

## SAES-422 Multistate Research Activity Accomplishment Report

**Projects:** NCCC42 Committee on Swine Nutrition  
S1061 Nutritional Systems for Swine to Increase Reproductive Efficiency

**Period Covered:** 01-2017 to 01-2018

**Date of Report:** March 4, 2018

**Meeting Date:** January 4 - 5, 2018

**Meeting Location:** Rosen Plaza Hotel, 9700 International Drive, Orlando, FL 32819

### Meeting Agenda and Minutes

#### Morning Session: Thursday, January 4, 2018

##### Joint Session

**NCCC42 Members Present:** Tayo Adedokun (University of Kentucky), Layi Adeola (Purdue University), Michael Azain (University of Georgia), Ryan N. Dilger (University of Illinois), Gretchen Hill (Michigan State University), Rajesh Jha (University of Hawaii at Manoa), Sung Woo Kim (North Carolina State University), Shengfa Liao (Mississippi State University), Yanhong Liu (University of California – Davis), Phillip Miller (University of Nebraska), Marcia Shannon (University of Missouri), Hans H. Stein (University of Illinois)

**S1061 Members Present:** Joel Brendemuhl (University of Florida), Lee Chiba (Auburn University), C. Robert Dove (University of Georgia), Mark Estienne (Virginia Polytechnic Institute and State University), Crystal Levesque (South Dakota State University), Merlin Lindemann (University of Kentucky), Eric van Heugten (North Carolina State University)

##### Committee Officers:

S1061: Eric van Heugten, Chair; Merlin Lindemann, Vice-Chair; Charles Maxwell, Secretary  
NCCC42: Rajesh Jha, Chair; Ryan N. Dilger, Vice-Chair; Shengfa Liao, Secretary

**Administrative Advisors (not present):** Dr. Robert Easter (for NCCC42) and Dr. Phillip Elzer (for S1061)

**Guests:** Charlotte Kirk Baer (USDA-NIFA, not present); Chris Hostetler (NPB, remote presentation), Kevin Touchette (AFIA, Ajinomoto Co., Inc.)

**The meeting** was called to order at 8:02 AM by Rajesh Jha, and introductions of administrative advisors and committee officers for both committees, and guest speaker followed.

### **Comments for Administrative Advisors:**

**NCCC42:** Dr. Rajesh Jha announced that due to the severe weather and other commitments, Dr. Robert Easter was unable to attend the meeting. No new members joined the committee this year.

**S1061:** Dr. Eric van Heugten announced Dr. Phillip Elzer was unable to attend the meeting as well; no updated information was presented. No new members joined the committee this year.

### **Guest presentation: National Institute of Food and Agriculture (NIFA)**

Due to weather-related power failure, the scheduled Skype presentation by Charlotte Kirk Baer was delivered by Dr. Rajesh Jha (Chair). The presentation provided an update on the USDA administration changes last year and also the NIFA budget outlook. Additionally, Charlotte briefly analyzed NIFA Listens Input from stakeholders regarding research, extension, and education priorities in food and agriculture last year. Charlotte also mentioned that the National Animal Nutrition Program (NANP) is undergoing midterm review (<https://animalnutrition.org/>).

Following administrative updates, **oral reports from participating stations/members** started. Digital copies of 13 reports compiled from 13 stations, and one hard-copy report from Auburn, were distributed to the meeting attendants ahead of the oral reports. Another digital copy of Wisconsin's report was sent to all committee members via e-mail during the meeting.

Immediately before the station giving station reports, Dr. Sung Woo Kim (North Carolina) informed the meeting attendants of one publication opportunity. An Associate Editor for the journal of "Frontiers in Veterinary Science" invited Dr. Kim to serve as a Guest Editor for a special issue with a theme of "nutrient regulation of animal/pig gut health". Dr. Kim therefore invited anyone in the meeting who has interest to write a review paper for this special issue to talk to him about his/her writing plan after the meeting.

Following Dr. Kim's information, Dr. Kevin Touchette (Ajinomoto) informed the committee members about the growing need of the feed and animal industries in the US for university graduates with either a MS or a PhD degree in the coming years. Based on a rough estimation, less than 50 students with a MS or a PhD degree in Swine Nutrition related areas will probably graduate in the next 3 years. The demand for graduates may be much greater than the supply of graduates, especially giving that many of these future graduates will pursue careers in areas other than in the US feed and animal industries.

