

An adrenocorticotropin hormone (ACTH) induced stress challenge can be used to identify rams, which are different in net feed intake

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Net feed intake (NFI) is a measure of feed efficiency calculated as the difference between an animal's actual intake and its expected intake given requirements for maintenance and growth. Previous work has shown that rams with poor feed efficiency have a greater serum cortisol response to a known stressor such as adrenocorticotropin hormone (ACTH) than those that are more efficient (Knott *et al.* 2004). In beef cattle divergently selected for NFI, Richardson and Herd (2004) found that less efficient animals tend to have higher basal blood cortisol levels and suggested that stress, tissue metabolism and protein turnover could contribute 37% to the variation in NFI. The catabolic response to stress results in energy mobilisation, thereby providing a mechanism for stress to contribute to the lower efficiency of energy utilisation observed in less efficient animals (Elsasser *et al.* 2000). The hypothesis for this experiment was that animals identified as more susceptible to an adrenocorticotropin hormone (ACTH) induced stress challenge will be less efficient in their energy utilisation.

One hundred rams of a composite maternal sire line (mean \pm s.d., initial age 415 ± 17 days; initial liveweight 53.2 ± 6 kg) were used in a screening test to identify animals, which are more or less susceptible to a known stressor. Blood samples were taken immediately prior to and 45 minutes after, intramuscular administration of ACTH (Virbac®, 2 μ mg/kg LW) and analysed for total serum cortisol concentrations. Rams were ranked on post-ACTH serum cortisol concentrations, and those with extreme values selected (mean \pm s.d.; High Cortisol, HC, n = 12, mean = 215.6 ± 18 nmol/L, Low Cortisol, LC, n = 11, mean = 113.3 ± 15.8 nmol/L). Rams were then individually housed and fed a concentrate-based

diet (11.5 MJ/kg DM; 16% CP, 28% NDF) with *ad libitum* feed intakes and liveweights recorded for 40 days. Feed intake was regressed against mean metabolic liveweight ($W^{0.75}$) and average daily gain, with the residual portion defined as NFI. Analysis of variance was undertaken on a group basis, with results for one of the HC rams not used as it had an atypically low feed intake and did not gain weight over the 40 days.

NFI was higher in the HC rams than in the LC rams (HC mean = 0.45; LC mean = -0.35; s.e.d. 0.398; $P = 0.057$). There was a significant correlation between NFI and post-ACTH serum cortisol concentration ($r = 0.424$, $P < 0.05$) but no significant correlations with the pre-ACTH serum cortisol concentration nor the incremental change. These data confirm that there is a biologically useful relationship between NFI and stress susceptibility.

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Richardson, E.C. and Herd, R.M. (2004). Biological basis for variation in residual feed intake in beef cattle. 2. Synthesis of results following divergent selection. *Australian Journal of Experimental Agriculture* 44, 431–440.