GESTATION LENGTH, BIRTH TRAITS AND PREWEANING GROWTH OF WAGYU-, PIEDMONTES- AND ANGUS-Sired CALVES

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SUMMARY
Data on 143 calves, born to Hereford or Brahman-cross cows and sired by extreme genotypes for marbling (Wagyu), muscling (Piedmontese) or by Angus sires, were used to study variation in gestation length, calving ease, birth traits and preweaning growth. Calves by Piedmontese sires had longer gestations than calves by Wagyu or Angus sires (288.4, 282.7, 281.5 ± 1.05 days). Wagyu-cross female calves had lower birth weights (28.3 ± 2.4 kg) than other calves except their male counterparts, and Piedmontese male calves had heaviest birth weights (38.4 ± 2.4 kg). Male and female calves had similar birth height and length for Angus- and Wagyu-crosses, whereas Piedmontese-sired male calves were taller and longer than female siblings. The incidence of calving difficulty was similar for Piedmontese- and Angus-, but slightly lower for Wagyu-sired calves. Wagyu-sired female calves grew slower preweaning (849 ± 20 g/d) and were lighter at 150 days of age (155.6 ± 2.6 kg) than all other calves whereas Piedmontese-sired male calves grew fastest (1009 ± 20 g/d) and were heaviest at 150 days of age (189.8 ± 2.5 kg).

Keywords: Wagyu, Piedmontese, gestation, birth, growth.

INTRODUCTION
Australian domestic and export markets for beef have well defined specifications for carcass weight, fatness and maturity. Recently, there has been increasing interest in marbling (intramuscular fat), lean meat yield and eating quality. Substantial premiums are paid for carcasses with high levels of marbling, hence it is important to determine the advantage that sires from breeds with high potential for marbling, such as Wagyu, confer on commercial carcasses. It is also important that such advantages be compared with those from other extreme sire breeds, such as Piedmontese, with desirable combinations of carcass and palatability traits (Wheeler et al. 1996), and with more commonly used breeds such as Angus. Furthermore, awareness of trade-offs in growth or other production traits in Wagyu-cross cattle, irrespective of their marbling potential, are of considerable economic importance. In this regard, information is lacking on gestation, skeletal measures at birth and early growth traits of Wagyu-cross calves under subtropical Australian conditions.

This paper describes the birth characteristics and preweaning growth of calves with high potential for marbling (Wagyu-cross) or muscle growth (Piedmontese-cross) compared to Angus-cross calves. It is part of a study aimed at understanding production, and the carcass and meat quality characteristics from these crosses.
MATERIALS AND METHODS
Mixed-aged Hereford and Brahman-cross cows were assembled at NSW Agriculture, Research Station at Grafton for breeding in spring 1999. Seven Angus (A) sires, and four each from Piedmontese (P) and Wagyu (W) breeds were used in an artificial insemination program that continued for two cycles. The cows (n=330) were synchronised for oestrus using CIDR devices, and sires within each breed were allocated to oestrus females within dam breed. During pregnancy, cows grazed subtropical pastures of kikuyu, paspalum, carpet grass and some legume. At calving during August and September, birth weight, height and length were measured on 143 calves and the degree of calving ease recorded. Eighteen female calves sired by either Piedmontese or Wagyu sires were slaughtered at birth (see Greenwood et al. 2001), and birth data from these calves are included in analyses. Number of calves born for Angus-, Piedmontese- and Wagyu-sired female and male calves were 26, 30, 15, and 28, 15, and 29, respectively. At calving, live weights of cows ranged from 330 to 770 kg (mean ± SD, 478 ± 64 kg), and cows were scored from backward store to prime body condition (3-7 on a 9 point scale (5.2 ± 0.9)).

Cows and their calves were grazed preweaning on subtropical pastures. Calves were weighed in November at an average age of 85 days and again in January (~150 days of age). Male calves were castrated between 3 and 4 months of age and all calves were vaccinated for clostridial diseases. Calves with horns were dehorned at this time.

