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Muscle loading effects 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, inducing 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. Much data exists on the effects of unloading on the skeleton, but data regarding the effects of loading is limited. This study is aimed at examining the effects of loading 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 human 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 determine if current methods are sensitive enough to detect changes that occur due to muscle loading. Mice were anesthetized and the gastrocnemius muscle removed to impose mechanical overload on the plantaris and soleus muscles. The mice resumed activity for three weeks before being euthanized and the leg bones removed. The bones were subject to microCT to obtain geometric parameters before undergoing torsional loading to failure to assess bone biomechanics. The remaining muscles were examined for histological differences, and their collagen content determined using a hydroxyproline assay. Data thus far confirms that our methodology will detect changes in both muscle and bone, and future work will determine if muscle loading improves bone quality.