SKELETAL MUSCLE OXIDATIVE CAPACITY IS IMPROVED BY WHEEL RUNNING IN MICE WITH DUCHENNE MUSCULAR DYSTROPHY

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Background and Purpose

Duchenne Muscular Dystrophy (DMD) is caused by absence of the protein dystrophin and is characterized by muscle weakness, fatigue, and ambulation loss by ~12 years. If dystrophic muscles could undergo exercise-induced adaptations, ambulation and quality of life could be improved. However, exercise is rarely prescribed for fear of muscle injury. An animal model for DMD is the *mdx* mouse. The study objective was to investigate adaptations of *mdx* mice to voluntary endurance exercise. We hypothesized that runner *mdx* mice would be more active and have greater mitochondrial enzyme activities compared to sedentary *mdx* mice.

Subjects

20 male *mdx* mice (10/group).

Methods

Sedentary mice were put in cages without wheels and runner mice were put in cages with wheels. After 8 weeks, each mouse's cage activity was measured in an activity chamber for 24 hours. After 12 weeks, citrate synthase (CS) and beta-Hydroxy Acyl-CoA Dehydrogenase (β-HAD) activities were measured in the TA and gastrocnemius to reflect oxidative capacity. Differences between groups were determined with t-tests.

Results

Runners averaged 3.40±0.11 km/day. There was no difference in cage activity ($P \geq 0.283$). All *mdx* mice spent 210±17 min/day doing non-wheel running activities and ambulated 0.42±0.07 km/day. Gastrocnemius oxidative capacity, as indicated by CS and β-HAD enzyme activities, were 22% and 26% greater in muscles of runner compared to sedentary mice ($P \leq 0.036$). Enzyme activities were not improved in the TA ($P \geq 0.839$).

Conclusion

Results support voluntary wheel running does not further injure muscle of *mdx* mice because there were no significant differences in cage activities between groups. The increase in mitochondrial enzyme activities in the gastrocnemius allows efficient ATP generation and would theoretically reduce fatigue.

Implications

PT for DMD patients including voluntary endurance type exercise may be effective in decreasing the progression of muscle weakness and fatigue, which may prolong ambulation.