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

L. Panicke¹, G. Freyer¹*, R. Staufenbiel² and E. Fischer³
FBN 18196 Dummerstorf¹, Freie Universität 14163 Berlin², Universität 18059 Rostock³, Germany

EAAP Meeting 2005 Uppsala, N 4.13 (Abstract No. 97)
freyer@fbn-dummerstorf.de

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

L. Panicke¹, G. Freyer¹*, R. Staufenbiel² and E. Fischer³
FBN 18196 Dummerstorf¹, Freie Universität 14163 Berlin², Universität 18059 Rostock³, Germany

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 continuously 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.:
  \[ \text{CBV} = b_1 \times G + b_2 \times \text{ln}G + b_3 \times \text{PBV} \]
- Pearson’s correlation coefficient of CBV from Glucose and Insulin traits (Ghwz, Ga, IA and IA/GA) 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.

<table>
<thead>
<tr>
<th>coefficients of heritability $h^2$ and SE($h^2$)</th>
<th>correlation coefficients ($r$) of CBV based on glucose and insulin traits and breeding values in protein yield</th>
</tr>
</thead>
<tbody>
<tr>
<td>glucose- trait</td>
<td>insulin- trait</td>
</tr>
<tr>
<td>N</td>
<td>472</td>
</tr>
<tr>
<td>$G_G$</td>
<td>0.18 (0.06)</td>
</tr>
<tr>
<td>$G_A$</td>
<td>0.59 (0.18)</td>
</tr>
<tr>
<td>$G_{\text{hwz}}$</td>
<td>0.49 (0.14)</td>
</tr>
<tr>
<td>$\ln G_G$</td>
<td>0.11 (0.05)</td>
</tr>
<tr>
<td>$G_{\text{A}+\text{I}_{\text{ln}G}}$</td>
<td>0.27 (0.24)</td>
</tr>
</tbody>
</table>

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.

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

---

**Glucose tolerance test (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 measure reaction of insulin and glucose.