

## EFFECT OF SALINOMYCIN SUPPLEMENTATION ON PLASMA GLUCOSE AND INSULIN RESPONSES TO INTRAVENOUS INJECTION OF GLUCOSE IN SHEEP

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### Introduction

Body weight gain and feed efficiency were improved in ruminants when the diet was supplemented with such carboxylic ionophores as monensin and lasalocid (Potter et al., 1976). These ionophores are thought to act directly on the ruminal microfloral metabolism by increasing the propionate fraction and decreasing the acetate and butyrate production, as well as changes in protein utilization and gas production (Schelling, 1984). Intravenous administration of monensin has been reported to elevate plasma levels of glucose and free fatty acids, while lowering the plasma K, P and Mg (Armstrong and Spears, 1988). These results demonstrate the effect of monensin on ruminant metabolism while not altering the ruminal microbial metabolism. The present study was therefore conducted to investigate the effect of salinomycin supplementation on plasma glucose and insulin responses to intravenous administration of glucose to sheep on a high roughage diet.

### Materials and Methods

Six Corridale ewes weighing 70-79 kg were used in this study. Two weeks prior to the commencement of the experiment, the animals were chronically catheterized with polyethylene catheter at the carotid artery and portal vein for routine blood sampling and mesenteric vein for infusion of para-aminohippuric acid. A day before the glucose loading experiment, polyethylene catheter was inserted into the jugular vein for administration of glucose.

Four feeding regimes were designed: 1) high roughage diet (orchardgrass hay 8: commercial concentrate 2; roughage period), 2) high roughage diet supplemented with 20 ppm salinomycin (salinomycin period), 3) high concentrate diet (orchardgrass hay 2: concentrate 8; concentrate period) and 4) 6 days fasting (fast period). Each

sheep received all four feeding conditions in a randomized manner. Sheep were adapted to their respective diets over 3 weeks and glucose loading experiment was carried out on the morning of last day of each experimental period. On the experimental day, 20% glucose solution (0.625 mmol per kg body weight) was injected through a catheter into jugular vein in one minute. Sample of arterial and portal blood were collected simultaneously from 30 min before injection until 90 min after injection. Plasma glucose was determined by the glucose oxidase method and plasma insulin by the radioimmunoassay (Sasaki and Takahashi, 1980). Portal blood flow was measured by the dye-dilution method with para-amino-hippuric acid. A half time ( $t_{1/2}$ ) and k value (0.693/half time) as a parameter of glucose treating potency were calculated on the declining slope of the incremental plasma glucose concentration after glucose injection (Baba, 1973)

### Results and Discussion

#### 1. Glucose treating potency

Although both the extent and the pattern of hyper-glycaemia caused by glucose injection were similar in the four periods, the decrease of plasma glucose concentration from the peak value were more rapid in the salinomycin period and the roughage period than in the concentrate period and fast period. A half time and k value which were calculated from declining slope of plasma glucose concentration revealed that glucose treating potency was significantly higher in the salinomycin period (21 min; 3.46) and significantly lower in the concentrate period (41 min; 1.94) and the fast period (62 min; 1.20) than that in the roughage period (21 min; 3.46).

#### 2. Insulin response to glucose injection

The effects of intravenous injection of glucose on plasma insulin concentrations of portal and

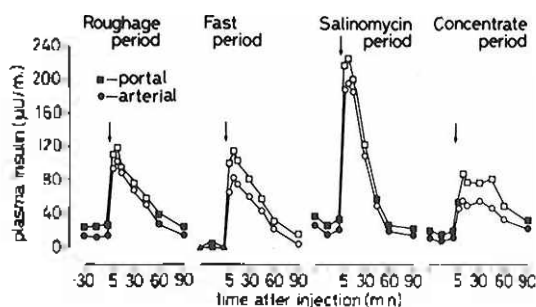


Figure 1. Changes in insulin concentration of portal and arterial blood in sheep following the intravenous injection of glucose.

Open symbols indicate significant difference ( $p < 0.05$ ) from the values at zero time.

↓ : Injection

arterial blood in sheep in each experimental period are presented in figure 1.

The basal concentration of insulin of arterial blood was slightly lower in the concentrate period and markedly lower in the fast period and significantly higher in the salinomycin period than that in the roughage period. Although the concentration of plasma insulin increased to a peak at 5 min after the glucose injection in each period, the peak value was significantly higher in the salinomycin period and slightly lower in concentrate period than that in the roughage and fast periods. The quantity of insulin secretion, which was calculated from portal-arterial difference of insulin concentration and rate of portal blood flow, between 0 and 90 min following glucose injection was significantly higher in salinomycin (149%), concentrate (151%) and fast (153%) periods than

that in roughage period (100%).

In the present study glucose frating potency and insulin response to intravenous injection of glucose in sheep fed roughage diet supplemented with salinomycin was significantly higher than that in sheep fed high roughage diet. Armstrong and Spears (1988) revealed that intravenous administration of monensin elevated plasma glucose and free fatty acid and altered secretion of insulin and plasma minerals concentrations and emphasized an effect of monensin on metabolism in ruminants without alteration in ruminal microbial metabolism. The results presented herein also suggest that further experiment will be necessary to investigate the effect of salinomycin on metabolism and hormonal control in ruminant.

(Key Words: Salinomycin, Glucose Tolerance, Insulin Response)

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