

NE -1042
Optimization of Poultry Welfare and Production Systems for the 21st Century
Meeting Minutes
October 4-5, 2013
Crowne Plaza Hotel
Bloomington, MN

Friday, October 4, 2013

Call to Order:

The meeting was called to order at 8:05 am at the Crowne Plaza Hotel in Bloomington, MN by chair Darrin Karcher.

Members present: 13 present.

The following members of the committee were present: Ken Anderson (NC), Mike Darre (CT), Jeremiah Davis (MS), Mike Hulet (PA), Darrin Karcher (MI), Yi Liang (AR), Sally Noll (MN), Paul Patterson (PA), Tim Shephard (IA, for Hongwei Xin) , Janice Swanson (MI), Michael Toscano (Bern), Kelley Wamsley (MS) and Wei Zhai (MS)

Opening Remarks:

Dr. Michael Schmitt- Assoc. Dean for extension and research programs and Deputy Director of the Experiment Station welcomed the group to U of MN. He spoke a little about the University stating that it was unique for land grant in that it is in the middle of a city. The university has a vet school, med school, public health, law, and other major programs all in one place on the main campus. The university brings in about \$750 million in research each year. They have 53,000 students; 59% UG, 25% grad, 7% professional and 9% non-degree. The university has 4 regional campuses and 15 regional extension offices. MN is a state with an abundance of natural resources for recreation and enjoyment. MN is the headwaters of the Mississippi River, the Red River, and the St. Lawrence river. The state has a total of 92,000 miles of rivers. It also has 11,842 lakes of greater than 10 acres. Agriculture is big in the state with 81,000 farms at an average size of 332 acres. Farm income is \$13.2 billion annually (7th in US). There are more than 544,000 farm jobs. Minnesota is #1 in Oats, Sugarbeet, Sweet corn, Green peas and Turkeys; # 2, wild rice, #3 in soybean , hogs, and #4 in corn, dry beans, and flax seed production. Like many other states, they are losing Dairy production to the west, especially Idaho and California. The state produces about 44 million turkeys. This led to a discussion on use of litter and manure from these turkeys. It was stated that we can obtain better crop yields by applying the litter/manure on fields compared to anhydrous ammonia, but now some of the litter/manure is being sold to companies like Fiberwatt who burn litter and sell the ash back.

Committee Business:

A. General Business and Membership Reports

Sally Noll said that the registration fee is \$110 each, cash or check made out to University of Minnesota. This fee covers lunch, meeting room rental, breaks and van use. Dinner on Friday will be at the NAPA Valley Grille at the Mall of America at 6 pm. A tour of the U of MN UMore Park Turkey Research Facility in Rosemont will follow the meeting on Saturday.

Current committee structure: Chair is Darrin Karcher, Senior Executive Officer is Jody Pursewell, Junior Executive Officer is Ken Anderson and Secretary is Mike Darre

Ken Anderson was appointed chair of the nominating committee to select a new Junior Executive. Due to the rotation schedule we need to elect an engineer. The potential candidates are Yi Liang, Jeremia Davis, Hongwei Xin or Tim Shephard.

Darrin said that he was in contact with members of two other multistate groups who might want to merge with ours, the air and water quality group and the food safety/quality group. One group did not get the re-write approved and the other did not apply for a new project. Since some of the objectives of these projects overlap with us, we have invited them to join our group. So we now have a much broader systems approach.

As a carryover from last year, we still need to identify potential industry reps and an economist. Tomislav Vukina (NC), or Bailey Norwood OK State have indicated some interest. Paul Patterson said there was an economist who worked with UEP, Nicole Widmar at Purdue.

For the industry reps on the committee it would be good to look for people representing different aspects of the industry, such as feeds, equipment engineer, quality control, etc. We currently have Kevin Roberson. Some suggested people are: Ryn McDonald-Devine, from Cal Maine (Quality Assurance); Ernie Meyer at McDonalds; Derek Emmerson at Aviagen; Jesus Agraro or Ian Rubinaoff at HyLine; Curtis Novack from Land-o-Lakes; Mike Kreher at Chorettime. Does anyone know people from Cargill, Cumberland-Hired Hand, Whole Foods, Big Dutchman (Darrin?). Anyone who knows someone from industry that might join, contact them prior to Nov1 and let Darrin Karcher know.

