HETEROSIS EFFECTS ON EFFICIENCY OF POST-WEANING GROWTH

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Increased growth of crossbreds due to the effects of hybrid vigour or heterosis are well known. Recently it has been shown that in sheep and cattle heterosis is positive for mature weight and negligible for rate of maturation (Pitchford 1993; Pitchford *et al.* 1993). The aim of this study was to test whether increased growth is due to increased efficiency or solely to increased feed intake.

This study utilised 2 inbred mouse strains (BALB/c and C57) and their reciprocal crosses. Each litter was weaned at 21 days of age and separated into groups of male or female siblings. Groups were fed *ad libitum* to approximately 150 days of age. Weight gain and food consumed were recorded for each group every 2-3 days.

Post-weaning growth was modelled as follows:

$$\text{Weight} = (MW - WW)\left(1 - e^{-\left(\frac{\text{Growth efficiency}}{\text{Maintenance efficiency}}\right)(\text{Age} - 21)}\right) + WW$$

where WW is weaning weight (g) at 21 days; MW is mature weight (g); growth efficiency is weight gained (g) on the first unit of feed (g); and maintenance efficiency is weight maintained (g) per daily feed intake (g/day) (= mature weight divided by mature intake). The advantage of this model is that growth can be described as a function of feed intake as well as age. This model is a modification of the approach taken by Parks (1982) in that rate of maturation (days-t) is estimated as growth efficiency divided by maintenance efficiency. Growth curve parameters were estimated for each group and then the importance of litter size, group size, sex, sire breed, dam breed and heterosis was tested using analysis of variance. Heterosis effects are shown in Table 1.

Table 1. Estimates of heterosis (least square means ($\pm$ s.e.))

Trait	Inbred	Crossbred	Heterosis (%)
Weaning weight (g)	8.9 (0.2)	9.5 (0.2)	7*
Mature weight (g)	25.2 (0.4)	28.1 (0.3)	12**
Rate of maturation (days^{-1})	0.0588 (0.0020)	0.0592 (0.0017)	1
Mature intake (g/day)	4.20 (0.06)	4.49 (0.05)	7**
Growth efficiency (g/g)	0.354 (0.012)	0.371 (0.010)	5
Maintenance efficiency (days.g/g)	6.02 (0.08)	6.28 (0.06)	4*

*$P < 0.05$, **$P < 0.01$.

In accordance with results for sheep and cattle, heterosis was positive for mature weight and negligible for rate of maturation. As expected, crossbreds ate more than inbreds. However, while heterosis was not significant for efficiency of growth, crossbreds had significantly higher maintenance efficiency than inbreds.

Since heterosis effects on the form of the growth curve of mice were the same as those for sheep and cattle, the results in this study may provide a useful model for those species. Hence, an advantage of crossbred livestock would be heterosis for decreased maintenance feed requirements.

PARKS, J.R. (1982). "A Theory of Feeding and Growth of Animals", 1st Ed. (Springer-Verlag: Berlin, Heidelberg, New York).
PITCHFORD, W.S. (1993). *Livest. Prod. Sci. 33:* 127-39.
PITCHFORD, W.S., BARLOW, R. and HEARNSHAW, H. (1993). *Livest. Prod. Sci. 33:* 141-50.