

BLOOD GLUCOSE AND INSULIN RESPONSES DURING THE GLUCOSE TOLERANCE TEST IN RELATION TO DAIRY COW BODY CONDITION AND MILK YIELD

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Abstract. For dairy cows, insulin sensitivity plays a key role in *post partum* lipid mobilization. In addition to genetic factors, body condition at calving affects the development of *post partum* insulin resistance. The aim of this study was to examine glucose and insulin responses at the time of the glucose tolerance test (GTT) in relation to Body Condition Score (BCS) and milk yield in Estonian Holstein (EH, n=16) and Estonian Red (ER, n=15) cows. The GTT was carried out at 31±1.9 days *post partum*. Blood samples were collected at -15, -5, 5, 10, 20, 30, 40, 50 and 60 min relative to infusion of 0.15 g/kg BW glucose, and were analyzed for glucose, insulin and non-esterified fatty acids (NEFA). Energy-Corrected Milk (ECM) yield, at the time of the GTT, was calculated as the mean ECM of the day before and the day after the GTT. Spearman correlations for BCS measurements (BCS at calving and at the time of the GTT, and BCS loss) and milk production traits (ECM yield and milk fat content) with basal concentration of metabolites, maximum increase and area under the curve (AUC) of glucose and insulin, clearance rate (CR) of glucose, and Revised Quantitative Insulin Sensitivity Check Index (RQUICKI) were calculated. Correlations between BCS and GTT characteristics were different between the breeds. For EH cows, BCS at calving was correlated positively with basal NEFA; BCS at the time of the GTT with maximum increase and AUC of insulin, and with basal NEFA. In ER cows BCS at calving was correlated positively with maximum increase and AUC of glucose and negatively with CR of glucose. BCS loss was negatively correlated with RQUICKI. Milk fat content was correlated positively with basal NEFA in EH cows; ECM yield and milk fat content with basal NEFA in ER cows. Observed glucose and insulin responses in the breeds examined indicate greater impairment of insulin function of thin cows amongst EH, and of over-conditioned cows amongst ER, compared to cows with moderate BCS at calving. In addition, the results indicate an association between milk production and adipose tissue mobilization.

Keywords: glucose tolerance test, glucose response, insulin response, area under the curve, clearance rate, RQUICKI, body condition score, NEFA, milk yield.