings for consistent updates.
- Upcoming Meetings:
  - Midwest Conference breakfast meeting scheduled for Wednesday, March 12th, 6 AM.
  - February virtual meeting set for Tuesday, February 11th, from 12 to 1 PM ET.
- Meeting Guidelines: Emphasis on structured agendas for both old and new business, ensuring participation and engagement across the committee.

Continue and finalize discussions on research plans for the coming year (9:32 AM):
A. Swine Nutrition Book
Tom Crenshaw and Merlin Lindemann agreed to contact the original authors of the Swine Nutrition Book to explore the process of updating and revising it. Their efforts aim to determine permissions and outline steps for creating an updated edition, reflecting advancements in swine nutrition while maintaining the book's value as a reference for the industry.

B. Guidance on using AI in swine nutrition research
Young Dal Jang will lead the initiative to develop guidance on ethical and effective use of AI in swine research, with support from Amy Petry and Kwangwook Kim. This project aims to establish protocols for utilizing AI tools, ensuring transparency, appropriate data handling, and maximizing the benefits of emerging technologies in research and education.

C. Soybean meal quality and mycotoxins
The committee decided to delay the soybean meal project for six months to avoid duplicating efforts and focus on nutritional quality and anti-nutritional factors rather than mycotoxins. A future project may explore the impacts of mycotoxins, pending funding and committee priorities. Discussions emphasized the variability in detecting mycotoxins and the potential value of ring tests to compare lab accuracy. The group proposed pursuing funding through an upcoming United Soybean Board RFP.

D. Microbiome Analysis and Antimicrobial Resistance
Kwangwook Kim addressed the plans include collecting fecal samples from various stations to analyze microbiomes and antimicrobial resistance. Existing data from Co-op facilities may supplement this work. The project will establish lab protocols, survey diet and environmental conditions, and analyze microbial profiles and resistance markers.

E. Phosphorus prediction from saliva samples
The committee explored using saliva samples as a non-invasive tool to predict phosphorus requirements in pigs. Discussions covered analytical challenges like protein interference and sampling techniques, including sponges and rope collection. Proposed applications include rapid on-farm assays for nutrient adjustments and broader studies on calcium and phosphorus variations. The committee aims to develop and validate saliva-based assays, integrate these tools into larger studies, and test them in real production settings.

The NCCC42 business meeting concluded at 10:07 AM.

S-1081
Continue discussion on new research objectives (8:00 AM)

Milestones:

To discuss the possibility of emerging essential oil and sensory additives as phytogenic feed additives in the coming year.
To lay out a plan to evaluate the relationship of iron status and hemoglobin level in sows and the relationship to farrowing duration in the upcoming year.

To consider incorporation of sow metabolic status markers in study outcomes

To continue the evaluation of phase feeding sows and histidine studies in 2025.

To assess the water quality of participating stations in 2025.

Election of officers for the next year (Discuss the roles of officers):

- Chair: Tsai Tsungcheng
- Vice Chair: Eric Weaver
- Secretary: Katelyn Gaffield

Break-out session meeting adjourned: 10:00 am.

Break 10:07-10:30 AM

Joint Session
Discuss research projects between the 2 committees (10:31 AM).

- NCCC42 and S-1081 chairs updated their discussion before break.
- **S-1081:** Merlin Lindermann and Eric Weaver updated the discussion.

    - Robert Dove and Merlin Lindemann are spearheading efforts to investigate iron injection protocols for sows. They plan to develop and refine methodologies, which will subsequently be distributed to the group for collaborative feedback and improvement. This project aims to address potential deficiencies and optimize sow health and productivity through improved iron supplementation strategies.

    - A project is being initiated to analyze the mineral content in water across various research stations, recognizing the variability in water sources such as high-iron water, high-nitrate water, and municipal supplies. These differences are often unquantified in research but could influence experimental outcomes. Efforts are underway to secure free assays for water samples. Once arrangements are

finalized, researchers will be invited to send water samples for analysis. The results will be compiled into a technical note to provide insights into the mineral variability present across research stations, aiding in better standardization and interpretation of research findings.

- The committee proposed a collaborative project to study the effects of copper and iron supplementation on farrowing duration and sow health, focusing on late gestation. Farrowing duration will serve as a practical health indicator, with undergraduate students gaining research experience through data collection. A draft proposal will standardize protocols, compare NRC and enhanced trace mineral levels, and facilitate multi-station collaboration to address the nutritional needs of prolific sows.

