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Muscle Regeneration Levels in the canine model of Duchenne Muscular Dystrophy

Kevin Cai[1, 2], Matt Burke[1], Keqing Zhang[1], James Teixeira[1], Chady H. Hakim[1], Dongsheng Duan, PhD[1, 3, 4, 5]

[1]Department of Molecular Microbiology and Immunology, School of Medicine, University of Missouri, Columbia, MO.

[2]Department of Chemistry, School of Arts & Sciences, University of Washington, Seattle, WA.

[3]Department of Biomedical Sciences, College of Veterinary Medicine, University of Missouri, Columbia, MO.

[4] Department of Bioengineering, College of Engineering, University of Missouri, Columbia, MO.
[5]Department of Neurology, School of Medicine, University of Missouri, Columbia, MO.

INTRODUCTION: Duchenne Muscular Dystrophy (DMD) is a genetic disease that is the result of mutations of the gene encoding dystrophin that prevents the production of the dystrophin protein. Dystrophin protects muscle from contraction-induced injury. Humans affected by DMD lack dystrophin to protect their muscles from damage. Thus, DMD patients experience muscle degeneration followed by regeneration at early ages, but over time, DMD patients lose their regeneration ability. This leads to muscle failure and death. Muscle degeneration/regeneration has been studied extensively in the murine DMD models. But little is known about muscle degeneration/regeneration in the canine model, the best animal model for DMD.

METHODS: To investigate the levels of muscle regeneration in the canine DMD model, 50 muscles per dog were taken from 3 affected and 3 normal dogs. Muscles were examined using Hematoxylin & Eosin staining (HE), laminin staining, and Masson's trichrome staining (MTC) to determine center nucleation, myofiber size, and fibrotic tissue, respectively. HE staining allowed us to determine the percentage of cells that have a centered nucleus. Laminin staining allowed us to determine the size of each muscle cell. Furthermore, muscle sections were co-stained with antibodies that recognize laminin and embryonic myosin heavy chains. This allowed us to identify newly regenerated myofibers. MTC stained fibrotic tissue, which allowed us to visualize the replacement of muscle by connective tissue.

RESULTS AND CONCLUSION: DMD dogs were found to have a higher percentage of center nucleated cells, freshly regenerated myofibers, and fibrotic connective tissue; all of which point to the hypothesis that canines affected by DMD experience greater muscle tissue regeneration than normal dogs.