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Effects of exercise on bone parameters in the oim mouse model

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Previous studies have shown that mechanical loading on the skeleton acts as an anabolic stimulus, including changes in bone geometry, bone mineral density, and mechanical properties. Increases in these properties may improve bone quality as seen by increased bone density following sustained physical activity, and the increase may be due to increased muscle contraction. This study is aimed at examining the effects of exercise on the skeleton of the oim mouse model. The oim mouse model produces defective type I collagen, the most abundant structural protein in the body. The oim mouse has a phenotype similar to human type III osteogenesis imperfecta (OI), including fractures, cortical thinning, and bowing of long bones. Current therapies for OI have been marginally successful and can be painful and invasive with significant recovery times. Data from this study may aid in development of non-invasive treatments via target exercise and muscle training for OI and other bone diseases such as osteoporosis. This project served as a pilot study to test the effect of swimming on the oim mouse model. Mice were divided into two groups: swim and control. The mice in the swim group swam for 30 minutes/day, 5 days/week for 6 weeks against a water current to ensure constant movement. At the end of the 6 week exercise regimen, mice were euthanized and their leg bones removed. The right femur and tibia were subject to microCT to obtain geometric parameters before undergoing torsional loading to failure to assess bone biomechanics. The left femur underwent the hydroxyproline assay to measure collagen content in bone. Data thus far has shown that in the control group, oim mice have reduced femoral biomechanical integrity and collagen content as compared to wildtype mice. Although the sample size is small, swimming appears to improve the biomechanical integrity of oim femora, although they did not attain wildtype levels. Future studies will be designed to determine if an extended exercise regimen of 8 weeks or if high impact exercise like running will induce more dramatic effects on bone.