**NRE1942 Annual Meeting Minutes: July 28, 2022**

**Enhancing Poultry Production Systems through Emerging Technologies and Husbandry Practices**

**Virtual Meeting**

**July 28, 2022**

The meeting was called to order by John Boney at 1.06 pm.

**Introduction of Participants:**

* John Boney (Penn State): Broiler, turkey nutrition and management
* Rajesh Jha (University of Hawaii): Poultry nutrition and gut health
* Birendra Mishra (University of Hawaii): Reproductive health
* Shawna Weimer (University of Arkansas): Poultry Welfare
* Indu Upadhyaya (University of Connecticut): Food Safety Ext Spec
* Pratima Adhikari (Mississippi State University) Laying hen nutrition, management, gut health
* Rich Gates (Iowa State University) – Layer production
* Li Zhang (Mississippi State University) -Bacterial genetics, genomic, gut health
* Kelley Wamsley (Mississippi State University)- Broiler nutrition, feed particle, amino acids
* Aditya Dutta (University of Delaware) -Reproductive biology
* Anthony Pescatore (University of Kentucky) – Extension Poultry specialist
* Lilong Chai (University of Georgia) Animal environmental engineering, poultry health and welfare
* Tayo Adedokun (University of Kentucky) Poultry nutrition
* Richard Blatchford (UC Davis) – Poultry welfare
* Lingjuan Wang-Li (North Carolina State University) – Air quality, ag engineering
* Abhi Upadhyay (University of Connecticut)-Poultry health and safety, nanoemulsions
* Sara Orlowski (University of Arkansas)- Poultry management, genetics
* Wilmer Pacheco (Auburn University) – Feed Milling
* Ken Macklin (Auburn University) – Poultry extension, food safety, genetics
* Tom Vukina (North Carolina State University) – Poultry economics
* Tim Boltz (Mississippi State University) – Poultry nutrition, broiler performance
* Dawn Koltes (Iowa State University) - Physiology
* Peter Ferket (North Carolina State University) – Turkey nutrition, extension
* Janice Siegford (Michigan State University) – Behavior and welfare
* Prafulla Regmi (University of Georgia) - Welfare
* Hong Li (University of Delaware) – Welfare, housing systems
* Scott Beyer (Kansas State University) – Poultry nutrition and managament
* Mary Amalaradjou (University of Connecticut) – Food safety, natural antimicrobials
* Reshma Ramachandran (Mississippi State University) – Reproductive physiology and microbiology
* Anuraj Theradiyil Sukumaran (Mississippi State University) – Pre-harvest and post harvest poultry safety.
* Colin Usher (Georgia Tech Research Institute) – Guest Speaker

 **Administrative updates:**

* + Mid-year meeting minutes were motioned and approved.

 **Officer election:**

* + Pratima Adhikari will be the Sr Executive for 2023.
	+ Rajesh Jha suggested to promote the current junior executive and secretary to the senior executive and junior executive roles respectively, and to appoint a new secretary. Pratima Adhikari and Indu Upadhyaya both agreed to this motion.
	+ Shawna Weimer was nominated by Abhi Upadhyay for the secretary position.
	+ The vote was unanimous for the 2023 officer slate to be Pratima Adhikari as senior executive, Indu Upadhyaya as junior executive, and Shawna Weimer as secretary.
* **Proposed location for the 2023 meeting and Mid-year meeting:**
	+ The mid-year meeting will be held in conjunction with IPPE in January 2023, like last year.
	+ Shawna Weimer suggested that Mississippi State University could host the 2023 meeting.
	+ Birendra Mishra mentioned a previous meeting at Purdue University and suggested that the meeting should be hosted at a location with a strong poultry facility and industry.
	+ There was a brief discussion on the potential for a Latin American conference in the future, possibly in 2024. Further discussion on PSA potentially supporting membership and travel to a Latin American poultry conference was conducted. This will be further discussed in the next meeting.
	+ Anthony Pescatore mentioned the Arkansas Nutrition Conference in late August or September as something to possibly link to the 2023 meeting.
	+ The time of year for the 2023 meeting was also discussed. Spring could be an issue due to biosecurity concerns regarding HPAI, though there should be less of a transmission risk by June.
	+ Alternatively, the meeting could be hosted by both Mississippi State University and Auburn University. Iowa State also has new facilities for cage-free chickens as well as turkeys.
	+ Mary Amalaradjou suggested having the meeting in a hybrid format, allowing members to join virtually if they are unable to travel and attend in person.
	+ The final options for hosts for the 2023 meeting were Mississippi State, Auburn University, Penn State in conjunction with the PSA meeting, and Iowa State. This will likely be further discussed at the mid-year meeting in January in Atlanta.
	+ A survey was planned to narrow down potential times and locations for the annual meeting, which can be finalized at the mid-year meeting.