Darrin stated that we need to publish a termination report. State annual and termination reports are due on January 17. The termination report is a comprehensive summary based on each objective in original outline. You need to include any funding, such as grants, allocations, etc. Include the titles of grants, time period, involvement, impact statement, significant publications resulting from project involvement, etc. The annual report and termination report needs to be sent to Ken Koelkebeck (IL). We had two objectives. On the last project:

1. Energy/resource efficient poultry production systems

This will include collaborative efforts on feed energy sources for poultry by geographical region, ventilation systems, lighting systems, animal welfare and modeling energy use in poultry systems.

2. Alternative production systems

This collaborative research will encompass characterization and mitigation of air emissions, manure nutrient management, animal welfare (including health), and economic evaluation of alternative poultry production systems.

B. Administrative Update:

Dr. Cameron Faustman (CT) was unable to attend the meeting this year. Other than the partial government shut down, and no approved farm bill and appropriations, nothing new to report.

C. Approval of Minutes of last meeting.

The minutes of the October 12-13 annual meeting held at the Piedmont Research Station in Salisbury, NC were approved as distributed. Some of the business we discussed last year was collaborations for the coming year (this year):

It was agreed that the committee write some joint extension type bulletins for web presentation. The topics that are pertinent to the group are:

DDGS – Ken, Sally and Sheila

Housing – Ken, Sheila, Deana,

Develop a seminar on Lighting - It was agreed that we would develop a Symposia on Lighting for Poultry for the 2014 PSA meeting and then write a joint publication. Possible contributors are Mike Darre, Jody Pursewell, Darrin Karcher, Sally Noll, Susan Watkins, Brian Fairchild and Eric Benson. Economics of floor eggs for cage free production systems. Ken, Darrin, Deanna, others.

Beak Trimming/cannibalism/behavior – Ken, Hengwei, Joy, Darrin

Reducing Ammonia with PLT, All-Clear – Ken K. Hongwei, Jody, Darrin, Angel

Mike Darre accepted the duty to chair a lighting symposium group for 2014 Poultry Science. He will meet with interested members of the project and write a proposal to submit to Darrin. In addition to the members cited from last years minutes the following individuals may also be part of this effort: Hongwei xin, Mohamed El halawani, Paul vandeBunte.

D. Other business:

Janice noted that CAST is proposing a new report update on welfare of Ag Animals. She also said that a new study group on Animal Ag research is being formed with assistance from NAS. Another group, the National Association for Advancement of Animal Science- a new lobbying group is seeking funding for animal production research.

E. Compiling the 2012 annual report

The NIMMS report is due 60 days after the meeting. So each participant must get their short summary and references to Ken Koelkebeck no later than the week of November 24. These reports should be submitted in RTF format.

The full report is due by January 10, 2014 and is to be sent to Ken Koelkebeck. He asked to make sure you *Highlight* collaboration in your final reports. These reports should also be in RTF format. Ken will also send out an electronic version, in addition to a hard copy of the report to each participant.

F. Station Reports

AR Yi Liang- said that Susan Watkins is still doing water quality and lighting studies. Yi Liang, is working on evaporative cooling and stated that continued use of water for large cooling pads may cause water shortages, especially in times of draught. She is studying surface sprinkling of the birds for cooling broilers and laying hens. They have data from five flocks on water consumption and cooling with water. Bird performance was similar in both sprinkler vs pad houses. Sprinkling saved up to 60% of water compared to pad systems. Get some direct and indirect cooling. It was suggested that doing a behavioral preference study for pad vs sprinkling would be beneficial. One thing that helped with their work is the controller and logic system used to control the environment. They are using an advance algorithm in the logic controller.

CT Mike Darre reported that the use of plant derived antimicrobials, such as carvacrol (CR) (from oregano oil) and trans-cinnamaldehyde (TC) were effective in controlling SE in laying hens. TC worked well in reducing SE levels in the cecum and in controlling macrophage transport of SE to the ovary by down-regulating several virulence genes associated with SE movement and adhearance. In another study, TC was found to be effective in reducing the growth of *Aspergillus flavus* and *Aspervillis parasiticus*, two of the major molds that produce mycotoxins affecting the poultry industry. Aflatoxin production from *A. flavus* and *A. parasiticus* was significantly reduced within 3 days using TC or CR in a model broth system and also within 5 days in chicken feed. Both TC and CR down-regulated genes critical for aflatoxin production. It was concluded that both CR and TC could be used to reduce aflatoxins in poultry feed.

IA Tim Shepherd who is sitting in for Hongwei Xin presented data on several projects they have underway.

