

Influence of insulin and glucagon alone or combined on glucose and non-esterified fatty acids homeostasis in the lactating goat

P Schmidely, A Sleiman-Haidar, P Bas, A Rouzeau, D Sauvant

INRA, station de Nutrition et d'Alimentation de l'INA-PG, 16, rue Claude-Bernard,
75231 Paris Cedex 05, France

Nutrients partitioning during lactation involves resistance to insulin (INS) (Grizard *et al*, 1988), whereas the role of glucagon (GLA) remains doubtful. As GLA and INS peak after ingestion of feed, the effects of INS and GLA alone or combined on glucose (GLU) and non-esterified fatty acids (NEFA) homeostasis were studied.

Twelve multiparous goats in mid-lactation (milk production = 3.1 kg/d, SD = 0.7) were injected after milking either with INS (10 µg/kg, *n* = 4), or GLA (0.5 µg/kg, *n* = 4) or a combination of INS + GLA (10 + 0.5 µg/kg, *n* = 4) after an overnight fast. Blood samples were collected before injection (IC) and 2, 6, 10, 14, 18, 22, 30, 46, 62 and 88 min after injection in order to measure GLU and NEFA levels.

Basal GLU was found to be 720 mg/l (SD = 50) and basal NEFA 500 µEQ/l (SD = 50). INS decreased GLU to 40% of the IC value 30 min after injection (fig 1). Thereafter, GLU increased slowly but did not attain IC values. INS reduced NEFA during the first 14 min after injection, but this effect was then reversed and NEFA rose to 245% of IC values at 46 min. This lipomobilisation could provide NEFA for oxydation and glycerol for neoglucogenesis. GLA was

found to have a neoglucogenic effect as it increased GLU to 225%. It simultaneously decreased NEFA to 60% of the IC value, at least partly because of the increase in INS concentration (results not shown). After this, NEFA increased but to a lesser extent than with INS alone. After GLA + INS injection, the short-term variations in GLU and NEFA were found to be fairly similar to the response with GLA alone. However, although the GLU peak was as high as with GLA alone it decreased more rapidly between 14 and 42 min to reach 46% of IC at 62 min, probably because of a more elevated INS concentration (results not shown). The NEFA began to rise after 30 min.

In conclusion, the main consequence of simultaneously injecting high doses of INS and GLA shows a priority effect of GLA followed by a delayed effect of INS. With such hormonal doses, mechanisms (probably hormone-dependent) which cause lipolysis in adipose tissues are initiated to compensate for the glucose shortage.

Grizard J, Champredon C, Aina E, Sornet C, Debras E (1988) *Hormon Metab Res* 20, 15-22

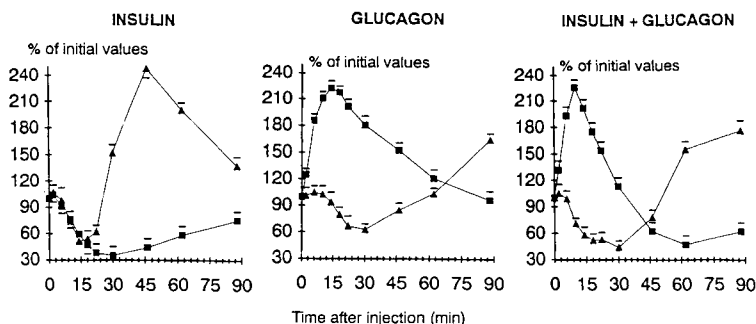


Fig 1. Plasma glucose (■) and NEFA (▲) after hormone injection.