**Other Administrative items:**

Each group should submit their station report to Ken Koelkebeck with 2-3 paragraph in a WORD document by September 21st detailing progress from October 1st, 2021 through September 30th, 2022. A template will be emailed out.

**Station Reports:**

* + University of Arkansas: Sara Orlowski reporting. Sara’s research has been focusing on genetics and resource efficiency. Research has focused on developing lines divergently selected for a low water conversion ratio currently at 2.69 compared to the control of 3.03. The high conversion ratio is nearly at 4.00. Further UArk is developing technology for potential application in feed conversion as well.

Shawna Weimer reporting. The drinking behavior of these lines including water wasting, along with effects and prevention of heat stress are also being investigated by Shawna. UArk has hired a new parasitologist, Dr. Danielle Graham, and in September Dr. Tomi Obe will join them as a Food Safety Microbiologist. They are also looking for an extension faculty (see link below).

* + - <https://uasys.wd5.myworkdayjobs.com/uasys/job/Assistant-Associate-Professor-Extension-Poultry-Husbandry-and-Management_R0014016>
	+ Auburn University: Ken Macklin reporting. The new poultry farm would be fully operational by the end of the year. Ken has been working with farms investigating food-borne pathogens, going through all stages of poultry production. He has also been looking for signs of pathogens in poultry feed. Research on the diet of breeders on eggshell quality is being conducted. Dianna Bourassa has been looking at different disinfectants that could be used for poultry processing and is working with Ken.

Wilmer Pacheco reporting. Wilmer’s work mainly focuses on feed milling and nutrition, conducting research on different feed diameters and forms, and how those factors affect performance and digestibility. Current findings suggest that the optimum particle size varies depending on feed form. Wilmer’s student is working on a methodology for evaluating particle size in the microstructure of the pellets. Future projects include the effects of feed retention time and the financial impacts of this, and how changes in feed can improve performance of small chicks. Wilmer would like to collaborate with anyone who is interested in these topics. There is also research being done on enzymes such as phytases and alpha galactose in energy- and phosphorus-deficient diets, alternatives for antibiotics, and how amino acid and energy availability in feed is affected by corn origin.

* + University of Connecticut. Maryanne Amalaradjou reporting. Maryanne’s lab is currently looking at egg disinfection methods and how they can control *Salmonella* in embryos, hatchlings, and grown birds. She is working on another project with laying hens in collaboration with Indu Upadhyaya and John Boney. Maryanne’s students presented their findings at the PSA meeting.

Indu Upadhyaya reporting. She has been working on outreach enhancing the safety of eggs by ultra-fine bubble technology. A virtual demonstration on the usage of equipment for this is in development. She is also working with John and the rest of the UConn group on a USDA-SAS grant, mainly on broiler outreach. Also working on evidence-based handling guidelines for improving the safety of free-range poultry and eggs. Indu is developing a training for poultry processors and poultry HACCP to get virtual and in-person USDA certification training.

Abhi Upadhyay reporting. Abhi has been working on nanotechnology for poultry safety, including the use of ultra-fine gas bubbles as an antimicrobial agent. He has also been working on nano emulsions of essential oils in water for controlling poultry pathogens.

* + University of Delaware: Hong Li reporting. Hong’s group has completed a prototype development for a new foam-based vaccination system for poultry hatching to improve vaccination coverage. He is working on local air circulation to improve the microenvironment at the bird level. A prototype circulation system will be added into a commercial house in September. He has also been working with the EPA Chesapeake Bay program during the past year, with about four seminars being done on emission mitigation along with a white paper report to be released in September.

Aditya Dutta reporting. Aditya has been working on two primary projects over the past year. Research is being done on gene expression and metabolic profiles in layers and broilers during different stages of ovulation, and manuscripts will be submitted after meta-analysis.

