**SAES-422 Multistate Research Activity Accomplishment Report**

**Projects:** NCCC42 Committee on Swine Nutrition

S1061 Nutritional Systems for Swine to Increase Reproductive Efficiency

**Period Covered:** 10/01/2015 to 09/30/2016

**Date of Report:** February 14, 2017

**Meeting Date:** January 5 - 6, 2017

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

**Meeting Agenda and Minutes**

**Morning Session: Thursday, January 5, 2017**

**Joint Session**

**NCCC42 Members Present:** Tayo Adedokun (University of Kentucky), Layi Adeola (Purdue University), Michael Azain (University of Georgia), Samuel Baidoo (University of Minnesota), Scott Carter (Oklahoma State University), Ryan N. Dilger (University of Illinois), Rajesh Jha (University of Hawaii at Manoa), Brian Kerr (USDA-ARS, Ames), Sung Woo Kim (North Carolina State University), Shengfa Liao (Mississippi State University), Yanhong Liu (University of California – Davis), Phillip Miller (University of Nebraska), Jim L. Nelssen (Kansas State University), Marcia Shannon (University of Missouri), Hans H. Stein (University of Illinois), Tofuko Woyengo (South Dakota State University)

**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), Charles Maxwell (University of Arkansas), Eric van Heugten (North Carolina State University)

**Administrative Advisors Present**: None

**Guests:** Charlotte Kirk Baer (USDA-NIFA, remote presentation); Chris Hostetler (NPB, remote presentation), Kevin Touchette (AFIA, Ajinomoto), Ron Nimmo (Phibro Animal Health), Henry Turlington (AFIA)

The meeting was called to order at 8:03 AM by Brian Kerr, and introductions by members of both committees followed. A moment of silence was observed for colleagues who passed away since the last meeting (Don Mahan, Ohio State University; Kees de Lange, University of Guelph; Wayne Stockland, Ag Processors Group)

**Introduction of officers, committee members, and guests:**

S1061: Crystal Levesque, Chair; Eric van Heugten, Vice-Chair; Merlin Lindemann, Secretary

NCCC42: Brian Kerr, Chair; Rajesh Jha, Vice-Chair; Ryan N. Dilger, Secretary

**Comments from Administrative Advisors:**

**NCCC42:** Brian Kerr delivered a brief update provided by Neal Merchen, who was unable to attend the meeting due to an unavoidable conflict. The project underwent a midterm review, which was completed and filed in mid-December 2016; the project will be re-reviewed in Jan/Feb 2017 with a continuance decision likely to be filed by mid-March 2017. There were 2 new members this year (Yanhong Liu, University of California – Davis; Tofuko Woyengo, South Dakota State University).

**S1061:** Crystal Levesque reported for Phillip Elzer, who was unable to attend the meeting; no updated information was presented.

**Discussion on upcoming meeting:** The joint committees agreed that the meeting would be held Jan 4-5, 2018 at the Rosen Plaza Hotel, Orlando (motion: Marcia Shannon; second: Jim Nelssen).

Following administrative updates, oral reports from participating stations were started; digital station reports were distributed to all committee members ahead of the meeting.

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

Charlotte Kirk Baer (NIFA; remote video connection) provided an update on the NIFA funding outlook and provided an understanding of how the administrative transition would occur. Additionally, Charlotte stated that NIFA’s FY2017 budget request is $1.38 billion covering 57 distinct lines, representing a $50 million increase over the FY2016 appropriated amount. Existing grant opportunities, including the Exploratory Research Program (ERP) and Critical Agricultural Research and Extension (CARE) programs were discussed, and she lauded the National Animal Nutrition Program (NRSP-9 project) for the continued and successful efforts.

Following the guest presentation, a discussion regarding an update about animal welfare issues at the Meat Animal Research Center in Clay Center, NE ensued, which transitioned into a group discussion of institutional differences in IACUC procedures and upcoming changes. The joint morning session concluded with further discussion about the National Animal Nutrition Program, including open post-doc positions to support NANP sub-committees. Following additional station reports, the joint morning session concluded at 9:30 AM and break-out sessions began at 10:15 AM.