1. They did some hen behaviors using RFD chips on the legs of the hen and a 3D camera. Their goal was to develop an automated system so the computer will do the work of keeping track of individual bird in multiple bird groups. The set up pens with both 5 and 10 birds. They can track movement, trajectory, activity, nesting, perching, at feeder or water and how much time at each. This reduces the time humans need to observe the

birds. The camera is used to determine if the bird is on the perch, near feeder and water, going to nest box, etc.

2. The Egg Industry Center did a review of environmental improvements and sustainability of the egg industry over the past 50 years. They looked at Greenhouse gases, acidification, energy demand, total environmental footprint. The only compared cages to cages. The 2010 data compared to 1960 data indicated that in 2010 birds used 26% less feed with a 27% higher feed efficiency. Using 1960 methods, birds and equipment we would need 27% more hens. The current energy foot print is 65-71% less and total energy demand is 31% lower. Now supply 30% more eggs on less inputs with fewer birds. The bottom line is we have better production, less pollution, CED was 31% less than 1960 per kg of eggs. Full report is on the Egg Industry Center Report.

3. Coalition for Sustainable Egg Supply. They are looking at three housing systems, aviary, enriched, conventional. They studied air quality, emissions, energy use, and production efficiency. They used the mobile Air Emission Monitoring Unit. They also did a manure storage study. They found that both Aviary and Enriched systems did well in maintaining temps. The Aviary system was a bit warmer than the others, but all were kept between 76-80°F. The Aviary had higher NH₃ levels, above 25 ppm, especially in cold weather which was mostly due to litter moisture. Conventional and Enriched were the best for ammonia and particle (pm10). Ammonia emissions were greatly affected by manure storage. See the CSES site for more information <http://www2.sustainableeggcoalition.org/>.

MI Darrin Karcher discussed several projects at Michigan.

1. Fearfulness and stress and injurious pecking in turkeys. They did tonic immobility and novel object testing. Tonic immobility is the best test. They found that feather pecking is higher in the HyBrid turkey vs the randombred strain.

2. Evaluation of behavior and feather lipid content of laying hens on different litter substrates. What is lipid content on feathers relative to lipid substrates Atro turf, concrete, straw and shavings.

3. Feather pecking in laying hen study. The question they asked was: Does and environmental stimulus affect feather pecking? For an enrichment/distraction they used a hay bale, plastic box, and no-enrichment. There was no treatment effect on pecking. At peak egg production, more aggressive pecks, fewer gentle pecks. They also pecked more at hay than plastic box.

4. Enriched Colony Cage density Project. 8 rooms in the enriched house, four will molt, four no molt. Six different densities over two systems: 72, 90 101, 116, 124 and 144 in sq. They are measuring feed disappearance, hdp, mortality, feed conversion, weight, and salmonella shedding.

5. Cage free Aviary substrate study to determine what works best for litter.
6. Comparison of bone quality between breeds and housing. Found breed and housing effects. Barred Rocks had thicker and more dense bone cortex.
7. In collaboration with researchers at Purdue, the studied duck gait scores relative to bone strength. They found a difference between the right and left hips. Hip angle increases as gait score increases. There is more potential for lameness on one side vs other.
8. Behavior of hens housed in an enriched cage system. Presented at PSA 2013.

MN Sally Noll presented information on two projects.

1. Nutritional factors affecting poult performance. Poults were behind bw potential at 2 weeks and 30% below at 3 weeks of age. This is due to the fact that turkey poults are more difficult to get started, eating and drinking. The question is: Does better brooder body weights equal better grow out weights? She looked at the ratio of digestible thr/lys and total protein levels. Higher AA density is better for overall growth.
2. Studied the oil extracted from ddg's from ethanol from corn and regular corn oil. Corn oil did a better job for growth. It can be used in the pre-starter diets also. There was some variability in the ddg's extracted oil.

MS Jeremiah Davis reported on several ongoing projects from MS.

1. Energy in poultry houses. They looked at the effect of sampling intervals on house size and design on air velocity distribution. They used hot wire anemometers. They had as many as 66 sensors in a house. They compared three different house designs. They looked at fan placement, evaporative pad size and placement and baffles and found that all affect the air velocity. Fans on sidewalls and not ends results in poor velocity.
2. Effect of air deflectors in a ceiling vent house. Houses loose 11% of fan capacity with deflectors.
3. Monitoring heat transfer through the thermal envelope (wall insulation). Sidewall insulation is very important, especially in steel sidewall buildings. Need to put the insulation on the inside of the metal sidewall for the greatest effectiveness in reducing heat transfer.
4. Comparing radiant heaters for brooding. They looked at the hot spot vs. usable area on several types of heater, including heat lamps and hover brooder stoves. A lot of variation due to size, height, reflectors, etc.
5. Energy grasses as a sustainable Litter Material. You can get 25 tons per acre by third year of growth. They want to determine the cost of changing verses treating the litter

and re-using it. They got better foot pad scores on the grasses compared to fresh pine shavings.

