IMPROVING ANIMAL MUSCLE GROWTH FOR EFFICIENT MEAT PRODUCTION

Meat is an important, nutrient-dense source of protein for many people around the world. In order to meet growing demand in an economically and environmentally sustainable manner, producers need ways to increase the efficiency of meat production.

Researchers from 25 Agricultural Experiment Stations are working together to understand the molecular and cellular processes and environmental factors that control or influence animal muscle growth and function. These insights are illuminating ways to improve animal productivity and the overall quality of meat through breeding, diet, and other strategies. Findings may also help ameliorate muscle disorders in humans and other animals, including pets and performance animals like race horses.

Working together allows project members from multiple states and disciplines to share data, samples, equipment, and knowledge. This enables efficient, comprehensive research. Since its inception, the project has been highly productive, generating important findings and many articles in top tier journals. In recent years, the number of project participants has increased 40%, facilitating even greater productivity. Project members have also trained numerous students and post-docs, facilitating future research and animal production professionals.

Multistate Research Fund
IMPACTS

RESEARCH HIGHLIGHTS

Scientists gained knowledge about the function and influence of biochemical processes/molecular factors on muscle growth in many different species. For example, new information regarding the role satellite cells (precursors to skeletal muscle cells) could lead to strategies to eliminate Wooden Breast condition, a costly meat quality defect in poultry.

Researchers provided insights on the effects of environmental factors, such as temperature, on skeletal muscle growth in chickens, turkeys, sablefish, swine, and cattle. For example, researchers demonstrated that the effects of stress-induced deficits in muscle growth in animal fetuses are still present in juvenile animals.

Project members studied how animal nutrition (including supplemental amino acids, nutraceuticals, and vitamins) impacts skeletal muscle growth and energy-storing fat tissues in horses, mice, pigs, and cattle. For example, consuming more protein than required can reduce rapid loss of muscle mass associated with metabolic stress. Benefits of increased protein intake include improved muscle function and improved ability to recover from disease and trauma, which could result in reduced animal production costs.

Several project members increased knowledge regarding the effects that maternal factors have on the skeletal muscle growth of their offspring. For example, data suggest that maternal over-nutrition and obesity have negative impacts on fetal muscle and body fat development. In addition, diets adequate in calcium phosphate lead to greater satellite cell proliferation and differentiation rates, which may improve muscle growth potential.

New data on how tenderness develops can be used to enhance the quality of meat products. For example, research found that factors that affect the aging process also play a role in development of beef tenderness. Studies also showed that thermal stress may have long-term implications on turkey meat quality. Tenderness is a highly sought after quality, so improved tenderness could be a major economic boost to the industry.

Researchers were granted a U.S. patent for nicotinamide riboside, a vitamin B3 analogue, which increases poultry muscle size, improves pig resistance to fatigue, and stabilizes the color of pork cuts. Recently, a company licensed the patent for commercialization. Scientists continue to test the product and refine the protocol for its use.

This project, *NC1184: Molecular Mechanisms Regulating Skeletal Muscle Growth and Differentiation (2015-2020)*, is funded in part by the Multistate Research Fund through the USDA-NIFA and by grants to project members at the following institutions: University of Arkansas, Auburn University, University of California-Davis, University of Connecticut, University of Florida, University of Georgia, University of Hawaii, University of Idaho, University of Illinois, Iowa State University, Kansas State University, Louisiana State University, Michigan State University, University of Minnesota, Mississippi State University, University of Missouri, University of Nebraska, North Carolina State University, North Dakota State University, Ohio State University, Oklahoma State University, Purdue University, University of Rhode Island, Rutgers University, South Dakota State University, Texas A&M University, Texas Tech University, Utah State University, Virginia Polytechnic Institute and State University, Washington State University, University of Wisconsin. In 2020, NC1184 was renewed through 2025.

Learn more: ***bit.ly/NC-1184***