The joint morning session concluded at 10:00 AM, and the break-out sessions began at 10:40 AM.

### **Break-out Sessions**

#### **S1061**

The meeting was called to order by Dr. van Heugten.

The minutes from the 2017 meeting were distributed and a motion was made and seconded to approve the minutes as distributed.

Dr. Lindemann indicated he had been in touch with Dr. Elzer, who was unable to attend the meeting due to other commitments, and that there was nothing specific from the Administrative Advisor. The group discussed that we may need a new advisor with the new project. The group agreed to recommend either Dr. Coffey from the University of Kentucky or Dr. Brendemuhl from the University of Florida.

***Research Discussion - Update, review, planning, execution, publication***

Appetein project. Dr. Chiba reported that the journal manuscript was undergoing the review process in Livestock Science. The paper has been reviewed by one reviewer and the editor was currently waiting on the second review.

Low protein project. The group discussed the data generated from the low protein project and determined that there was very limited usable data in the project and that further publication was unlikely. The group agreed not to pursue the project any further.

Organic mineral project. Dr. Maxwell was unable to attend the meeting to give a report. The current status of the paper is unknown, but it has not been submitted. Dr. Estienne volunteered to work with Dr. Maxwell to complete the paper and get it submitted. Dr. Lindemann indicated he would discuss the paper with Dr. Maxwell, and if acceptable to Dr. Maxwell, work with Dr. Maxwell and Estienne to get the paper moving forward.

Essential oil project. Dr. Lindemann reported that there had been some data collected. The group discussed the project and potential future projects. Dr. Lindemann encouraged the group to continue to collect data and forward it to him.

Copper project. Dr. Lindemann presented some preliminary data from the copper project. He indicated there was still data being collected. Preliminary data indicated some responses to copper.

Morning session adjourned for lunch at 11:55.

**NCCC42**

Review and approval of the 2017 meeting minutes unanimously by the committee members.

***Research Discussion - Update, review, planning, execution, publication***

Microbiome project:

Dr. Phil Miller (Nebraska station) distributed a draft protocol for the “microbiome” project entitled “Variability of fecal microbial populations from nursery pigs fed animal-based and plant-based diets: a multi-station approach” which had been proposed in the NCCC42 meeting last year. A lively discussion of some details of the protocol ensued.

The objective of this study is to document the basic microbial populations in nursery pigs from different stations and to determine if differences in diet will affect microbial populations in pigs among these research stations. In addition to a minor discussion about the procedure of fecal sample collection and the number of pigs (including barrows and gilts) that should be used, a major discussion was on the diet preparation. Purina-Land O’Lakes agreed to prepare the common corn-soybean meal diets for Phase 1 and Phase 3. The group suggested that Dr. Miller investigate the possibility of Purina-Land O’Lakes preparing the 4 experimental diets for Phase 2 in order to minimize variation. Each participating station will then buy these 4 diets from Purina-Land O’Lakes.

Again, the committee emphasized that the project was to elucidate fundamental profiles and shifts in microbial diversity in weanling pigs, and would not reflect use of commercial feed additives, such as antibiotics and antibiotic alternatives. The discussion ended with Dr. Miller agreeing to further define and revise the protocol with the inputs from the discussion, and then to distribute the revised protocol to the participating stations. All stations except Hawaii agreed to participate in this project

The NCCC42 morning session adjourned for lunch at 11:59 AM.

**Afternoon Session: Thursday, January 4, 2018**

**Joint Session**

**Guest presentation: National Pork Board (NPB)**

Dr. Chris Hostetler (Director of Animal Science, NPB; remote video connection) provided an update of the NPB 2018 Research Efforts. The total budget of NPB for 2018 will be \$66.8 M. \$6.2 M will be used in the area of Science and Technology. Roughly 16% of the \$6.2 M will be used for Animal Science Funding. \$1.27 M of the Animal Science Funding will be used for eight research priority categories, which will be: 1) improve pig survivability, 2) high feed cost mitigation research, 3) sow lifetime productivity, 4) pork industry scholarship program, 5) animal science program management, 6) industry productivity analysis, 7) digital media, and 8) dues and subscription. The historical budget data for the

NPB total, the area of Science and Technology, and the subarea of Animal Science were also presented. Some Science & Technology Initiatives in the past years were briefly reviewed.

