

The different impacts of a high fat diet on dystrophic mdx and control C57BI/10 mice.

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Abstract:

The absence of functional dystrophin protein in patients with Duchenne muscular dystrophy (DMD) and dystrophic mdx mice leads to fragile myofibre membranes and cycles of myofibre necrosis and regeneration. Studies in both DMD patients and mdx mice indicate that dystrophic muscles have altered metabolism and impaired energy status and has led to the proposal that nutritional supplementation may reduce the severity of dystrotopathology. This research compares the *in vivo* responses of dystrophic mdx and normal control C57BI/10 mice to a high protein (50%) or a high fat (16%) diet. Consumption of a high protein diet had minimal effects on the body composition or muscle morphology in both strains of mice. In contrast, striking differences between the strains were seen in response to the high fat diet; which also varied between mdx mice aged ≤ 24 weeks, and mdx mice aged 24 - 40 weeks. C57BI/10 mice demonstrated many negative side effects after consuming a high fat diet including weight gain, significantly increased body fat and elevated inflammatory cytokines. In contrast, mdx mice (≤ 24 weeks) remained lean with minimal fat deposition and were resistant to changes in body composition after consuming the high fat diet. These results support the proposal that dystrophic mdx mice have an altered 'energy status' compared to normal C57BI/10 mice because the mdx mice appeared more capable of metabolising the high fat diet and avoiding fat deposition. However, older mdx mice (24 - 40 weeks old), with increased energy intake, exhibited some mild adverse effects of a high fat diet but to a far lesser extent than age-matched C57BI/10 mice. Benefits of the high fat diet on dystrophic muscles of young mice were demonstrated by the significantly increased running ability (km) of voluntarily exercised mdx mice and significantly reduced myofibre necrosis in 24 week old sedentary mdx mice. These novel data clearly identify an 'altered' response to a high fat diet in dystrophic mdx compared to normal C57BI/10 mice. The high fat diet was beneficial to young mdx mice and our data indicate that energy deficient mdx mice may utilise excess dietary fat to improve muscle function and reduce muscle damage.