* + University of Hawaii: Rajesh Jha reporting. Most projects are being done through collaboration throughout the Hawaii team. Rajesh’s work primarily focuses on the evaluation of poultry feed, including polysaccharides and incorporating enzymes from alternative feedstuffs such as micro algae. Results are being looked at from a holistic perspective, investigating how poultry metabolic profiles and the birds are affected. There is also a regular lab running in China focusing on a stress management nutritional study, as well as projects on insect meal as alternative feed and its impact on performance and gut health.

Birendra Mishra reporting. Birendra is currently focusing on two main topics: poultry production and physiology. In production, his goal is to enhance the efficiency of broiler breeders and laying hens to produce more eggs. Research on this includes using biomarkers to assist in developing genetic and hormonal regulation of egg production, as well as how environmental factors can impact egg laying efficiency. Additional research is being done on how different phytochemicals and flavonoids can reduce oxidative stress. He would like to collaborate on projects relating to poultry reproduction and the transcriptomic metabolomic proteomics pathway.

* + Iowa State University: Dawn Koltes reporting. A few projects have been delayed due to HPAI affecting the availability of laying hens from commercial facilities. In fall, a study will be done on mitigation strategies of *Salmonella* in laying hens, preventing the pathogen from colonizing the gastrointestinal tract and entering eggs. This will be a direct inoculation study at a BSL-2 facility. A new turkey barn at IOWA state will also be operational soon.

Rich gates reporting. Rich has been working on a life cycle assessment for the US Egg Industry, which will provide more data on cage free birds. He is also working to study drafting emissions models for criteria pollutants that impact poultry that may be used to regulate the industry. A technical report on this is available on the Egg Industry Center main webpage. Rich also recommended a pooling of expertise to form an extension resource giving advice to the general public, on what to do if poultry flock has contracted HPAI.

* + University of Georgia: Prafulla Regmi reporting. Prafulla has been working on multiple projects, including a useful trend egg project where they validated RFID-based tracking technology for laying hens. An experimental trial was also recently completed that looked at the effect of different growth rates on lameness and lameness-related behaviors. He will also be collaborating with Purdue University to investigate turkey lameness. Other projects include looking at environmental enrichment strategies for birds that are feed restricted.

Lilong Chai reporting. He is concluding a project about case air quality management and is also investigating the automatic tracking of hen behavior. He will be working on a new project to study air quality. He has been working primarily on Clostridium, necrotic enteritis, and coccidiosis. In addition, his focus is on food safety and product production. Lilong is currently working on a large project on using virtual simulation tools to look at heat stress in broilers during transportation to the slaughterhouses.

* + University of Kentucky: Tayo Adedokun reporting. He is working on studies centering around effective sources of vitamin E with and without vitamin D supplementation, how these vitamins affect performance and fatty acid composition, and the amount deposited in various parts of the birds. His group is also working on how different levels of phosphorus affect bone and egg quality. There were two other studies involving effects of a multi enzyme combination on bird performance. A new poultry farm at Univ of Kentucky is under construction.

Anthony Pescatore reporting. Anthony is currently working on two main projects. The first is an online training program for veterinarians to learn about poultry health. This program is developed, and it only needs approval from the USDA for details on fees structure. The second project is a regional study on human stress on farms and ranches. They are also looking for a new department chair.

* + North Carolina State University: Peter Ferket reporting. With hiring of new staff and faculty at NC State, focus is on collaborative projects. The topics include broiler breeder fertility and its relation to nutrition and growth characteristics; incubation, data analytics and feed formulation; training extension opportunities; establishing an egg innovation research facility; turkey management and feed manufacturing, feed milling, heat stress, effects of foodborne pathogens on the entire system, poultry processing and food quality, and poultry behavior and welfare. Ken Anderson has been working on topics related to ventilation, environmental effects, and caging systems. They have also been renovating some of their older facilities and are converting another house into a smart building for precision technology. A new aviary system will be completed soon as well. At their turkey farm, two of the large grow-up facilities have been renovated and a new BSL-2 facility has been installed. A plan for a new hatchery is being developed. A new initiative is to transform pre-existing laboratories into a farm of the future, including modernized facilities and a building showcasing and teaching technology. This will act as a location for something adjacent to eco-tourism for experiencing modern agriculture while maintaining biosecurity. Peter has been working with slow-releasing micro-encapsulated vitamins, trace minerals, and other bioactive compounds, and has found that these reduce related nutrient requirements and change the gut microbiome towards a more symbiotic state. He is also working on a new turkey growth model, utilizing data analytics and precision animal farming. They are also looking for a new poultry science department head.