**Guest presentation: American Feed Industry Association (AFIA)**

Dr. Kevin Touchette (AFIA Non-Ruminant Committee, from Ajinomoto Co., Inc.) provided an overview of AFIA that represents the US feed industry with over 600 members that include 75% of the commercial feed industry and 70% of the non-grain ingredient industry. The AFIA top legislative and regulatory priorities include: (1) Food Safety and Modernization Act (FSMA), (2) ingredient approval process [AAFCO vs. FDA], (3) ongoing efforts involving the Veterinary Feed Directive, (4) labeling genetically-engineered products, (5) trade agreements such as Trans-Pacific Partnership (TPP), and (6) distinguishing animal feed and human food. Additionally, Kevin reiterated the value of the AFIA iFeeder Program that was discussed in the previous year and how this program continues to grow and to be improved (usually, iFeeder funds \$25,000/year per project). The current research priorities set forth by AFIA largely remained the same as what were presented to this committee meeting last year. Briefly, the research needs include feed safety, ingredient valuation, environment/sustainability, health issues after AGP, nursery pigs, growing-finishing pigs, heavy pigs, sows, alternatives to antibiotics, and gastrointestinal microbiome. The market for vitamins and amino acids were also discussed.

**Guest presentation: Current state of amino acid nutrition and future opportunities**

Dr. Kevin Touchette (Associate Director - Swine Nutrition at Ajinomoto Co., Inc.) presented an overview of the current state of amino acid nutrition and future opportunities in Ajinomoto. (1) *Nursery pigs*: Titration trials on lysine, methionine + cysteine, tryptophan, valine, isoleucine, and histidine. Validation trials up to valine. We do not need to worry about the ratios when you feed above the requirements. Isoleucine is going to be used more. (2) *Growing-finishing pigs*: Many trials with tryptophan, and now with valine. Aggressive use of amino acids could lose performance. Mechanisms are unknown. Nutrient metabolism studies are required. Valine or isoleucine is the next limiting amino acid. (3) *Gestation sows*: Research is relatively limited. Multiple phase feeding sometimes did not give better performance. (4) *Lactation sows*: Lysine requirement is different than the literature. Lysine:energy ratio needs to be validated. Some studies need to be done with valine. (5) *Functional properties of amino acids*: Arginine and glutamine are well known. In the near future Ajinomoto may sell blends of amino acids instead of individual ones. Universities will still play a big role in industry R&D.

**Member presentation: Composition of fiber in feed ingredients for pigs**

Dr. Hans Stein (Illinois) delivered a very informative presentation titled “Composition of fiber in feed ingredients for pigs.” Based on the energy (GE and ME) differences between corn and DDGS, and also between corn and wheat, Dr. Stein concluded that dietary fiber is very complicated, and that may be why there are conflicting results from dietary carbohydrase supplementation studies. Then, Dr. Stein reviewed in detail the classification and structures of different fiber molecules, and where in the molecules different carbohydrases act. Finally, Dr. Stein pointed out some of his suppositions in terms of multiple enzyme application for improving the utilization of energy from cereal grains and oilseeds, respectively.

After Dr. Stein’s presentation, the committee continued with station reports. Before adjournment, Dr. Joel Brendemuhl (Florida) proposed the dates and location for the 2019 and 2020 meetings for the committee to discuss. The afternoon session was adjourned at 4:55 p.m.

### **Morning Session: Friday, January 5, 2018**

#### **Breakout sessions**

#### **NCCC42**

The committee business meeting was called to order at 8:05 AM by Dr. Rajesh Jha. Dr. Tayo Adedokun was nominated for the Secretary position by Dr. Sung Woo Kim, the committee unanimously supported this nomination, and Dr. Tayo Adedokun accepted this position. Dr. Ryan Dilger will move up to Chair position, and Dr. Shengfa Liao will serve as Vice-Chair for the 2019 meeting.

