Concurrent Session 9A: Diet Intervention Studies/Obesity

The effects of dietary fructose on growth and glucose tolerance in chickens

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Background – A diet high in fructose is known to cause insulin resistance in most mammals. Broiler chickens have long been thought to be insulin resistant and indeed do not have the GLUT4 transporter.
Objective – To examine the effects of dietary fructose on growth, digestibility and glucose tolerance in broiler chickens.
Design – Five day old broiler chickens (150) were fed diets containing either 30% glucose, fructose or starch for a period of five weeks. Growth, water and food intake and digestibility were measured for the first three weeks. At five weeks oral glucose and fructose tolerance tests were performed and liver and abdominal fat pad measurements taken after slaughter.
Outcomes – The birds fed the fructose diet ate more food, but grew at a rate similar to the starch fed birds. The digestibility of energy in the fructose diet was lower than in the other diets. Water intake was increased in the birds fed the fructose diet. An oral glucose challenge produced a substantially greater glycaemic response in the fructose-fed pullets, but not in the fructose-fed cockerels or birds of either sex fed the starch or glucose diets.
Conclusion – High fructose diets cause significant malabsorption in the chicken. These diets also lead to an enhanced glycaemic response, suggestive of insulin resistance, in female but not male birds when they are given an oral glucose challenge.

The effects of intravenous glucose and fructose on insulin levels in sheep

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Background – A high fructose diet is known to cause insulin resistance in a wide range of mammals. An acute oral loading of fructose has no effect on the insulin level of normal or diabetic animals. No studies have investigated the effects of intravenous fructose loading in sheep, a species which generally derives all blood glucose from gluconeogenesis.
Objective – To compare the effects of a bolus loading of intravenous fructose and glucose on blood glucose and insulin levels in sheep.
Design – Ten crossbred wethers were fed lucerne chaff ad libitum. They were given either 0.24 g/kg of glucose or fructose intravenously in a single bolus dose. Plasma glucose, fructose and insulin were measured in serial blood samples for the following six hours.
Outcomes – As expected glucose infusion resulted in a substantial rise in blood glucose and a modest increase in insulin level. The fructose infusion led to very a modest rise in blood fructose and large increase in plasma insulin level with a resultant fall in blood glucose level.
Conclusion – Sheep respond differently to other mammals to fructose loading. Intravenous fructose stimulates insulin release in sheep. This response is different to most other mammals which show insulin refractoriness to fructose loading.