Public Abstract
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Graduation Term:FS 2017
Department:Biological Sciences
Degree:PhD
Title:Eph/ephrin involvement in skeletal muscle development and regeneration

Skeletal muscle development and regeneration-

Skeletal muscle makes up about 50% of the total body mass in humans and is important for breathing, movement, and metabolic regulation.

During development, blocks of precursor cells, somites, contain cells that will form muscle, cartilage, tendon and the dermis. Myogenic differentiation is primarily from muscle progenitor cells that committed to the muscle lineage and fuse with one another to form an initial scaffold of muscle fibers. All muscle fibers are formed before birth and have muscle progenitor cell incorporation for several months after birth.

Satellite cells are muscle stem cells that are normally found in a resting or quiescent state. Satellite cells become activated when muscle becomes damaged. These cells have the remarkable ability to regenerate each muscle to the exact size, shape, and orientation as the muscle was before injury. To do this, satellite cells first activate after injury, then proliferate and migrate to the site of injury. These cells will fuse with existing injured muscle fibers or with each other to repair the injury.

Understanding the regulation of skeletal muscle development and regeneration can lead to insights into muscle specific diseases and enhancement of volumetric muscle loss therapies. Our insights from this research can relate to experiments of geriatric muscle which fails to regenerate correctly with age.

Eph/ephrins in skeletal muscle-

The large family of Eph receptor tyrosine kinases and their ligands, ephrins, are involved in growth, differentiation, and patterning. Each of these processes have an aspect of cell adhesion and repulsion. Ephs and ephrins are present in skeletal muscles and on satellite cells. Their presence has been shown to affect satellite cell migration and motility. EphA8/ephrin A3 has been shown to play a functional role in the innervation of slow twitch muscle fibers. EphB1 has been implicated the ability for a satellite cell to go back into quiescence. Besides these 3 proteins, none of the other 22 Eph/ephrins have been shown to play a definite role during skeletal muscle development or regeneration.

My research has focused on EphA7, and EphA3. Lack of EphA7 in mice results in decreased number of muscle fibers, smaller muscle fibers, and reduced satellite cell populations which results in incomplete regeneration of skeletal muscle. EphA3 has been correlated with satellite cells residing on specific muscle fiber types. Further research will be needed to test whether EphA3 satellite cells are intrinsically different that other satellite cells.