

# Improving Poultry Genetics

NC-1170 (2008-2013)

## *Demand for High Quality Poultry on the Rise*

Meat and eggs are efficient, economical, and nutritious sources of protein around the world. In the U.S., recent scientific discoveries in genetic selection, disease control, and nutrition have propelled unprecedented growth of the poultry industry. Americans eat more poultry than either beef or pork, and consumption is on the rise. The U.S. is a major producer and exporter of poultry meat. In recent years, the combined value of production of chickens, eggs, and turkeys has neared \$36 billion dollars per year. To sustain the poultry industry and meet domestic and international demands for poultry health and poultry product quality, scientists must continue to improve knowledge and test new technology that will boost production efficiency and poultry performance.



Lance Cheung/USDA Flickr photo.

## *Multistate Research Project Brings Better Poultry to the Table*

Multistate Research Project NC-1170 has brought together researchers and forged strong partnerships with the poultry industry and producers. NC-1170 coordination allows researchers to share information, resources, and tools, including databases, cell lines, and experimental poultry populations, and address complex national and local issues facing the poultry industry. NC-1170 has also produced and shared chicks, fertile eggs, blood, tissues, DNA or RNA from a variety of poultry lines (including highly inbred and advanced intercross lines), expanding genomic studies among cooperating researchers.

Over the past five years, NC-1170 researchers have developed new state-of-the-art tools, statistical models, and methods that have enabled scientists to much more rapidly and accurately evaluate poultry genes as well as regulatory regions in order to explore the fundamental biological mechanisms responsible for poultry growth, physiology, behavior, and health. Analyzing genes has made it possible for NC-1170 researchers to generate genetic and physical trait maps that show how genes are organized for chicken and turkey and to draft the sequence of the whole chicken and turkey genomes. Researchers have also developed a standardized vocabulary and categorization scheme for genes to help researchers compare genes. With full genome sequences, poultry can be used as a versatile model for understanding genes and genetic mechanisms important to skeletal, limb, and organ development in other birds and vertebrates, including humans.

Increased understanding of gene function and expression has helped researchers identify genes that influence important traits that control growth, reproduction, and disease resistance. By giving researchers a better understanding of how genetic variation leads to physical variation in chickens and turkeys, this work is improving poultry breeding and production. Identifying



United Soybean Board Flickr photo.

**Broiler**



**Fayoumi**



**Leghorn**



**Adiposity**

**Plasma NEFA  
Fatty Acid Oxidation**

Studying three genetically distinct lines of chickens enable NC-1170 researchers to identify genes and metabolic pathways involved in fatness and leanness.

genes related to Marek's disease and other diseases (like avian influenza, coccidiosis, cellulitis, avian metapneumovirus, and infectious laryngotracheitis) has helped develop strategies that reduce the incidence and severity of the disease. Other researchers have identified traits related to aggression, stress, aflatoxicosis, and nutrient intake during embryo development and as adults. These discoveries have led to more effective treatments for poultry diseases and more efficient feeding, which in turn have improved animal welfare and performance. Breeding and raising chickens with improved genetics makes production more efficient and less costly, which lowers prices for consumers and helps the U.S. poultry industry maintain its competitive edge. These advances ensure a sustainable supply of safe, nutritious protein.



With improved genetic resistance, along with good handling and hygiene, chickens are less susceptible to diseases. FAOALC Flickr photo.

## Want to know more?

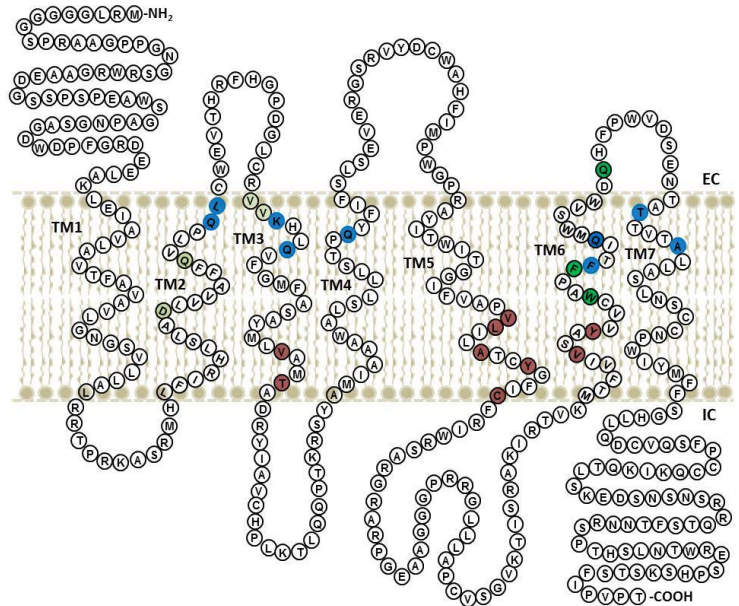
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This Impact Summary was compiled and designed by Sara Delheimer.



NC-1170 researchers have identified molecules that regulate how birds respond to stress. Diagrams like the 2-D illustration above help researchers keep track of the various amino acids involved. This figure comes from the following paper by NC-1170 members: Jayanthi, S., S.W. Kang, D. Bingham, B.A. Tessaro, T.K.S. Kumar and W.J. Kuenzel. 2014. Identification of antagonists to the vasotocin receptor subtype 4 (VT4R) involved in stress by molecular modeling and verification using anterior pituitary cells. *J. Biomolecular Structure and Dynamics* 32:648-660.