Comparing metabolic traits glucose and insulin in their relationship to milk production

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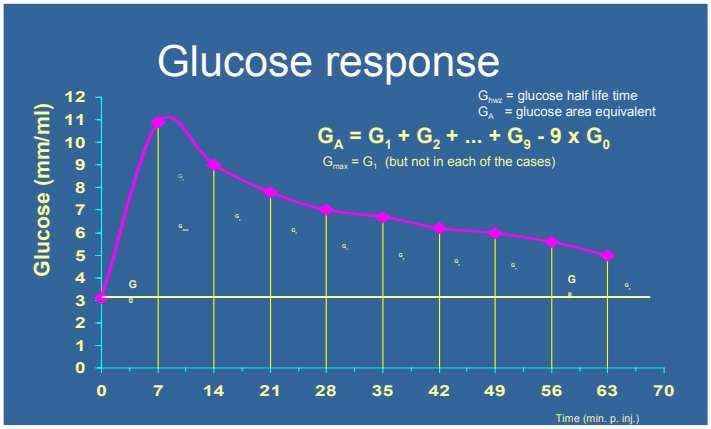

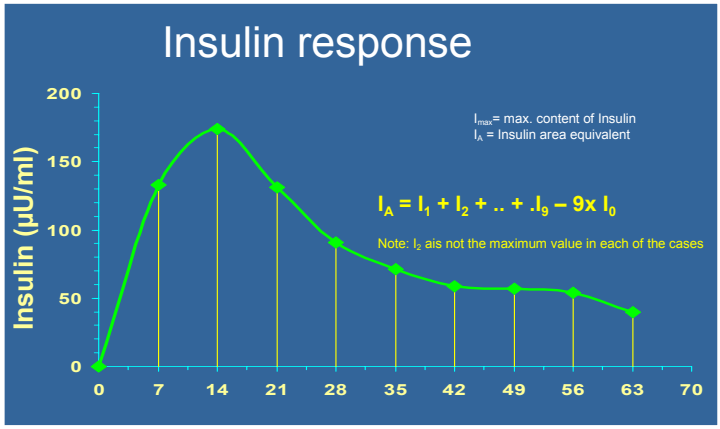

GTT: intra-venous injection of 1 g glucose per kg body weight$^{0.75}$ (Burkert 1998), 10 blood probes within 63 min in order to measue reaction of insulin and glucose

Glucose tolerance test (GTT) for measuring the individual metabolic response in dairy cattle

Introduction

Early information on evaluation of growing young dairy bulls is of interest to breeders. Our investigation is aimed at metabolic traits that can be observed before the individual estimated breeding values (EBV) for milk production is known. Insulin has a central position within the energy metabolism and the reaction can be measured by glucose challenge (GTT).

Material and Methods

• 472 young bulls tested by GTT between 350 and 450 days of life in two test stations. Breeding values expected continously until 2008.

• calculating animal effects using PEST and VCE.
• CBV for predicting milk performance, using GTT- information (by linear regression) and PBV, were calculated in 16 CBV versions, e.g.:

$$CBV = b_1 * G_a + b_2 * lnG_{hwz} + b_3 * PBV$$

• Pearson's correlation coefficient of CBV from Glucose and Insulin traits (G_{hwz}, G_a, I_A and I_A/G_A) and milk production (EBV) calculated from 83 bulls (VIT evaluation 08/2004).

Results and Discussion

Earlier results showed that the contrary glucose and insulin reaction depends on the age. The highest correlation between GTT and EBV is reached within the third half year. Heritability coefficients of glucose traits after GTT are comparable to milk production traits. In addition to the results of CBV, they confirm that their use for breeding purposes is possible. Note that the dataset is still incomplete w.r.t. breeding values. First results showed a higher correlation (r) of predicted performance (CBV) in protein yield based on glucose traits and EBV in comparison to using insulin traits. Thus, glucose reaction is closer related to milk protein yield and milk production than insulin content (r=0.08) and insulin reaction, respectively.

coefficients of heritability h^2 and SE(h^2)

glucose- trait			insulin- trait		
N	472		N	146	
G_0	0.18	(0.06)	I_0	0	(0)
G_A	0.59	(0.18)	I_A	0.37	(0.27)
G_{hwz}	0.49	(0.14)	I_{max}	0.18	(0.22)
lnG_0	0.11	(0.05)	lnI_0	0	(0)
lnG_A	0.37	(0.14)	lnI_A	0.34	(0.24)
lnG_{hwz}	0.33	(0.14)	lnI_{max}	0.35	(0.25)

correlation coefficients (r) of CBV based on glucose and insulin traits and breeding values in protein yield

glucose- trait	r	insulin- trait	r	trait combin.	r
G_A	0.38	I_A	0.23	G_A+I_A	0.37
G_{hwz}	0.30	I_{max}	0.27	(PBV	0.16)
G_A+G_{hwz}	0.37	I_A+I_{max}	0.26	G_A+I_A+PBV	0.38
$G_A+G_{hwz}+PBV$	0.39	I_A/G_A	0.31	G_A+I_A/G_A+PBV	0.42

A recommendation on adapting GTT before evaluating breeding values might be possible if our results will be confirmed based on the whole data set or by an independent study. The aim should be excluding extreme bulls instead of selecting best GTT- bulls. The costs for testing sires might be decreased then.