The NRSP-8 Poultry Workshop held January 14-15, 2017 at the Plant & Animal Genome Conference, San Diego CA, attendance overview:

- Attendance during the 1.5 day workshop averaged n=75 with peak attendance in excess of 120.
- Representatives of 16 agricultural experiment stations attended from across the US including the membership of NRSP-8 Poultry group: Iowa State, Michigan State, University of Arizona, Univ of Delaware, Univ of Georgia, University of California Davis, University of Minnesota, Beckman Research Institute, USDA-ARS.
- Attendees also included members of the poultry layer and broiler breeding companies, U.S. government officials, and scientists from the United Kingdom, Germany, Canada, Sweden, Netherlands, Thailand, and China

Grants

- Kent Reed, Univ of Minnesota:
    - Effect of AFB1 on immune tissues of turkeys from diverse genetic backgrounds. USDA-UMN Multi-State Project, 2016-2018, $94,221;
    - USDA National needs fellowship for enhancing animal production: Addressing national need in poultry production. USDA-NIFA-NNF. 2016-2021, $241,000;
    - Antibiotic-free alternatives to improve health and performance in commercial turkeys. USDA-NIFA-AFRI. 2016-2018, $464,000;
    - Influence of thermal challenge on turkey muscle development and meat quality. USDA-NIFA-AFRI. 2014-2018, $975,000.
- Marcia Miller: Beckman Research Institute, City of Hope Medical Center, CA: USDA NIFA Foundational Program *Understanding Antimicrobial Resistance*. Award: $387,518.00. Period of Performance: 06/01/2017-05/31/2020. MHC-Y-Directed Immune Responses during Colonization of Chickens by *Campylobacter.*
- Doug Rhoads, Univ Arkansas: Marker Assisted Selection for Ascites Resistance in Broilers. NIFA-AFRI; 11/2014-10/2017; $467,000; PI: Rhoads
- H. Zhou, UC Davis: $9,212,800 from USAID, USDA, Egg Industry Center, France-Berkeley Fund including newly funded $737,800 during that period.

Impacts

Our members are highly focused on fundamental, translational and applied research to benefit U.S. Agriculture and through genomics improve poultry health and contribute to the productivity of the relevant industries. Below are listed some of the highlights from 2016-17 research. Many of the efforts are focused on projects that directly impact poultry health and production.

Extreme temperature variations threaten the quality of poultry muscle as a healthy, high quality food product. Identification of molecular mechanisms associated with altered muscle development will result in development of mitigation strategies based on improved genetic selection, nutritional intervention, and other strategies to improve poultry muscle food quality and quantity. **Likewise, exposure to aflatoxin (AFB_1)** causes annual industry losses estimated in excess of $500 M. Increasing innate resistance to AFB_1 could result in numerous health benefits. Transformational improvements in

AFB_1 resistance require a multidisciplinary approach to identify protective alleles with potential to reduce disease. Genetic markers to improve AFB_1-resistance have a potentially high commercial value and positive economic impact to industry, owing to improvements in health and well-being, productivity, and a safer product for consumers. **The gastrointestinal health of an animal is key to its successful growth and development.** Elimination of subtherapeutic antibiotics for growth promotion and health in poultry will leave a critical void. This project will improve our mechanistic understanding of host-microbiome interactions in the avian host, and identify feasible approaches towards modulating the turkey intestinal microbiome resulting in enhanced health and performance.

Whole genome resequencing was utilized to identify and fine map 31 potential QTLs for ascites which would be a major breakthrough in methods to map complex traits in domestic animals. We have been examining the basis for resistance and susceptibility to bacterial diseases in bacterial chondronecrosis with osteomyelitis in broilers.

Provision of unique poultry genetic materials (chicks, fertile eggs, DNA) to group members enabled multi-state collaborative research on topics including genetics of resistance to heat and pathogens, and allele-specific expression.

BRI SMRT was utilized to sequence BAC clones corresponding to the MHC-*Y* region in the red jungle fowl (RJF) reference genome. The MHC-*Y* genomic sequence revealed the presence of 91 genes within 649 kbp contained within four contigs. The 91 genes are located within dense arrays of repetitive sequences. This represents most but perhaps not all the RJF MHC-*Y* haplotype. The MHC-Y region is likely segmented and subject to variation among haplotypes in gene copy number. In addition we sequenced 137 kbp of the closely adjacent ribosomal RNA region. Within this sequence are four ribosomal RNA units along with intervening sequence. These data (soon to be published) add substantially to the genome assembly for chicken chromosome 16

ChIP-seq and ATAC-seq assays developed and other -omic data generated for regulatory elements annotation will be important for not only poultry but the entire animal genome community. Identification of genes that are associated with resistance to heat stress and Newcastle disease virus can be used to genetic enhancement of disease resistance of chicken in adaption to hot climate. Knowledge of genes associated with enhanced immune response may inform further information on vaccine efficacy in poultry production. Understanding the impact of gut associated pathogen on microbiota composition at different development stages will provide great insights in improve gut health and subsequently increase production efficiency and animal well-being.

Understanding of the driver mutations for Marek's is a key gap in our knowledge of genomic-based causation contributions by the host. Ikaros is the first discovered Marek's disease driver gene. Based on human and mouse studies, somatic mutations in the Zn-finger binding domains will lead to uncontrolled proliferation of T cells. Marek's disease virus Meq is likely to prevent apoptosis of these rapidly growing cells by inhibiting bcl-xL.

Bioinformatics and annotation projects provide poultry researchers with the ability to effectively translate genomics data into knowledge that can be applied to agricultural systems. A search of the CRIS

database identifies almost 260 actively funded genomics projects; this represents millions of dollars of investment in animal production. The direct **economic impact** of our research is to enable this investment to be more readily applied to production systems. In addition to the economic impact, strategies to reduce or eliminate the severity animal disease also broadly impact society.