

## **USPOULTRY Identified Research Needs (2020-2022)**

### **What needs have been identified?**

Proposed research projects should be designed to provide information that has the potential to resolve real industry problems. **The following list is organized by overall subject area. Items within each list are presented in priority order.**

USPOULTRY realizes that new issues are always emerging and that scientists may see the importance of a potential problem that has not been recognized or cited as an industry research need. USPOULTRY invites proposals that address problems outside the industry lists but urges the submitter to provide ample background and justification to explain the need for the research.

### **Animal Welfare**

1. Develop method to determine sex of embryos prior to hatch
2. Investigate methods to improve bird welfare during catching, cage unloading and bird movement through to shackling (Including unloading area design)
3. Validate quantitative method(s)to evaluate bird welfare. Method may be specific to an area of production
4. Devise and test improved conveyances and methods for reducing bird stress, injuries and enhancing product quality and public image in live transport
5. Evaluate methods of mass depopulation, specifically for broilers, turkeys, layers or breeders
6. Investigate alternatives to maceration for cull chicks or embryonated eggs
7. Evaluate the effects of probiotics/feed supplements on gut health
8. How is bird growth affected by G.A.P standards

### **Breeder Management (Broiler/Turkey)**

1. Alternative feeding/nutrition management for replacement pullets to replace current feed restriction programs
2. Establish feeding and lighting schedules for pullets/hens and turkey breeder hens for maximum production/hatchability
3. Develop improved methods for egg management, sanitation and storage to optimize chick quality
4. Improve the understanding of the transmission of Salmonella Reading from turkey breeders to progeny
5. Determine etiology, epidemiology, prevention, and control measures for mortality of breeder hens and roosters from housing to peak production

6. Develop rapid, non-destructive, and quantitative methods for determining egg microbiological quality for routine quality control practices: hatching eggs

### **Meat Bird Management**

1. Nutrition/Management programs to maximize performance and antibiotic-free production systems
2. Define and describe the microbiological effects of lay-out time, and interventions that can substitute for layout time (e.g., sanitation practices, litter composting, litter amendments, etc.)
3. Determine influence of spectrum, intensity, and photoperiod for different ages on performance and wellbeing
4. Compare different brooding methods using energy use, mortality, and growth rate as criteria
5. Develop and evaluate a feeding program and management practices (lights, feed pan management, water pressure, temperature, etc.) to slow the growth of normal growing commercial broilers and turkeys in the field that can be immediately implemented during an emergency

### **Commercial Egg Production**

1. Develop rapid, non-destructive, and quantitative methods for determining egg microbiological quality for routine quality control practices in commercial eggs
2. Devise environmentally acceptable and residue-free systems of fly control
3. Devise environmentally acceptable working conditions for employees in alternative housing systems
4. Devise systems to prevent starve-outs and/or injuries

### **Diseases**

1. Determine risk factors, epidemiology, pathogenesis, prevention, and control of the various clostridial diseases of poultry (gangrenous dermatitis, clostridial dermatitis, necrotic enteritis, focal duodenal necrosis, cholangiohepatitis, etc.)
2. Enhanced Gut Health - understanding and improving micro biome, including the mechanism and impact of prebiotics and probiotics; understanding host/pathogen interaction; understanding the role of viruses: develop strategies to manage gut health; improve diagnostics
3. Determine the risk factors, epidemiology, prevention, of reovirus infection in broilers and meat turkeys. Develop a live vaccine which will provide protection against current reovirus strains
4. Development of a live *Salmonella* vaccine that is equally effective across multiple serogroups

5. Determine the length of protection generated by killed bacterins, especially autogenous *Salmonella* bacterins
6. Devise improved methods for the diagnosis and control of variant strains of infectious bronchitis
7. Determine risk factors, epidemiology, pathogenesis, prevention and control of *Campylobacter hepaticus* infection in chickens
8. Devise methods for prevention/reduction of pathogenic bacteria colonizing poultry
9. Devise improved methods for the diagnosis and control of variant strains of infectious laryngotracheitis

### **Employee Safety Health**

1. Industrial Hygiene monitoring and sampling protocols -- identify potential exposures and develop a protocol for determining permissible exposure levels and for determining required frequency and methodology for routine sampling -- including ammonia, chlorine, nuisance dusts, formaldehyde, carbon dioxide and a variety of airborne infectious diseases such as aspergillosis and histoplasmosis
2. Determine the incidence of repetitive motion disorders in catchers and live hanging workers and develop strategies to minimize these disorders
3. Identify existing and novel practices to prevent dissipation and spread of any public health virus aerosols from workers near one another in processing plants. Provide safety guidelines and design criteria for common areas such as break rooms, bathrooms, etc.

### **Environmental Management**

1. Devise methods for odor and ammonia control from poultry production houses via diet manipulation, litter additives, etc.
2. Devise methods for water reuse, conservation and recycling
3. Evaluate the impact of processing food safety chemical interventions and wastewater treatment system
4. Development of a feed decontaminant/antimicrobial similar in cost in-use and effectiveness as formaldehyde but with less concern regarding worker safety
5. Development of carbon footprint for various poultry industry sectors (feed mill, rendering, grow out, hatcheries, and processing plants) - or development of model to calculate carbon footprint for various sectors
6. Impact of the use of poultry litter as a fertilizer both on soil quality and water quality.