6. Kelly Wamsley at MS is doing facility renovations and can do fecal collections for studies. Will be doing feed studies in cages in cecectomized birds. She also did some vitamin D and algae feeding studies. She sees a difference in feed ingredient due to pellet quality from one end of the house to another, due to breaking up the pellet.

7. Wei Zhai from MS is also doing physiology/nutrition work. She is studying the effect of methionine and immunity in chickens. She also looked at the level of methionine, lysine and fiber on growth and meat quality of broilers. She also studied DDG as replacement for meat and bone meal in poultry diets. There was an effect on cholesterol in the blood, lower in DDG group. Use of DDG caused a thickening of intestinal muscle and length of intestine. She is also working on pre-biotics and pro-biotics because of concerns over antibiotic use.

NC Ken Anderson is redoing their pen and cage free facilities at the Piedmont station.

1. He has 22 strains of layers. He said that breeders are developing birds for different housing and growing environments. He is currently on the third generation of range research. He has developed a paddock rotation system. Range facilities require about 1.6 man hours per bird. For 60 birds he uses a 3600 sq ft. and rotates paddocks every 28 days. Mortality was between 13 and 17% in low and high density groups. Low density is 30 sq ft bird, high is 15 sq ft bird.

2. He also did an organic egg production study following a 2 day rotation following application of dairy cattle manure to the pasture. He found darker yolks, but no change in shell color. Looked at the crop contents and noticed that no-cow manure group had more fiber in the crop and more bug bodies.

3. They just finished a nest material study, comparing stroturf, straw and woodshavings. They liked the chopped straw the best.

PA Mike Hulet is doing research on turkey euthanasia options.

1. He presented information from an AVMA talk he gave about using penetrating and non-penetrating captive bolt systems for euthanizing turkeys. The NTF is looking at other options other than blunt force trauma to the head. There are basically two current choices, the TED captive bolt gun or the Zephyr-E. The TED uses a CO₂ cartridge. They looked at time to tonic immobility and used the nictitating membrane response or loss of wing flapping as criteria of death.

2. Broilers study on backyard flocks.

3. They are training people in PA on how to deal with mortalities during transport.

4. Also looking at pendulus crops in turkeys. Held at 85F then dropped 5F per week and it helped. High brooding temp led to more pendulus crops.

PA Paul Patterson reported on several studies he is involved with.

1. Vegetative buffers for poultry farms. They are also good for snow control. They make a good visual screen and help control the movement of emissions, such as ammonia, dust, odor and some viruses away from the farm. Leguminous trees cycle the ammonia into growth. Trees such as Willow and Poplar and miscanthus grass seem to work the best. P2.5 is an issue with emissions and these buffers help in reducing their spread. In PA they have an odor regulation so must control

2. He also did studies on using poultry litter as fuel. They also studied gasifying poultry manure for energy. They dry the manure, capture the ammonia, bring temp up to get gas, burn the gas for steam and make electricity. The ash is removed and sold for the phosphorus and calcium. Birds did well on ash as sub for all phosphorus. But the calcium was calcium oxide (quick lime) and burned the tongs of the chickens.

3. Salmonella control studies. FDA took the PQAP program. Now they are looking at SE incidence in farm with less than 3,000 bird. Found that SE was mostly from rodents or other birds.

4. He made pick balls of grit and calcium to help reduce feather picking. When they were softer they picked them.

BERN Mike Toscano is doing projects with ZTH Zollikofen in Switzerland and the University of Bern at the Poultry and Rabbit research facility.

1. His work is on animal welfare issues. He is studying perches in broilers, nest box design (partitions and persistence), range use with RFID technology, feed trough design, position and bird density.

2. He is also studying bird behavior leading/following collisions/crashes into each other, and genetic influence on keel bone damage. Most of his work is on modeling keel bone growth and damage. Keel bone fractures are welfare issues and may reduce egg production by 5%. Perches may increase keel fractures by 10-30%. His project is on quantifying the fractures, quantifying collisions and determining which birds are having issues. To study this they are using controlled collisions using dead birds and a collision simulator. They developed a tri-axial accelerometer so they can measure energy of collisions and how many occur at a time. They are also modeling birds and graphing potential for fractures over time. One interesting finding is that as birds age, the incidence of fractures increases and then decreases. This change may be because as egg production drops, calcium removal from bones decreases. Not sure of the cause yet.

