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Expression of 11 β -hydroxysteroid dehydrogenase type 1 and gluconeogenic enzymes in liver of obese diabetic mice after exercise

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We have previously shown that acute exercise leads to a pronounced post-exercise hyperglycemia and hypercorticism in the db/db mouse. Knowing that insulin resistance is increased in muscle of db/db mice, we tested the hypothesis that post-exercise hyperglycemia is mediated by increased corticosterone (CORT) secretion and its subsequent effects on protein expression of key enzymes in hepatic gluconeogenesis. Diabetic db/db and lean control wild type (C57BL/6J) mice were subjected to a 30-minute running session on a treadmill and sacrificed 8 hours later. Plasma measurements revealed increased plasma levels of CORT in exercised db/db mice compared with sedentary db/db and lean mice. Plasma levels of hypothalamic CRH and pituitary ACTH were reciprocally decreased in all mice, indicating intact feedback mechanisms. Protein expression, determined by Western blot analysis, of the glucocorticoid receptor (GR) was significantly increased in liver of exercised db/db mice. However, this was not met with significant increases in the expression of phosphoenolpyruvate carboxykinase (PEPCK) and glucose-6-phosphatase (G6Pase α or β), although expression of PEPCK tended to be higher in exercised db/db mice. Expression of 11 β -hydroxysteroid dehydrogenase (11 β -HSD type 1), the key enzyme that converts inactive CORT to active CORT, and regulating access to the GR, was increased significantly in exercised db/db mice. Our results indicate that acute exercise in db/db mice is associated with increased plasma CORT and increased protein expression of GR and HSD type 1 in liver. These findings could explain, in part, the hyperglycemia and hypercorticism we report in this model of diabetes.

Biography

Tom L Broderick completed his MSc from Laval University and PhD from the University of Alberta. He is currently professor of Physiology at the Arizona College of Medicine, Midwestern University in Glendale, Arizona. He has published more than 80 papers on the effects of diabetes and exercise training on cardiac function, endocrine and metabolic regulation.

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