**Break-out Sessions**

**S1061**

Review and approval of the 2016 minutes: Motion to accept previous minutes without any discussion or changes was made by Merlin Lindemann and seconded by Robert Dove.

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

Appetein objective: Dr. Scott Carter presented and distributed a draft paper and will send it to us after the meeting. Comments for change in the manuscript are to be sent to Scott by February 1. All participants are to provide information on the genetic background of the sows used. Merlin Lindemann is to provide the composition of the vitamin and trace mineral premixes used in the study. Discussion ensued about the appropriate place to submit the manuscript with general consensus that it would be sent to Livestock Science (some reasons for the decision were that there are no page charges and it has rapid turnaround). Suggested reviewers: Martin Nyachoti, Sam Baidoo, Marcia Shannon, Brian Richert

Low protein objective: The data for this project needs to be sorted and analyzed. Dr. Joel Brendemuhl and Dr. Eric van Heugten agreed to send all the data to Dr. Levesque for review and analysis. Some data is already in summary form (i.e. means tables) while other is raw data. Summary data cannot be pooled with raw data. Therefore, in order to use it rather than discard it, the raw data must be obtained. If raw data cannot be obtained from Louisiana State University, then the objective should be closed out. Dr. Levesque was given authority by the committee to decide if the data could be salvaged. It may be possible to consider preparing abstract using just NCSU data.

Organic minerals objective: An abstract of this project was presented at the Animal Science Meeting in 2015. The manuscript is currently in preparation with a target date of July 1. Data used in the manuscript is from the University of Arkansas, Southern Illinois University, and Virginia Tech. The results did demonstrate a tendency in improvement for sow performance with use of organic minerals.

Essential oils objective: Dr. Lee Chiba submitted a proposal to DSM for funding and requested $3,000 to $5,000 per participating station. No commitment from DSM was received. Dr. Merlin Lindemann shared data on a small pilot study with an essential oil product that showed some interesting results. He indicated that he has a protocol that can be used as a group project for lactation assessment; it includes fecal scoring (pre-farrowing, on d 4 to 7, and on d 14 to 17) and days to estrus, conception rate, litter size, etc. Georgia, Virginia Tech, Arkansas, SDSU, and NCSU indicated that they may have an opportunity to participate in this objective. Texas Tech has also participated with a nursery study. Inquiries to a commercial company in Mexico did not result in an industry partner. However, Lindemann will attempt to get farrowing records from that company for an analysis of birth interval.

Copper objective: Dr. Lindemann indicated that he submitted a proposal to the Pork Board for funding that was not funded. Virginia Tech has 48 sows currently on test (3 dietary treatments) for a minimum of 2 parities, Kentucky has 60 sows on test (6 dietary treatments) for up to 4 parities, and Arkansas has 70 sows on test for at least 2 parities (3 treatments). Kentucky is also collecting blood, milk and tissue samples in addition to the reproduction data normally collected. South Dakota may have sows for this project in August. Preliminary data from UK indicate that there is improved DM digestibility in Cu-supplemented groups compared to the controls in lactation but not in gestation. Potential to do LH in sow blood was discussed.

***Officer elections***

It was noted that if we follow a rotation through the committee, that the chairpersons would be the following:

South Dakota (Levesque) 2017

North Carolina (van Heugten) 2018

Kentucky (Lindemann) 2019

Arkansas (Maxwell) 2020

Auburn (Chiba) 2021

Virginia Tech (Estienne) 2022

Georgia (Dove) 2023

In keeping that rotation intact, Dr. Charles Maxwell was nominated for secretary (M. Lindemann nominated, M. Estienne seconded) and elected. Dr. van Heugten will serve as the next chairperson and M. Lindemann as the next vice-chairperson.

**NCCC42**

Review and approval of the 2016 minutes: Motion to accept previous minutes without any discussion or changes was made by Marcia Shannon and seconded by Jim Nelssen.

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

A discussion ensued regarding updates to the NCCC42 website, including the desire to include historical attendance. Hans Stein moved to have Ryan Dilger work with Gary Cromwell to complete this effort, and the motion was seconded by Jim Nelssen.

