THE EFFECT OF BIOTIN ON BLOOD METABOLITES IN F1 WAGYU-BLACK ANGUS STEERS

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Biotin belongs to the water-soluble B vitamin group. It is an essential co-enzyme for the activation of a range of carboxylase enzymes. These enzymes play vital roles in cellular fatty acid and glucose metabolism. Biotin deficiency has been associated with feeding grain-based diets to cattle by reducing rumen pH and compromising ruminal biotin synthesis (Fitzgerald *et al.* 2000). A feedlot experiment was conducted over 400 days to determine the effects of biotin supplementation at 3 levels (0, 10, 20 mg/hd/d) on the growth, health and meat quality of F1 Wagyu-Black Angus steers. The effect of biotin supplementation on some blood metabolites was investigated.

The study was conducted at the Queensland Department of Primary Industries, Brigalow Research Station feedlot facility and consisted of 12 pens of 9 Wagyu-Black Angus steers per pen (initial weight 411 kg, s.d. 24.4). Steers in each pen were the progeny of 4 Wagyu grandsires and 7 sires. Pens were allocated to 1 of the 3 biotin treatments in a randomised complete block design with 4 replicates. The biotin supplement was administered in a mineral supplement (250 g/hd/d). All steers were fed a wheat-based diet. Steers were inducted into the feedlot in March 2001 and a subset of 48 steers was selected for blood collection after 301 days of feeding. The blood serum metabolites, glucose, triiodothyronine, thyroxine and insulin, were measured.

Table 1. Effect of biotin (B) supplementation on blood glucose, triiodothyronine, thyroxine and insulin.

Treatment (mg/hd/d)	Glucose (mmol/L)	Triiodothryonine (pmol/L)	Thyroxine (pmol/L)	Insulin (mU/L)
B-0	4.71[a]	5.83[a]	14.01[a]	0.75[ab]
B-10	4.60[a]	5.68[a]	12.71[b]	0.94[a]
B-20	4.48[a]	5.38[a]	12.87[b]	0.55[b]
s.e.m	0.09	0.18	0.48	0.09

Means with different superscripts within columns are significant at P<0.10 for thyroxine and P<0.05 for insulin

Biotin supplementation had a significant effect on blood serum thyroxine and insulin, with no effect on glucose or triiodothryonine (Table 1). Biotin appears not only to have an influence on biotin-dependent carboxylase enzymes, but also on the blood serum metabolites of thyroxine and insulin. Biotin activated enzymes play a key role in gluconeogenesis and glucose regulation (Fitzgerald *et al.* 2000). Bender (1999) reported that biotin is also associated with glucose regulation via the synthesis of glucokinase, with glucokinase being a key regulator of glucose uptake and insulin secretion from the pancreas. The decrease in blood insulin and glucose with increasing biotin intake suggests that biotin may have increased glucose uptake into muscle and adipose tissue, and this effect may be the result of increased glucose incorporation into fat through increased activity of the biotin-containing enzyme, acetyl CoA carboxylase, which is a key regulator of lipid synthesis in adipose tissue. The effects of biotin on thyroxine in blood is more difficult to interpret, but may be more related to inheritance than dietary treatments. For example, there was a significant effect of grandsire on thyroxine and insulin (P<0.05) and there was a significant interaction between treatment and grandsire for insulin (P<0.01). These interactions are being explored further.

BENDER, D.A. (1999). *Proc Nutr Soc* **58,** 427-433.
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