- The discussion emphasized the need to expand nutritional research for sows, particularly in late gestation, beyond just trace minerals to include broader nutritional adjustments. A collaborative approach was suggested to ensure relevance to the industry and participation across multiple research stations. While evaluating higher levels of trace minerals like copper and iron (excluding selenium) was a primary focus, the group acknowledged the challenge of identifying meaningful biomarkers or functional measures that correlate with improved sow health and performance. Metrics such as farrowing duration were highlighted as key indicators for assessing the efficacy of nutritional interventions, ensuring that changes in serum or tissue levels reflect tangible benefits to the sow's health and productivity.

- The discussion centered on the potential for tracking hemoglobin levels in sows throughout gestation, particularly during the periparturient period, to better understand the biological changes and nutritional needs. Suggestions included using the HemoCue device for daily monitoring from day 110 to several days post-farrowing to capture hemoglobin dynamics and their relationship to farrowing duration and functional sow health. Participants highlighted the challenges of traditional single-point measurements and the need for more detailed data, emphasizing the benefits of collective efforts across research groups to build a comprehensive dataset. They also discussed the potential links between hemoglobin, trace mineral nutrition, immune cell responses, and farrowing outcomes, advocating for phase feeding and targeted interventions based on gestational stage. The importance of practical methods for commercial applications and the value of exploring dynamic, day-by-day biological data were strongly emphasized.

- **NCCC42:** Laura Greiner updated the discussion.
  - Officer election Tom Crenshaw will serve as Secretary in 2026, Amy Petry will step in for Vice Chair in 2027

  - The group discussed revisiting the outdated swine nutrition book to determine its relevance and potential updates. Tom Crenshaw will explore the book's status, including authorship and publishing logistics. There was debate about whether to create a new book, transition to a web-based resource, or compile peer-reviewed publications as a special collection. The committee sees updating this resource as their responsibility but plans to wait for the release of the new NRC book to guide their approach.

  - The committee had an in-depth discussion about integrating AI tools into swine-related programs and research. Key considerations included creating documents to train students on using AI responsibly and effectively, developing guidelines on acceptable AI usage, and optimizing the visibility of relevant work in search engine results. The group plans to explore strategies for leveraging AI to improve access to relevant data. Amy Petry mentioned Animal Frontiers recently

published a three-part series on this topic, and Young Dal Jang, Amy Petry, and Kwangwook Kim will review it and lead further discussions.

- The committee decided to close certain projects due to lack of recent progress or the departure of project leads. One such project, led by Ryan Dilger on lactose mannitol permeability, will be concluded independently by Ryan Dilger with a Master's student, as he is no longer part of the NCCC-42 group.

- The discussion about nitrogen retention, focusing on how it changes over time and across growth phases in animals. The group agreed on an initial project to explore this, with Amy Petry taking the lead and reaching out to Hans Stein for potential data. Many participants mentioned having metabolism data available, either stored or analyzed, which they are willing to share. The goal is to examine nitrogen retention in different phases and compare findings with existing literature.

- The group discussed incorporating mycotoxins into their research, particularly in relation to soybean meal. While recognizing the expertise of specialized companies in this area, the idea of conducting a large-scale mycotoxin screen across multiple plants and sharing the results with stakeholders was proposed. Additional suggestions included ring tests, methodological comparisons, and sample analyses. However, the decision was made to table this topic for six months while monitoring potential funding opportunities, particularly from USB's animal working group RFPs, to support future work in this area.

- The group discussed the availability and potential use of samples stored in freezers for collaborative studies. They also considered creating prediction equations for feces, acknowledging challenges such as color changes impacting accuracy. Additionally, saliva samples were highlighted, particularly for studies evaluating phosphorus or calcium-phosphorus ratios, with Tom Crenshaw expressing a need for such samples. The group emphasized opportunities for sharing samples and collaborating on studies across research teams to maximize resources and data utility.

Decision on next year's meeting place and date (11:18 AM)

- The group discussed potential conflicts with scheduling the annual meeting, especially due to overlaps with other events like the Banff conference and state pork congresses. While the January timing poses challenges, including conflicts with academic schedules and industry events, the consensus leaned toward maintaining the first week of January to preserve consistency. Shifting to summer introduces its own conflicts, such as graduations, World Pork Expo, and vacation time. The preference for in-person meetings was emphasized, as they foster richer discussions compared to virtual formats. Overall, the group acknowledged the difficulty of finding a perfect time and leaned toward sticking with January, accepting occasional conflicts as unavoidable.

- The date and location were decided (Jan. 8th–9th) in Nashville.

- The final decision was made on January 8th–9th at the Hyatt House (Vanderbilt) in Nashville. The group needs to fill over 75% of the rooms that are booked.

- Tom Crenshaw made a motion to express appreciation for Laura Greiner and the other officers for their efforts in organizing the meeting, which was seconded by Sung Woo Kim.

The meeting was officially adjourned at 11:28 AM ET.