Phytase super-dosing project: Marcia Shannon stated that the manuscript is still progressing, and that Hans Stein and Tom Crenshaw (not present) needed to review the manuscript prior to submission. Sung Woo Kim suggested that Marcia Shannon send out the data tables to all participating stations now, with feedback to be submitted within 2 weeks, at which point Hans Stein will follow-up with others to get a draft of the paper out in the next few months.

Bakery meal project: Hans Stein relayed that his lab had analyzed all samples for fructans, but phytate analysis would require more sample than is available; the samples will also be analyzed for Na and Cl. A lively discussion ensued regarding the appropriateness of publishing the resulting manuscript in the Journal of Animal Science (JAS), considering the document would be relatively short. Another suggested outlet included Translational Animal Science, but the group preferred to attempt publication in JAS and plans to reference precedent in the journal for publishing compositional data of this sort.

Marcia Shannon asked about a previous Ca and P project led by Don Mahan (deceased) and Gretchen Hill; it was decided that Brian Kerr would follow up with Gretchen Hill on this project.

***New projects***

Bakery meal digestibility in grower pigs: Another project to follow the ongoing bakery meal project was defined, with outcomes focused on ileal digestibility (cannulated pigs; amino acid and perhaps lipid targets) and total tract digestibility (total collection of feces and urine; energy and fiber targets). Overwhelming support for both phases of this project was received and after a lengthy and productive discussion, Hans Stein and Brian Kerr volunteered to summarize input into initial study protocols for distribution to all participating stations.

Microbiome and protein source in weanling pigs: Phil Miller initiated a rousing discussion with microbiome-related outcomes, with 3 study objectives identified: 1) quantify baseline microbial diversity in newly-weaned pigs across stations, 2) enumerate changes in microbial diversity following ingestion of a common, complex diet across stations, and 3) quantify combinatorial effects of feeding animal (fishmeal) and plant (wheat midds) sources of protein for 3 weeks. The committee was adamant that this project was to elucidate fundamental profiles and shifts in microbial diversity in weanling pigs, and would not reflect use of commercial products, including antibiotics and antibiotic alternative feed additives. The discussion ended with Phil Miller agreeing to further define this project with input from other committee members. The NCCC42 morning session adjourned for lunch at 11:58 AM.

**Afternoon Session: Thursday, January 5, 2017**

**Joint Session**

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

Dr. Chris Hostetler (NPB; remote video connection) provided an update of the NPB, including a financial accounting, level of research support, and research priority areas for 2017. Areas included general swine health, antibiotic resistance, pork safety and quality, sustainability efforts, and animal welfare. Priorities and funding levels for multiple NPB research interests were outlined and upcoming requests for proposals were discussed. Ultimately, the NPB will provide $1.1 million in animal science research funding in 2017, with research focuses including: 1) reducing feed cost, 2) sow lifetime productivity, and 3) seasonality of pork production.

**Guest presentation: American Feed Industry Association (AFIA) – Non-Ruminant Committee**

Dr. Kevin Touchette (AFIA, Ajinomoto) provided an overview of AFIA that represents over 600 members and 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 (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 food and human food. Additionally, Kevin reiterated values of the AFIA iFeeder program that was discussed previously and how this program continues to grow and improve. Research priorities set forth by AFIA largely remained the same as presented at this committee meeting in 2016.

**Guest presentation: Veterinary Feed Directive (VFD)**

Dr. Ron Nimmo (Phibro Animal Health) discussed the newly-implemented VFD rule, with emphasis on implications for research institutions. Ron noted that the FDA/CVM classification of medically-important drugs has not been updated in 13 years, and that notable swine exclusions still currently exist; these exceptions will likely be evaluated in 2017. Ron also presented the timeline for VFD implementation, noting landmark events, and outlined the multiple Guidance for Industry documents that shaped where we are today. Producer requirements were discussed, and implications of the VFD for altering industry practices including nursery phase feeding programs were relayed.

Following a break, the afternoon session reconvened at 3:45 pm.

