

Public Abstract

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Title:Metabolic Responses to a High-Fat Diet in Skeletal Muscle of Rats Bred for High or Low Endurance Running Capacities

Aerobic capacity and metabolic capacity are linked and may play an obligatory role in the maintenance of metabolic function and protection against insulin resistance (pre-diabetes) when challenged with a high-fat diet (HFD). The purpose of this study was to determine whether maintenance of metabolic health after HFD is associated with a HFD-induced increase in skeletal muscle expression of metabolic genes and increases in mitochondrial content and density, organelles which provide energy to the cell. Methods: We previously reported a novel model in which rats were artificially selected over several generations to produce high and low capacity runners (HCR and LCR) with contrasting intrinsic aerobic capacities which were resistant or susceptible to the effect of a HFD on insulin resistance. HCR and LCR rats were divided into HFD or normal chow (NC) fed groups for 7 weeks. Techniques were performed in red gastrocnemius skeletal muscle to examine gene expression and transmission electron microscopy was used to characterize mitochondria. Results: Despite illustrating that inherent metabolic capacities of the HCRs and LCRs confer protection and susceptibility to insulin resistance when challenged with a HFD, between strain similarities and lacking HFD-induced alterations in expression of metabolic genes and mitochondrial content and density between HCR and LCR animals indicated that these measures are not predictive of protection against insulin resistance. Conclusions: These results suggest that other mechanisms besides mitochondrial content and size, and metabolic gene expression are responsible for protection against HFD-induced insulin resistance.