Dr. Tom Kwiatkowski – Biochemistry

Kwiatkowski's lab has two unique areas of research.

Project 1:

The glucose uptake machinery in cells and muscle fibers is a robust and highly regulated system used to import extracellular glucose for intracellular metabolic processing. The majority of glucose uptake in skeletal muscle is done through stimulated exocytosis and fusion of vesicles to the plasma membrane to enrich the cellular exterior with glucose transporter protein GLUT4. In our investigation, we found evidence that GLUT4 containing vesicles (GSV) and the glucose uptake regulators AS160, rab8A, and rab10 serve an additional role in the plasma membrane repair response. My research focuses on targeting glucose uptake regulators to develop new therapies for muscle disease and injury. Through three specific aims, we will test the hypothesis that the myosin-Va motor protein is involved in the exocytotic membrane repair response through its association with rab G proteins 8A and 10.

Aim1: Examine the contribution of myosin-Va in the repair response of two muscle derived cell lines.

Aim2: Establish protein interaction differences with myosin-Va in cells and muscle tissue, with and without damage.

Aim 3: Investigate if stimulating or overexpressing myosin-Va can improve membrane repair in muscle derived cell lines.

Project 2:

The consumption of electronic cigarettes (e-cigs) with a variety of e-liquids is increasing at an alarming rate without thought given to the unrealized health effects. Recent studies find that the use of e-cigs may correlate with an increase in cardiovascular disease, liver disease, renal injury, and the neural stress response. Because e-cig users display pathological defects in multiple organ systems, it is likely that the secretion of compounds and cytokines from lung cells into the pulmonary circulation is exacerbating various health problems. This project will investigate the hypothesis that e-cig vapor induces secreted cytokines from lung epithelial cells that cause a hypertrophic response in cardiomyocyte cell lines.

Aim1: Examine the differences in morphology and inflammatory signal transduction in H292 lung epithelial cells exposed to different quantities of vaporized nicotine, propylene glycol, and glycerin.

Aim2: Determine if the exposure of e-cig induced H292 cytokines upregulate hypertrophic signal transduction pathways in cardiomyocytes.

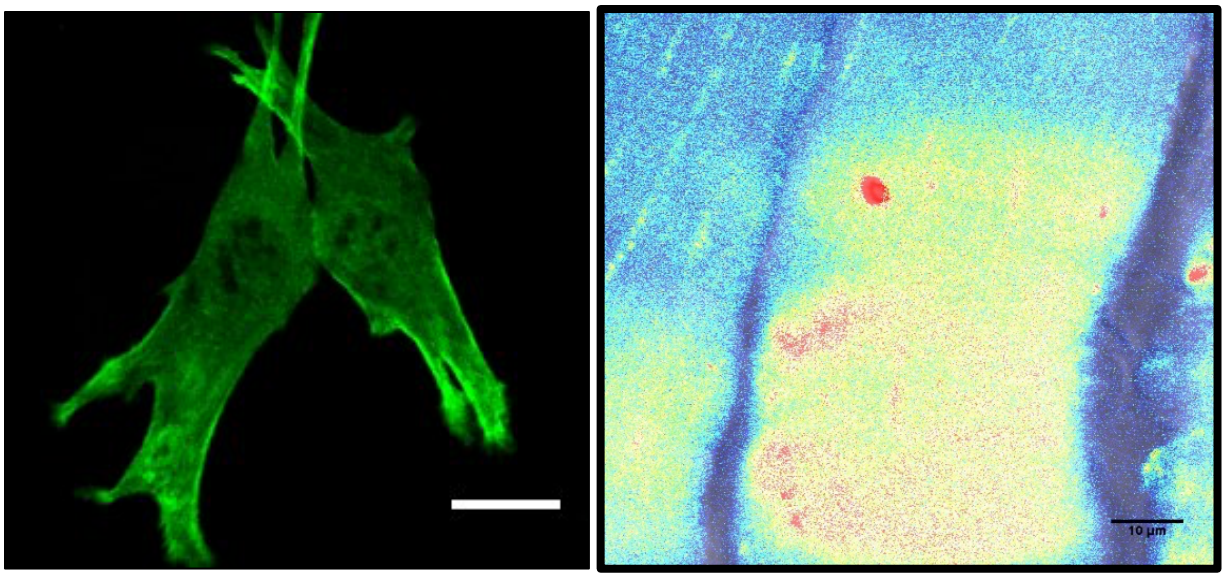
Aim3: Measure changes in pro-inflammatory markers in lung and heart tissue of mice

Publications

1) Thomas A. Kwiatkowski & Aubrey L. Rose, Ana Capati, Rosalie Yan, Diana Hallak , Noah Weisleder "Multiple poloxamers increase plasma membrane repair capacity in muscle and non-muscle cells." The American Journal of Physiology-Cell, 2019

2) Thomas A. Kwiatkowski & Liubov V. Gushchina, Noah Weisleder. "Conserved structural and functional aspects of the tripartite motif gene family point towards therapeutic applications in multiple diseases." Pharmacology and Therapeutics, (2017).

3) Thomas A. Kwiatkowski, Aubrey Rose, Rachel Jung, Kevin McElhanon, Brian Paleo, Eric X Beck and Noah Weisleder, "Muscle Fibers Utilize its Glucose Uptake Machinery to Reseal Sarcolemma Disruptions & Stimulating Affiliated Rab G Proteins Improves Repair Capacity in Muscle Dystrophic Mice." The Journal of Cell Biology, (In preparation)



Left: GFP-transfected myoblast cell
Right: Electroporated muscle fiber that is injured with a multiphoton laser.