A brief report about the archive/records of NCCC42 Committee past activities was given by Dr. Dilger (University of Illinois). Dr. Dilger reported that the construction of the NCCC42 website has been done and the current committee members should be able to access these historical records from the NIMMS website (specifically, at the attachment section).

Dr. S. W. Kim reminded the committee members about the publication of review papers (nutrient vs. gut health) in the journal of “Frontiers in Veterinary Science”. The deadline for manuscript submission is December 2018.

Phytase super-dosing project: Dr. M. Shannon (Missouri) reported that she would follow up with the super-dosing phytase manuscript, which was discussed during the 2017 meeting, and try to complete the manuscript.

Bakery meal project: Dr. Hans Stein stated that his lab basically had finished the analyses of all the samples for fructans and phytate, as well as the in vitro digestibility study. He will send the draft of the manuscript to all the committee members for review and comments soon after the meeting. He planned to submit the manuscript to the Journal of Animal Science (JAS) after revision. If the JAS does not accept the manuscript for publication because of a lack of animal trials, the authors will send it to “Animal Feed Science and Technology”.

Bakery meal digestibility in growing pigs (a new project): Dr. Stein, along with stations that agreed in 2017 to participate in the project, will use cannulated pigs to study ileal amino acid digestibilities, as well as the total tract digestibility of energy and fiber.

Ca and P project (a new project): Ca is usually over-fed to the pigs in the industry. Dr. Stein’s group would like to conduct a study to survey the Ca:P ratios in the commercial feed samples across the country. Dr. Stein asked each station to help by obtaining feed samples from either the big commercial feed companies or from the commercial integrators. Approximately 100 g/sample will be enough.

The remainder of the session was spent discussing and mostly finalizing experimental design details for the new project. Ongoing efforts among participating stations will continue following the conclusion of the meeting. The morning NCCC42 session ended around 9:30 AM.

## **S1061**

Meeting was called to order by Dr. van Heugten at 8:03. The committee discussed possible objectives for the new project that is being written. Dr. Lindemann agreed to coordinate the writing of the new project. Dr. Dove and Estienne volunteered to help as needed.

Bump feeding: Dr. Levesque discussed this potential project. She indicated that she felt this needed to be a multi-parity project for it to show any meaningful response. After some discussion, it was determined to leave this objective in the new project for those that could do at least 2 parities.

Essential oils: Dr. Chiba and Dr. Lindemann discussed the current data on essential oils. The committee discussed several ideas as to the future use of essential oils in the swine industry. Dr. Chiba and Lindemann agreed to develop an objective around the feeding of essential oils.

Boron: Dr. Maxwell had discussed this potential project with Dr. Lindemann. The committee discussed a potential protocol that would feed boron in gestation and/or lactation. Dr. Maxwell will continue to develop this objective for the new project.

Dr. van Heugten agreed to rewrite the introduction to the project and update the information in the introduction.

A timeline for the completion and submission of the project was discussed. Dr. Lindemann outlined the steps for approval and asked for the names of suggested reviewers on the project. The committee provided him with several potential names.

Election of Officers: Dr. Estienne was nominated to be secretary, Dr. Maxwell will move up to be Vice Chair and Dr. Lindemann will be Chair. Nominations closed and the officers were elected unanimously.

The committee then had a general discussion of current industry trends and issues.

The morning session adjourned at 9:30.

### **Joint Session**

The joint committee meeting reconvened at 10:00 AM, at which point each committee started to share with the whole group a synopsis of new projects being planned.

Dr. Joel Brendemuhl led a discussion and decision on the date and venue for next meeting: January 3-4, 2019 at the Rosen Plaza Hotel, Orlando, FL (motion: Adeola; second: Miller). The group tentatively scheduled the 2020 meeting for January 7-8, 2020.

Station reports continued and were completed. Dr. Stein shared information about a one-week course on feed ingredients and nutrition. This course sponsored by several feed companies will be conducted for personnel working in the swine and poultry industries.

Dr. Stein reported that from the information provided at the meeting, the group had 41 Ph.D. and 21 M.S. students currently.

The meeting was adjourned at 11:30 AM.