

## TRANSGENIC SHEEP WITH HIGH CONCENTRATIONS OF GROWTH HORMONE AND INSULIN-LIKE GROWTH FACTOR-1 HAVE LOWER FEED EFFICIENCY

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Sheep with a transgene encoding for ovine growth hormone (GH) could help to understand the role of GH and insulin-like growth factor (IGF-1) in feed efficiency. We hypothesise that sheep with high concentrations of GH and IGF-1 will be less efficient at utilising the available feed than sheep with normal concentrations of GH and IGF-1.

The study used 2 groups of 12 (total = 24) castrate male lambs of approximately 200 days of age, half of which were heterozygous carriers of an additional copy of the GH gene with a modified metallothionein promoter. The other 12 wethers were non-transgenic controls from the same flock, as described previously (Adams *et al.* 2002). The sheep were fed an *ad libitum* diet for 3 weeks. Voluntary feed intake was recorded over this period. Residual Feed Intake (RFI) was calculated as the difference between expected and observed intake, with expected intake predicted from Grazfeed (Freer *et al.* 1997) taking liveweight and liveweight gain into account.

The concentration of plasma IGF-1 was determined using an extraction and double antibody radio-immunoassay as described by Adams *et al.* (1996). Plasma concentrations of ovine GH were assayed in duplicate using a double antibody radio-immunoassay (RIA) as described in Adams *et al.* (2002). Pulses of GH were analysed by the Munro pulsar Algorithm as previously described by Adams *et al.* (1996).

There were no significant differences in liveweight and liveweight gain between the control and transgenic sheep (Table 1). The control sheep had a RFI of +18 g/day while the GH transgenic sheep had a RFI of +148 g/day.

**Table 1. Liveweight and feed intake of control and transgenic sheep during the *ad libitum* feeding period**

	Controls	Transgenic	s.e.m.	P
Starting LWT (kg)	34.5	34.4	0.99	0.61
Finishing LWT (kg)	36.0	36.1	0.86	0.42
LWT change (g/day)	42	47	14	0.84
Feed intake (g/day)	1082	1205	29.9	0.008

**Table 2. Characteristics of the secretion of growth hormone and IGF-1 by control and transgenic sheep during the *ad libitum* feeding period**

	Controls	Transgenic	s.e.m	P
GH mean (ng/mL)	4.1	6.9	1.1	0.09
GH pulses/10hr	4.3	1.3	0.4	0.01
GH pulse area (ng <sup>2</sup> )	178	32	39	0.00
IGF-1 (ng/mL)	89.5	342.1	36.6	0.00

GH transgenic sheep were less efficient at utilising the feed for liveweight gain when feed was freely available. GH sheep fed a moderate quality diet *ad libitum* for 3 weeks ate 11% more than control sheep (P=0.008) but did not gain more weight. The GH transgenic sheep had a higher basal concentration of GH (Table 2), but fewer and smaller pulses. They also had circulating IGF-1 concentrations that were 380% higher than in the control sheep (Table 2). That is, sheep with high concentrations of GH may be less efficient at utilising the available feed than sheep with normal concentrations of GH and will have high concentrations of IGF-1. So, in this study, the additional GH gene increased feed intake and reduced feed efficiency. It is not clear whether these effects were mediated through the accompanying increase in IGF-1, or by GH itself.

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