

Influence of insulin or glucagon, alone or combined, on glucose homeostasis in dairy goats treated or not with recombinant bovine somatotropin

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In dairy goats, insulin (INS) reduces the duration but not the amplitude of hyperglycemia induced by glucagon (GLA) (Schmidely *et al.* 1992). As glucose production and utilisation during lactation are altered by somatotropin (Gallo and Block, 1990), this trial aimed to study glucose homeostasis with injection of INS and/or GLA, in goats treated with recombinant bovine somatotropin (rbST).

On day 0, 12 multiparous goats (60 d *post partum*) were allocated to be either untreated (group CT, $n = 6$) or treated with 5 mg/d of rbST (group rbST, $n = 6$). Ten days after, goats in each group were allotted to a 3 x 3 latin square with period (15 d between injections, 2 df) and hormone injection (2 df) as factors. Hormones injected after milking were either INS (10 µg/kg, $n = 4$) or GLA (0.5 µg/kg, $n = 4$) or INS + GLA ($n = 4$). The latin square design was repeated on a separate occasion 15 d later. Blood samples were collected before injection (T0) and 2, 6, 10, 14, 18, 22, 30, 46, 62 and 88 min after T0 to measure GLU and INS.

During the trial (100 d), milk production (kg/d) was 3.0 and 3.4 ($P < 0.07$), energy balance (UFL/d) was 0.04 and 0.06 (NS), basal GLU (g/l) was 0.56 and 0.61 ($P < 0.07$), basal INS (µU/ml) was 13 and 18 (NS) for CT and rbST goats, respectively. Thirty minutes after T0, minimal glycemia induced by INS was slightly higher in rbST than in CT group (0.25 vs 0.21 mg/l,

$P < 0.08$). The decrease of glucose (g/l) was 0.36 and 0.35 (NS), whereas the increase in the rate of glucose (g/l/min) between 30 and 90 min was 0.0030 and 0.0055 (SEM = 0.015, $P < 0.05$) in CT and rbST goats respectively. The lower hyperglycemia (14 min after T0) induced by GLA in rbST vs CT (+0.58 vs 0.69 g/l, $P < 0.05$) goats could partly be due to a greater increase of INS (+37 vs +27 µU/ml over T0 values for ST and CT goats, respectively). The decrease in the rate of glycemia (g/l/min) between 15 and 88 min was 0.0082 and 0.0076 ($P < 0.07$) for the CT and treated group. Increase of glycemia after injection of INS + GLA was slightly lower in rbST (+0.47 g/l) than in CT goats (+0.51, NS). Decrease of glycemia was the same (0.014 g/l/min) in the 2 groups up to 60 min. However, recovery of glucose between 62 and 88 min was greater in rbST than in CT goats (+0.19 vs +0.07 g/l, $P < 0.05$). As for INS injected alone, INS disappearance rate was greater in rbST goats (-0.71 µU/ml/min) than in CT (-0.57 µU/ml/min). These results show that the response to homeostatic signals are altered by rbST treatment, probably in order to meet priority for glucose requirements by mammary gland.

Gallo F, Block E (1990) *J Dairy Sci* 73, 3276-3286
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Table 1. Influence of somatotropin treatment (rbST) on glycemia (g/l) after hormone injection in dairy goats.

| Hormone | Treatment | Time (T, min) after injection | | | |
|----------------|-----------|-------------------------------|------|------|------|
| | | T14 | T30 | T62 | T88 |
| Insulin (INS) | Control | 0.34 | 0.21 | 0.28 | 0.39 |
| | rbST | 0.37 | 0.25 | 0.38 | 0.58 |
| Glucagon (GLA) | Control | 1.25 | 1.00 | 0.61 | 0.53 |
| | rbST | 1.18 | 0.99 | 0.65 | 0.61 |
| INS + GLA | Control | 1.07 | 0.47 | 0.25 | 0.32 |
| | rbST | 1.08 | 0.46 | 0.27 | 0.46 |