Tom Vukina reporting: Tom discussed updates from the industry including a merger that will employ a new payment scheme that will not penalize inefficiency, as well as Proposition 12 in California that will ban the sale of eggs that are not produced in cage-free environments. Prior to this movement being on the table, it appears that only a small amount of all eggs was produced by cage-free hens.

* + Michigan State University: Janice Siegford reporting. Janice and group have been working on a mix of cage-free laying hen behavior and precision livestock farming. Recently, they have been working on development of computer vision programs for detecting problematic laying hen behavior such as laying eggs on the litter and piling. Janice has been researching different behaviors on litter, including dust bathing, circadian patterns, acclimation time, and wing flapping. She has also been working on using depth cameras for characterizing vertical and horizontal space used during wing flaps and other movements and plans to publish. In August, they will be launching a USDA-funded project on strategies for managing floor-laying in cage-free systems that will compare the effectiveness of robots and humans and finding effective and efficient ways to train the hens. They are looking for potential students who may be interested in these topics. A longstanding and productive poultry science researcher, Janice Swanson, will be retiring in 2023.
	+ Mississippi State University: The search for department head is ongoing and they will be scheduling interviews soon.

Kelley Wamsley reporting: Kelley has been working on digestible lysine requirement studies, and currently going through each phase of a Ross 708. Future studies will focus on interactions with branch chain amino acids. There has also been research on feed particle size preference. The Mississippi group have also been working on phytogenic feed additives, trying to control late cycling with different coccidiosis vaccines, projects with trace minerals, protease and phytase effects with broilers, and reducing data variation based on differences in personnel and sample size.

Pratima Adhikari reporting. Pratima’s group has been working mainly in layer nutrition and pre-harvest food safety. A major project she has been working on investigates *Salmonella* in laying hens with industry collaboration. Another project investigates protease feeding in a corn/soybean meal diet funded by the USDA which was completed last year, and the manuscript is now in progress. A project on phytase super dosing in laying hens that investigates limestone particle size ratios has been recently completed. She is looking for a PhD or master’s candidate interested in layer nutrition to help with a project on amino acid feeding in laying hens. Her next project starts in the fall that will focus on retesting pre-existing cocci vaccines, redosing them in the feed, and observing how they affect various aspects of the birds such as lesions in the gut, overall histology, and gene expression. Pratima will also be exploring probiotics and enzyme combinations with probiotics, and how it will affect production and bird microbiomes.

Anuraj Sukumaran reporting. Anuraj’s research is on post-harvest food safety and poultry processing. He is working with *Salmonella* and *Campylobacter*. His work focuses on formation of *Salmonella* biofilms on poultry production surfaces. His research with *Campylobacter* is primarily to establish the mechanism that makes it the most common foodborne outbreak causing organism when it has so many restrictions for growing in aerobic environments. Anuraj is working with companies to develop a replacement for peracetic acid use, developing camera vision technology to detect broiler breast defects, and working on a grant to get their poultry processing facility to be federally inspected for the purpose of using it for education and certification courses. He hopes to collaborate with others who have similar interests.

Li Zhang reporting. Li has been focusing on food safety and rapid pathogen detection on the farm. His lab is also working on loop media isothermal amplification for detecting *Clostridium perfringens*. Another student from his lab is using reverse methodology to develop a vaccine for campylobacter through whole genome sequencing. He is also working with a student to develop an *E. coli* vaccine using very similar methods. Recently, he has completed whole gene sequencing and rapid detection of woody breast. He is happy to collaborate with this group.

Reshma Ramachandran reporting. Reshma has been focusing on broiler breeder reproductive physiology and reproductive health and is mainly working on mitigating bacterial pathogens such as *E. coli* and *Salmonella*. A graduate student has been working on understanding virulence characteristics of pathogenic *E. coli*, and a challenge model is also in development. She is assisting with the *E. coli* vaccine development. She recently got a grant for studying the vertical transmission potential of *Salmonella* in turkey breeders and developed a bioluminescent strain of the bacteria to assist with in vivo tracking. There will be a project starting soon on understanding the reproductive tract microbiome and its role in the male and female fertility and the female egg production, which will hopefully help develop microbial biomarkers for improving fertility in breeder populations. She would like to collaborate with anyone who is also interested in these projects.