## **Feed Mill Operations**

1. Estimate Salmonella and Campylobacter prevalence in poultry feeds and feed ingredients, and significance/role of same in relation to Salmonella and Campylobacter prevalence in finished products
2. Devise cost-effective ways to improve pellet quality

## **Food Safety**

1. Determine safe and effective antimicrobial applications to reduce Salmonella and Campylobacter prevalence associated with mechanically deboned poultry, poultry parts, and heat treated (Not-Ready-To-Eat) poultry products, as well as the raw materials used to produce them
2. Develop methods for cleaning deep skin Salmonella contamination in poultry carcasses or parts
3. Develop post-chill handling methods to reduce microbial contamination
4. Develop rapid methods for detecting foodborne pathogens
5. Evaluate effectiveness of carcass dips/sprays in reducing microbial contamination
6. Validations for interventions: Identifying the critical monitoring parameters for Salmonella
7. Devise methods for prevention/reduction of pathogenic bacteria of food safety concern colonizing poultry
8. Determine the portion of human Salmonella and Campylobacter infections that is scientifically linked to consumption of poultry products

## **Genetics**

1. Devise ways to improve the immune response of poultry through genetics, including resistance to colonization by salmonella and campylobacter
2. Define the contribution of genetic selection to leg weakness and skeletal problems and devise selection strategies to ameliorate these problems
3. Develop Marek's resistance in chickens through genetics

## **Hatchery Management**

1. Devise and validate enhanced hatching egg management and operational sanitation methods to improve microbiological quality of hatching eggs and chicks/poults while protecting worker safety
2. Develop alternative methods to enhance chick quality without the use of antibiotics
3. Evaluate the value of in-hatchery feeding of chicks
4. Devise and validate measures to reduce stress and injuries in automated bird handling systems

5. Evaluate the effects of prolonged time lapse between poult hatching and placement in the field. What is the optimal time range to place poult s after hatching to achieve maximal well-being?

### **Human Nutrition**

1. Compare the nutritional and microbiologic quality of poultry raised using organic and conventional methodologies, as well as consumer perceptions related to both
2. Compare the nutritional and microbiologic quality of organic and conventional eggs, as well as consumer perceptions related to both
3. Evaluate the impact in which slowing the growth rate of poultry mid-production may have on meat quality and usefulness of the product. Assess factors such as change in taste, texture, processability to identify if there is a point where slowing growth rate impacts meat quality negatively.

### **Live Haul**

1. Define the impact of cleaning catching/hauling equipment on bacterial load on carcasses, especially *Salmonella* and *Campylobacter*
2. Devise and test improved conveyances and methods for reducing bird stress, injuries and enhancing product quality and public image in live transport

### **Nutrition**

1. Determine the influence of breeder nutrition on chick and poult performance
2. Define the optimal intestinal microflora for maximizing genetic potential of current broiler and turkey strains
3. Devise nutrition management programs to support extended lay in laying hens
4. Determine the impact that various ingredient combinations have on the microbial status of the bird
5. Determine the cost effectiveness of enzyme combinations that maximize energy and/or amino acid utilization from commonly fed feed ingredients
6. Define diets and withdrawal strategies to control contamination in processing
7. Formulating diets for reducing problems associated with broiler breeder obesity causing leg deformity, brittle bone and breakage in cage layers, thus enhancing animal welfare
8. Determine the optimal energy and protein needs of broiler breeders at various stages of production

### **Poultry Housing**

1. Evaluate oxygen and ammonia sensors to monitor air quality
2. Optimize integrated pest management programs in live production

### **Breeder Replacement Management**

1. Determine optimal feeding techniques for weight and uniformity management and welfare (potential alternatives to skip a day feeding programs)
2. Develop new vaccination techniques to improve protection and lessen stress on the bird
3. Determine optimum photoperiods, light intensity, and associated management factors (e.g., beak trimming) in relation to weight, uniformity, bird welfare and maturity
4. Determine optimal male weights throughout life for best hatch

### **Processing and Further Processing**

1. Define the cause of “white striping” and “woody breast” and other myopathies in chicken breast meat and determine procedures to reduce its incidence
2. Devise improved and rapid methods for the detection of metal fragments, bone, and other foreign materials in meat
3. Develop methods for prevention of cross contamination and prevention of ingesta contamination leading to elimination of contamination on final product
4. Define the effect of gas stunning on delay in defeathering, chilling, and meat quality in broilers and turkeys
5. Determine effects of preslaughter stress on feather release, moisture gain/retention, and muscle tissue quality
6. Determine the actual feasibility of irradiation of poultry meat
7. Devise technological methods that would allow plants to run a wider range of bird weights within the same processing facility during a crisis where there is a need to process birds at greater sizes/weights.
8. Determine additional automation capabilities in processing facilities from arrival of live birds through to packaging and dispatch.