Vaccination with an Insulin-like Growth Factor Binding Protein-1 (IGFBP-1)-bBased Vaccine Improves Growth in Feed-Restricted Brahman Steers.

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Dry-season weight loss in grazing cattle in northern Australia has been attenuated using a number of strategies (Hunter and Vercoe, 1987, Sillence *et al.* 1993, Gazzola and Hunter, 1999). Furthermore, the potential to improve efficiency of feed utilisation (and thus, dry-season performance) in ruminants through conventional modulation of the insulin-like growth factor (IGF) axis (Oddy and Owens, 1997, Hill *et al.*, 1999) and through immunomodulation of the IGF axis (Hill *et al.*, 1998a,b) has been demonstrated. The present study investigated the use of a vaccine directed against IGFBP-1 in Brahman steers which underwent a period of nutritional restriction followed by a return to wet-season grazing.

Twenty-four steers (273 ± 13 kg) were allocated on feed intake (FI) and body weight (BW) to one of 3 treatments in a randomised complete block design. Steers were in individual pens and fed low quality Rhodes grass hay for two weeks prior to treatment, and then for ten weeks of the treatment period. Although 3 treatments were used in the study, only results from 2 of these are reported here. Steers were given IGFBP-1 vaccine (80 μg per dose) in BioAdjuvant (Vet BioSearch, Mt Eliza, Victoria), or no vaccine during weeks 1, 4 and 7. Immediately prior to vaccination and during week 10, steers were bled from the tail vein. Steers were weighed weekly for the ten weeks of treatment. Individual steers were monitored daily for FI and faecal output, and dry matter digestibility (DMD) was calculated weekly. Plasma was analysed for antibody titre, IGF-1 and urea. Following this period of restricted nutrition in pens, steers were returned to good quality pasture, as a single group and weighed approximately every 12 weeks for the next 40 weeks. BW, BW change from week 1 to weeks 2, 7 and 10, and plasma IGF-1 and urea at weeks 1, 4, 7 and 10 were analysed by standard analysis of variance (ANOVA). Weekly, and cumulative FI and DMD for weeks 2, 4, 7 and 10 were also analysed by ANOVA. Treatment means were compared using a protected least significant difference test at the 5% level.

IGFBP-1 vaccination caused a significant (P<0.01) improvement in prevention of BW loss comparing the periods between week 1 and weeks 2, 7 and 10 (Figure 1). FI was largely unaffected by treatment except for the period between weeks 6 and 7, during which FI of the control group was less (P<0.05) than the treated group. This period also showed the most rapid decrease in BW for the control group, which may reflect the decrease in FI. There was no effect of treatment on DMD. Vaccination evoked low titres in 5 out of 8 animals by week 7, showing no change in response up to week 10. No specific antibodies were detected in the control group. There were no effects of treatment on either plasma IGF-1 or urea concentrations.

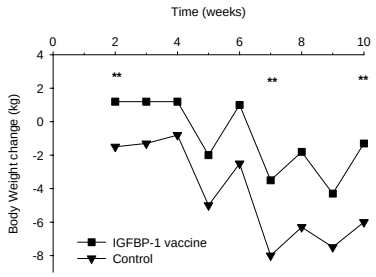

Figure 1. Changes in steer BW from week 1 of treatment (**, P < 0.01).

During the second phase of the experiment (weeks 11 to 50), steers were returned to positive growth, showing a period of compensatory gain and increased variability in BW. During this period there was little difference in BW between the groups but by week 50 the IGFBP-1 vaccinated group were heavier (P<0.05) than the control group (353 vs 342 kg respectively).

Vaccination with IGFBP-1 vaccine reduced BW loss during restricted feeding, however, the mechanism is not well understood. Steers developed only low specific antibody titres in plasma, thus, the mechanism of action may not be humoral. An alternative hypothesis is that antibody secretion is directed into the gut, having a direct action on absorption. The small improvement in BW preservation may not have been detected in DMD due to a lack of sensitivity of the technique.

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