For gestation and birth traits, data were initially analysed using linear models with sire breed, sex of calf, dam age and dam breed as predictors of each response. The significance of each term was assessed by univariate analysis of variance, and non-significant terms, including dam age and dam breed, deleted. Models were used to predict means and standard errors. Live weights of each calf, measured at birth, in November and in January, were analysed by regression, with calf age and its interactions included in the model. This linear model allowed for separate slopes and intercepts due to each combination of sire breed and calf sex and accounted for 96% of the variation in calf weights. Significance was accepted at P<0.05.

RESULTS AND DISCUSSION
Gestation length. Calves sired by P bulls had longer gestations than calves by W or A sires (288.4, 282.7, 281.5 ± 1.05 days respectively, (mean ± sem)). This agrees with data from Cundiff et al. (1998), who reported that P-sired calves had gestations of 287.3 days compared with 283.2 days for Hereford- and Angus-sired progeny. There does not appear to be any published reports on estimates of gestation length in Wagyu-cross progeny. Interestingly, sex of calf did not affect the length of gestation as was reported by Barlow and O’Neill (1978) and Cundiff et al. (1998).

Birth traits. Sire breed and sex of calf had effects on birth weight, with male calves averaging about 2 kg heavier than female calves at birth. When analysed by regression, significant differences in birth weight occurred between male P-sired calves (which were heaviest), and W male and female and A female calves. Wagyu female calves were also significantly lighter at birth than all other calves except their male counterparts (Figure 1a.). Overall, there was almost 10 kg difference in average birth weights between P male (38.4 kg) and W female calves (28.3 kg). This range in birth weights for extreme breed crosses, and the mean birth weights for W- and A-sired calves in this study, is
similar to results reported by Rutley et al. (1995). Our results for birth weights of P-and A-sired calves are similar to those of Cundiff et al. (1998). When we analysed birth weight as a univariate trait, overall differences in birth weights were larger than for regression analyses, and the interaction of sire breed and sex was significant, with the findings similar to those for calf height and length at birth. A similar interaction was reported by Barlow and O’Neill (1978) and Cundiff et al. (1998) for Bos indicus-crosses, but not Bos taurus-cross calves. Male and female calves were of similar birth height and length for A- and for W-sired calves, but P-sired males were significantly longer and taller than their female siblings (Figure 1b). The greater size of the P male newborns did not significantly increase calving difficulty, consistent with results of Cundiff et al. (1998) and Hearnshaw et al. (1997). Seven of the 143 births required assistance, with three assisted births each for P- and A-sired calves and one for W. Of the seven assisted births, five were male calves, two each from P- and A- and one from W-sired calves.

Figure 1. Predicted birth weights (from regression analyses) and birth heights of male and female calves from Angus, Piedmontese and Wagyu sires.

**Live weight and growth.** Within sire breed, male calves were heavier than females by approximately 7 kg at 85 days of age and by 10 kg at 150 days of age (Figure 2). Wagyu female and male calves were lighter than all other calves during growth from birth to 150 days; A-sired female calves were lighter than P-sired female calves; and P-sired male calves were heavier than all other calves (Figure 2). The advantage of P-sired calves over A-sired calves in live weight at 150 days of age was due to a tendency towards greater birth weight and growth rate. Growth rates of W-cross female calves from birth to 150 days were lower than all other calves: 850 for W-sired females compared with 903, 935, 955, 989, and 1009 ± 20 g/d for W-sired male, A- and P-sired female and A- and P-sired male calves, respectively. Trends towards better preweaning growth and heavier weights for P- compared with A-sired progeny, are similar to results reported by Hearnshaw et al. (1997) and Cundiff et al. (1998). The significantly lighter weight of Wagyu-cross calves at 150 days of age indicates that these cattle would be about 30-35 kg lighter than P-crosses at a weaning age of 230 days. Similar differences in weaning weight were reported by Rutley et al. (1995) for W-crosses, A-crosses and heavily muscled Belgian Blue-crosses. Given that postweaning growth of W-cross
cattle has also been reported to be slower than other genotypes (Myers et al. 1999), differences in age at which specified carcass weights are achieved for export markets are likely to be substantial. Appropriate marketing of W-cross carcasses with high potential for marbling will be imperative to achieve premiums that will compensate for any reductions in productivity.

![Graph showing live weights of calves from different genotypes](image)

**Figure 2.** Predicted live weights (kg) from 0-150 days of age, for male and female calves from Wagyu, Piedmontese and Angus sires.

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