Tim Boltz reporting. Tim is a new professor at Mississippi State and has been working on getting his lab up and running. He is planning to focus on feed hygienics and nutrition and is more than happy to collaborate with others on that.

* + UC Davis: Richard Blatchford reporting. UC Davis and UC Riverside have been collaborating to study ectoparasites including mites and lice and how parasite populations affect poultry welfare and behavior. Richard’s group has also been developing accelerometers to create behavioral dictionaries and do more automated data collection for that project. Richard is planning a study on wing flapping behavior and motivation to wing flap under different social and spatial contexts, which will be conducted soon. He has also been working with other members of the group on multiple projects including scatter feeding as a form of enrichment and the effects of access to different levels of height in pullet housing on the amount of keel bone damage, depth perception, resource use, general behavior, and floor eggs. There will be publications on these projects expected in Fall. It was reported that Maja Makagon has been working with ducks recently, looking at the effects of two common duckling rearing strategies on the development of reproductive behaviors of drakes and overall flock fertility. Crystal Yang has been working on antimicrobial patterns of both *Salmonella* and *E. coli* at a small-scale poultry facility.
	+ Penn State: John Boney reporting. At John’s lab, collaborative work with Wilmer and his student is being conducted. They are studying soybean meal particle size after it is pelletized. The first paper on this has been published and the second is being submitted. John has been working on farm nutrient segregation and how we can influence the nutrient profile of the feed at different parts of the house, ultimately trying to provide a homogeneous feed so that we have more uniform flocks. He has also been looking into lengths and bends of feedlines as well as pellet quality, and how they can influence the nutrient profile. Penn State also finished three studies with commercial turkeys looking at pellet quality strategies for hens and toms, and how they can be applied at different times. John has also been working with members of the UConn team on the SAS grant, looking at the potential for mealworm larvae and cricket meals as potential sustainable feed additives for broilers. The Penn State extension team was active in the response to HPAI in their state, working with small and backyard producers to quantify and locate where a majority of the exempted broiler processing is occurring as well as protect them and large commercial flocks. John’s group was recently awarded funding to start an apprenticeship program for this. They are also trying to find unique ways to have better trained people enter the industry, including on the job training.
* **Guest speaker presentation**
	+ The guest speaker for this meeting was Colin Usher, the new robotics branch head for the intelligent sustainable technologies division of Georgia Tech Research Institute. He explained what his division does, which is mainly the development of rapid prototype systems for specific problems as well as research, outreach, and education. The goal of the group is to generate a system, IP, or technology that can be commercialized and put into use by other vendors or companies.
	+ Major outreach projects they have are Poultry World at the Georgia State Fair, various STEM events, and attendance at trade shows and exhibitions. They also have a social media presence and a website where they have a twice-yearly publication highlighting current research and interviews.
	+ Colin presented examples of a few projects. They have worked on audio monitoring systems for detecting activity for welfare purposes, enhanced carcass chilling for increased efficiency and reduced footprint requirements, utilizing nanoparticles for filtering phosphorus out of wastewater, automated robots for collecting eggs, monitoring bird health, and potentially estimating bird weight in chicken houses, using adaptive robotics for deboning that may be assisted by a human using virtual reality systems, a vision system for estimating how much meat is left on the frame after deboning that rivals a manual scrape test, and systems for on-the-farm slaughter of broilers.

**Questions?**

* + The floor was then opened for questions. John asked what the most promising projects were for helping continue to produce food for a growing population. Colin believes that it is likely various systems used for better management through data, such as cameras using artificial intelligence for identifying disease or robots supplying high resolution environmental microclimate data. Rich asked a question on how the institute plans on influencing the industry and putting new products on the market without earning a negative relationship with other groups. Colin explained that his institute is trying to have partnerships with pre-existing companies rather than compete and listed some of the collaborations they currently have. He also mentioned a few groups that are planning on utilizing robots they developed.

The location of the 2023 annual meeting will be finalized at the mid-year meeting at IPPE in Atlanta in January,2023.

Meeting adjourned at 4:46 pm on the note that collaboration and outreach are vital for future innovation.