

**(Co-Authors: Ryan M. Bebej, PhD)**

*“Hind Limb Form and Function in Terrestrial and Semi-Aquatic Mammals: Insights into Locomotor Evolution in Early Cetaceans”*

Cetaceans (which include modern whales, dolphins, and porpoises) are descendants of terrestrial mammals. The earliest known cetaceans (about 52.5 million years old) had some adaptations for aquatic life, but remained quadrupedal with the ability to locomote on land. As cetaceans became increasingly adapted for life in water, their swimming became more efficient and resulted in adaptations such as flattened tail flukes, as seen in modern cetaceans. This also required an impressive amount of change in the hip and hind limb morphology of early cetaceans. While the earliest cetaceans had fully functional, stabilized hind limbs, those of modern cetaceans are significantly reduced or even lost. The purpose of this study was to understand the evolutionary pathway early cetaceans took as they transitioned from one type of aquatic locomotion (i.e., limb-dominated swimming) to another (i.e., tail-powered swimming) through quantitative comparisons of the hip and hind limb morphology of modern mammals.

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**36. Kelly McCormick, Calvin College****Biology****(Co-Authors: Dr. Daniel Michele, PhD. and Molly Thorson)**

*“Developing Bulk Wounding Methods to Study Plasma Membrane Repair in Skeletal Muscle Fibers”*

The absence of dysferlin compromises the repair process in skeletal muscle cells of mice following wounding. In healthy muscle fibers, dysferlin has been shown to accumulate after wounding, forming “patches” at the repair site. To better observe sarcolemma wound repair, two bulk-wounding methods, a stretch assay and a syringe flush assay, were developed to study the repair process of many muscle fibers at the same time in the hopes of observing dysferlin patches in wild type (WT) mice and to further investigate the role of other membrane proteins. It was observed that the stretch wound assay damaged too many fibers under no stretch conditions to be considered a viable assay for wound repair study, although the syringe flush assay showed possible dysferlin patches in WT fibers. Further refinements for this syringe flush assay are proposed based on observations from these experiments.

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**37. Lauren Strohbehn, Calvin College****Biology****(Co-Authors: Dr. Larry Louters, Dr. Brendan Looyenga)**

*“Exploring the Membrane Environment for Glucose Transporter 1”*

Glucose is a preferred metabolite, and proper regulation of uptake is critical for organism homeostasis. A membrane transporter such as the ubiquitous Glucose Transporter 1 (GLUT1) is required for glucose to enter cells. Abnormal GLUT1 regulation is linked to serious diseases, including diabetes and certain cancers. A clearer understanding of GLUT1 regulation is essential for developing therapeutic strategies to treat glucose imbalance-linked disorders. Previous findings suggest that plasma membrane subdomains called lipid rafts may play a subtle role in regulation of GLUT1 uptake activity. While studying this phenomenon in L929 mouse fibroblast cells, we discovered that GLUT1 associates with a low-density lipid domain distinct from traditionally defined lipid rafts. The purpose of this research was to investigate the nature of this raft-like structure, and if glycosylation or palmitoylation of GLUT1 targets the protein to these domains. GLUT1 lipid environment was determined by mechanical membrane disruption, density-based gradient centrifugation, and Western blot analysis of resulting fractions. Data from an array of experiments indicates that organization of raft-like structures in L929 cells is sphingolipid-dependent, but not modified by cholesterol chelation or cytoskeletal disruption. Neither palmitoylation nor glycosylation targets GLUT1 to these subdomains. Further research is needed to determine how membrane environment may facilitate acute GLUT1 activation.