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RESPONSE TO SELECTION FOR AGE AT PUBERTY IN AN ANGUS HERD

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SUMMARY
Direct responses and some correlated responses to selection for age at puberty in heifers were estimated in an Angus herd established in 1984/85. Lines were selected for early or late age at first behavioural oestrus (AFO) alongside an unselected Control, and evaluated up to 2004. Breeding values for AFO were calculated for both sexes and used for selection, from data on AFO and age-adjusted scrotal circumference or size (SS) evaluated monthly from 7 to 13 months; no liveweight selection criteria were included. Realised heritabilities for standardised AFO and single-record SS were 0.27 ± 0.03 and 0.41 ± 0.04, respectively, with a genetic correlation of -0.25 ± 0.09 between them. The direct response in AFO (difference between the 'early' and 'late' lines) was 62 days, 16% of the mean, and the correlated response in mean SS was 3.1 cm, 12% of the mean. There was no selection-line difference in weaning weight and only a 2.7% difference between the lines in yearling live weight ($P < 0.05$). The 'early' and 'late' selection lines differed in yearling-heifer pregnancy rate by 29 percentage points ($P < 0.001$), and there was a trend for an associated pregnancy-rate difference in mixed-aged cows between lines (91.8 vs 86.1%, respectively; $P < 0.10$). There was a significantly greater incidence of subfertile yearling bulls in the 'late' than in the Control or 'early' lines ($P < 0.001$).
Keywords: Cattle, puberty, selection, pregnancy.

INTRODUCTION
It is now well accepted that pubertal traits in beef cattle are heritable. There are frequent reports with heritability estimates for scrotal circumference or size (SS), although fewer for age at puberty (first behavioural oestrus, AFO). Morris *et al.* (1993a) reviewed three large New Zealand studies, and average heritability estimates were 0.34 for AFO (or 0.40 for AFO when standardised), and the AAABG website on genetic parameter estimates (http://www.gparm.csiro.au/) contains an average heritability of 0.45 for SS at fixed age (25 estimates). Although several single-generation selection studies have been carried out with pubertal traits in beef cattle, it is believed that AgResearch's project to apply long-term selection for higher or lower AFO is the only one of its kind. The selection experiment began in 1984/85, and the objective of this paper is to report results to 2004.

MATERIALS AND METHODS
Background and management. Earlier phases of the puberty selection experiment with Angus cattle were described in a previous Conference paper (Morris and Wilson 1995) but, briefly, the foundation stock in 1984/85 came from a prior experiment (1962-81) selecting for weight and weight-gain traits (Carter *et al.* 1990); there were then 3 years of re-randomisation. Alongside an unselected Control line, three puberty lines were set up, selected for increased age at puberty in heifers (AGE+ line), reduced age at puberty in heifers (AGE- line), or increased scrotal circumference, with the last two lines being merged at the 1992 matings (forming a new AGE- line, with continued early puberty selection in heifers). Calves were tagged and recorded to dam within 24 h of birth.