Roughage levels influence dry matter intake (DMI) of cattle exposed to heat stress

J.B. Gaughan[1], T.L. Mader[2], B.A. Young[1] and A. Kumar[1]

'Department of Animal Production, The University of Queensland, Gatton College, Lawes QLD 4345
*Department of Animal Science, University of Nebraska, Lincoln NE, USA

Economic loss associated with high heat load is a result of reduced feed intake, reduced gain, and in extreme cases, death of feedlot cattle (Hahn and Mader, 1997: Mader *et al.* 1997). The object of this study was to evaluate cattle exposed to hot conditions while being adapted to high-energy diets. Six Hereford steers (3/treatment; mean weight = 240 kg) were exposed to thermoneutral (TN) or hot (HT) climatic conditions in climate controlled rooms while being fed in order 40, 25, and 10 % roughage diets (Table 1) for 5, 5, and 7 d, respectively, over a 17 d period

Peak afternoon temperatures and temperature–humidity indices (THI)[1] averaged 28 °C and 76 for TN and 38 °C and 86 for HT treatment groups, respectively. HT reduced ($P < 0.05$) intakes by 18.3 % but only for those fed the 10% roughage diet (Table 2). Both respiration rates (RR) and pulse rates (PR; measured at 1600 h daily) increased in the TN group as diet energy density increased. In the HT treatment, while RR increased with increasing heat load (HL) and diet energy density, PR followed a similar trend as ME intake (MEI). Body temperature (BT; measured at 10 min intervals throughout the study), as well as differences between TN and HT BT, increased as the amount of roughage decreased. Data indicate that HL compromises the ability of feedlot cattle to adapt to high energy low roughage diets and that BT increases with increasing MEI and HL, but PR is influenced primarily by MEI.

In. conclusion the following observations were made:

- Differences in MEI and DMI between TN and HT groups were not observed until cattle were fed the 10 % roughage diet.
- Mean BT of steers stepped up from 55 % (pre trial BT = 39.1 °C) to 10 % roughage increased 1.2 and 1.8 °C for TN and HT groups respectively.
- PR tended to more closely correspond to MEI rather than exposure to HT.
- RR increased with increasing MEI and environmental temperature.
- Hot conditions compromise the ability of feedlot cattle to adapt to high energy (10 % roughage) diets.

[1] THI = ((1.8 x °C)+ 32) – ((0.55 – (0.55 x Relative Humidity/100)) x ((1.8 x °C) – 26).

References

Hahn, GL. and Mader, T. L. (1997). Heat waves in relation to thermoregulation, feeding behaviour and mortality of feedlot cattle. *Proceedings 5th International Livestock Environment Symposium (in* press).

Mader, T.L., Fell, L.R. and McPhee, M. J. (1997). Behaviour response of non Brahman cattle to shade in commercial feedlots. *Proceedings 5th International Livestock Environment Symposium (in* press).

Table 1 Composition of diets.

	Period		
Ingredient	**1**	**2**	**3**
Barley	27.5	35.0	42.5
Sorghum	27.5	35.0	42.5
Lucerne hay		5.0	10.0
Oat hay	40.0	20.0	
Supplement [a]	5.0	5.0	5.0
Nutrient [b]			
Crude protein %	13.4	13.4	13.4
Roughage %	40.0	25.0	10.0
Rumensin g/t	27.5	27.5	27.5
NEg, Mj/kg	4.48	5.02	5.56

[a]Farmstok Toowoomba, [b]calculated on a dry matter basis

Table 2 Mean DMI (kg) and MEI (Mj), RR (breaths/min), PR (beats/min) and BT (°C)[a].

	Percent Roughage					
	40		25		10	
	TN	HT	TN	HT	TN	HT
DMI	6.1	6.1	6.5	6.5	6.1	4.9
MEI	67	67	76	76	76	62
RR	58	109	64	132	80	135
PR	87	92	96	93	102	86
BT	39.6	39.6	39.9	40.3	40.3	40.9

[a] diets fed sequentially for 5, 5, and 7 d periods, respectively.