The meeting ended at 5:40 pm on Friday and the group went to dinner.

Saturday October 5. 8:06 am.

Nominating committee report: Jeremia Davis was elected as Junior Executive.

The 2013-14 Committee Structure is:

Chair - Jody Purswell
Senior Executive - Ken Anderson
Junior Executive - Jeremia Davis,
Secretary - Mike Darre

G. Time and Place of Next Meeting

Starkville, MS on September 18 and 19, 2014. Fly into GTR. Use Delta Airlines. Plan on full days on Thursday and Friday (8 am to 5 pm). So arrive on Wednesday.

H. Project Rewrite:

A new working title has been proposed: *Poultry Production Systems and Welfare: Sustainability for Tomorrow.*

Reports at the next meeting should be based on objectives , not just random material from each station. We will cluster reports on the three objectives and hope that those collaborating on these objectives will coordinate their reports for increased efficiency at the meeting.

The rewrite team is comprised of the following individuals: Darrin Karcher, Ken Koelkebec, Ken Anderson, Sally Noll, Janice Swanson, Mike Tuscano and Jody Purswell.

For input to the next project, we need material sent to Darrin by Nov 1. The following is required:

1. Project number and title,
2. Requested project duration,
3. related and previous work,
4. statement if issues and justification,
5. objectives (which objective are you working on) ,
6. methods,
7. measurement of progress
8. proposed results- outcomes, impacts, outputs and milestones.
9. Projected participation.
10. An outreach plan,
11. organization and governance and

12.literature review.

Total for our report to the USDA is only 15 pages so for your input on items 1-12, keep it short and to the point.

Our New Objectives are:

1. Energy/Resource efficiency

Feed and fuel energy sources for poultry and facilities by geographical region; facility design, equipment efficiency, management, and modeling energy use in poultry systems.

2. Establishing parameters influenced by the production system and strains utilized within the poultry industry

Areas include poultry nutrition, physiology, behavior, well-being, food safety and quality, and economic implications.

3. Evaluating Commercial Poultry Production Systems

Characterization of the performance of conventional, alternative, and organic poultry production systems relative to air and water quality, nutrient management, acoustic environment, and animal health and welfare.

Potential projects and collaborations to meet the objectives:

1. There is no standardization of litter characterization. Types of litter, types of feed, types of birds. We should produce a white paper on methodology. What are the funding sources? MS, PA, MN, NC, MI, AR, IA,
2. Animal Monitoring Systems- tracking MI, Bern, IA, IL, MS
3. Strain and Skeletal implications- Yield/ productivity NC, Bern, MI, PA, IN, AR, IL, MS, MN
4. Poultry nutrition under different production systems, IL, NC, MN, Bern, PA, MI, MS, GA, NE,
5. Lighting systems CT, GA, MI, MS, NC, Bern, IA, PA
6. Energy Efficiency MS, PA, IA, GA, AR
7. Food Safety/Quality/Yield factors CT, MI, NC, USDA-ARS, IN, MN, PA, MS, AL
8. Hen Behavior/ Welfare Assessment - MI, Bern, IN, CA, NC, NE,

I. Soliciting New Members

It was the consensus that we should invite some International researchers to join the committee. Some of the suggested people and who will contact them are: Tina Widowski, Guelph(Darrin); Inma Estevez, Spain(Sally); Karen Schwean-Lardner, Saskatoon (Sally); Britta Scholz, FLI Germany(Mike T); Ernst Frohlich- Swiss (Mike T)

J. Collaborative Grants and Opportunities:

The following are potential areas for grant funding and collaboration:

1. Water, Biomass, etc. – USDA-NRCS
2. Food safety/Quality – USDA
3. SARE project- CT,

K. Other Business

It was suggested that we use Adobe connect for mid-year conference/meetings, especially for non-US members and those unable to attend.

Darrin suggested we have a brief meeting in Atlanta at the IPPE for check on progress on the re-write. The IPPE is on January 28-29-30. Ken Anderson will book a one hour block sometime on either Jan 29 or 30.

The group thanked Sally Noll for hosting the meeting and making all the arrangements for a successful meeting.

The committee voted to adjourn at 10:39 am.

Respectfully submitted by Michael J. Darre, Secretary. October 5, 2013