Chromium propionate increases insulin sensitivity in horses following oral and intravenous carbohydrate administration

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Abstract

Forty-eight Quarter Horse geldings (3 - 8 yr of age) were used to determine the effects of dietary chromium (Cr), in the form of Cr propionate (Cr Prop) on insulin sensitivity. Horses were blocked by age, body condition score, and glucose response to concentrate feeding on d 0, and randomly assigned to treatments. Treatments consisted of 0, 2, 4, or 8 mg Cr/d from Cr Prop. Horses were fed daily a concentrate mix at a rate of 0.2 kg/100 kg BW and grass hay at 1.75 to 2.0 kg/100 kg BW. All horses were fed the control diet for 7 d prior to initiation of the study. After an overnight fast, blood samples from the jugular vein were obtained at 0, 2, and 4 h after concentrate feeding on d 0 and 28 for determination of glucose, NEFA, and insulin. A glucose tolerance test (GTT) was conducted on d 42. Glucose was infused via jugular vein catheters, and blood samples were collected at various times relative to dosing for glucose and insulin determination. Plasma glucose on d 28 was affected ($P < 0.05$) by treatment, time, and treatment x time. Horses fed 4 mg Cr/d had lesser ($P < 0.05$) plasma glucose concentrations than those in the other treatments at 0 h. At 2 h post feeding glucose concentrations were greater ($P < 0.05$) in horses fed 0 or 8 mg Cr/d than in those given 4 mg Cr. Horses fed 2 mg Cr/d had lesser ($P < 0.05$) plasma glucose at 4 h post feeding compared to those fed 0 or 8 mg Cr. Plasma glucose did not differ among horses receiving 2 or 4 mg Cr/d at 2 or 4 h. Serum insulin was affected ($P < 0.05$) by treatment, time, and treatment x time. Insulin concentrations were greater ($P < 0.05$) in horses fed 0 or 2 mg Cr/d than in those given 4 or 8 mg Cr at 0 h. At 4 h post feeding insulin concentrations were greater ($P < 0.05$) in horses given 0 or 8 mg Cr than in those fed 2 or 4 mg Cr/d. Plasma glucose was affected ($P < 0.05$) by treatment and time, but not by treatment x time following the GTT. Mean plasma glucose (across sampling times) were greater ($P < 0.05$) in controls than in horses fed 2 or 4 mg Cr/d. Glucose concentrations following the GTT did not differ among controls and horses given 8 mg Cr/d. Following glucose infusion, serum insulin concentrations were greater ($P < 0.05$) in horses fed 2 or 4 mg Cr and tended to be greater in those

fed 8 mg Cr/d compared to controls. Results of this study indicate that 2 or 4 mg Cr/d from Cr Prop increased insulin sensitivity in adult horses following oral carbohydrate consumption.