**Guest presentation: Food Safety Modernization Act (FSMA)**

Dr. Henry Turlington (AFIA) discussed the impact that FSMA will have on institutional ingredient evaluation research, and impressed upon the group the importance for every feed mill to write a food safety plan. Clarification was provided that the term ‘feed’ should no longer be used, and instead, this should be referred to as ‘animal food’ from a FSMA perspective. Henry mentioned that in particular, the FSMA animal food rule differs from its parent ruling in that it calls out nutrient deficiency and toxicity. Emphasis was placed on 21 CFR part 507, especially subpart C, and at this point, Henry defined a hazard and all areas where controls come into play and what documentation is needed at each step. Ultimately, FSMA will serve to shape the landscape of animal nutrition and the feeding strategies we use now and in the future.

The afternoon session was adjourned at 4:57 p.m.

**Morning Session: Friday, January 6, 2017**

**Breakout sessions**

**NCCC42**

The business meeting was called to order at 8:07 AM by Brian Kerr. Shengfa Liao was nominated for the Secretary position by Sung Woo Kim, Jim Nelssen made a motion to accept this nomination, and the motion was seconded by Rajesh Jha; the nomination was unanimously supported by the committee.

Rajesh Jha will move up to Chair and Ryan Dilger will be Vice-Chair for the 2018 meeting.

Sung Woo Kim suggested that the 2 new members share with the committee their background and research interests, and Yanhong Liu and Tofuko Woyengo shared their information.

The remainder of the session was spent discussing and mostly finalizing experimental design details for the 2 new projects. Ongoing efforts among participating stations will continue following conclusion of the meeting. The morning NCCC42 session ended at 9:17 AM.

**S1061**

The meeting was called to order at 8:03 AM by Crystal Levesque.

Objectives for next project were discussed because it will need to be submitted by about Feb 1, 2018. Subjects discussed and/or suggested were:

* Essential oil influence on estradiol (potential for CARE or Exploratory grant – Merlin to contact Charlotte Kirk Baer regarding suitability). Would this also involve the use of Lutelyse?
* Low birth weight piglets, increasing litter sizes, nutritional strategies,
* Amino Acids: reduction in protein w AA. What else (non-amino acid) is removed when SBM is pulled to reduce CP?
* Linoleic and linolenic acid. What is the essential fatty acid requirement of the sow?
* Injecting vitamins A, D, and E and follow the piglets.
* Yeast products? Interaction between sow and offspring response in the nursery.
* Hy-D product (DSM) in early gestation and market hog performance
* Grams AA/d added (Lys, Thr, Met amounts equivalent to a ‘bump’) or cornstarch (equivalent energy to a ‘bump’)
* contact Mexico company to get birthing cards (birthing interval, stillborns, litter size correlation)
* nutritional strategies in late gestation and lactation to enhance offspring development and growth during the suckling and early nursery phases

Following discussion of the possibilities, Merlin and Lee were assigned to prepare a draft of additional essential oils studies, Charlie to prepare draft of an AA project, and Crystal to prepare a draft of bump feeding. Drafts will be due July 1.

**Joint Session**

The joint committee meeting reconvened at 10:00 AM, at which point the remainder of oral station reports were provided. Each committee shared with the group a synopsis of new projects being planned. Finally, a discussion ensued regarding a request from Gretchen Hill (absent) that if anyone so desired, funds in memorial of Don Mahan could be donated to the Juvenile Diabetes Research Foundation (JDRF). Merlin Lindemann made a motion to have Marcia Shannon collect funds and provide them to Gretchen Hill for submission to the JDRF; the motion was seconded by Layi Adeola. Marcia plans to send correspondence to committee members with further details.

A special thank you to the National Pork Board for continued financial support of this meeting, and Joel Brendemuhl was recognized for his efforts to arrange the hotel and organize logistics for lodging.

The meeting was adjourned at 11:11 AM (motion: Layi Adeola; second: Merlin Lindemann).

**Decision on next meeting date and venue:** Jan 4-5, 2018 at the Rosen Plaza Hotel, Orlando.