UNIVERSITY OF DELAWARE

CENTER FOR BIOINFORMATICS & COMPUTATIONAL BIOLOGY

CBCB SEMINAR
12/7/2020

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bioinformatics.udel.edu

BIOINFORMATICS SEMINAR

HEIDI VAN EVERY

PhD Student, Department of AFS UNIVERSITY OF DELAWARE

PATTERNS OF METABOLIC REPROGRAMMING IN THE POST-HATCH BROILER CHICK AS CHARACTERIZED BY INTEGRATED CORRELATION ANALYSIS OF HIGH-THROUGHPUT DATA

The modern broiler (meat) chicken, selected for production characteristics over the past 70 years, demonstrates marked improvements in feed efficiency and muscle growth. The liver plays a primary role in this, especially over the first three weeks' post-hatch while the birds transition from reliance on stored yolk nutrients to a carbohydrate-rich diet. A preliminary comparison of hepatic transcriptome and metabolome has identified reprogramming in core metabolic pathways, including carbohydrate and lipid metabolism, along with suggesting that hypoxia response plays a protective role to the growing liver. Here, we apply a correlation network approach to integrate disparate types of high-throughput omic data and identify clusters of genes and metabolites displaying similar patterns related to pathways and phenotypic traits over this three-week time course. By including the plasma metabolome, we corroborate some of our previous findings about the liver's metabolic interactions with the body, and generate systems-level hypotheses about the liver's role in this critical transition, especially as it lays the foundations for the efficient nutrient utilization and rapid muscle growth that sets the modern broiler apart.

IMAN BHATTACHARYA

MS Student UNIVERSITY OF DELAWARE

OPTOGENETICS STIMULATION IN NON-INVASIVE SKELETAL MUSCLE ACTIVATION: BIOMARKER IDENTIFICATION VIA KEY GENE EXPRESSIONS IN CALCIUM SIGNALING

Optogenetic stimulation which enables spatially sensitive, cell-type-specific, pain-free stimulation, is an emerging alternative to electrical stimulation. Optogenetics directly activates the nerves distal to the paralyzed/injured skeletal muscle via expression of light-sensitive Channelrhodopsin-2 (ChR2) on cell membranes, Skeletal muscle contracts in response to optogenetic stimulation by triggering an action potential that propagates and induces a global cellular calcium response. Rises in cytosolic calcium then stimulate downstream calcium-dependent signaling pathways to regulate skeletal muscle contractions. Recognizing that calcium signaling pathways play a crucial role in skeletal muscle contractions, my thesis aims to identify the key genes/transcription factors in the calcium signaling pathway that mediate skeletal muscle contractions. I achieved this aim by comparing differentially expressed genes between ontogenetically stimulated skeletal muscle (triceps-surae) to the contralateral, unstimulated skeletal muscle of young mice. My results show that pro-inflammatory cytokines (Tnf, Il6) and growth factors (Egr1, Egr2), are up-regulated in the optogenetic stimulated skeletal muscle compared with the contralateral unstimulated control. These targets can potentially be utilized to regulate the production of a biological drug in-situ, by repeatedly applying light to the tissue and inducing expression of therapeutic transgenes in skeletal muscle paralysis.

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