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Genetics of heifer puberty and growth in tropically adapted beef breeds

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Heifer reproductive performance is a driving factor for profitability in northern beef systems. Age at puberty (AP) directly influences conception rates and is a highly heritable early-in-life trait for the genetic improvement of female reproduction (Johnston *et al.* 2009). The research showed selection could occur with few major antagonisms with production traits. Recognising the relationship between AP and growth traits during sire selection has the potential to achieve desirable mating weights of pubertal heifers. The aim of this paper was to investigate the genetic relationship between age at puberty, weight at puberty (WP), and 600-day weight (600 dW) through use of sire EBVs.

As part of the 'Repronomics' project (Johnston *et al.* 2017) heifers (N = 2438) were weighed and ovarian scanned every 4–6 weeks to identify the age (AP) and weight (WP) at first-observed corpus luteum (CL). Heifer weight was also recorded when the heifer cohort was approximately 600 days of age (600 dW). The heifers were located at DAF Brian Pastures (Gayndah) and Spyglass (Charters Towers) Research Facilities from 2014 to 2020. The breeds recorded included Brahman, Droughtmaster and Santa Gertrudis. Each trait was analysed separately to estimate genetic parameters and estimated breeding values (EBV) using ASReml (Gilmour *et al.* 2009) and models included fixed effects associated with the experimental design. EBVs for sires (N = 91) with greater than 10 daughters recorded were plotted below.
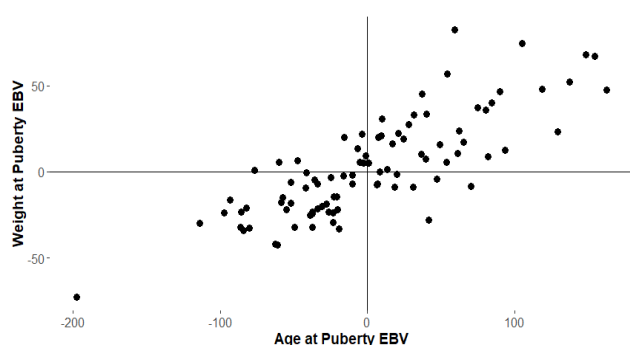
Fig. 1. Relationship between sire EBVs for age and weight at puberty.

Fig. 2. Relationship between sire EBVs for age at puberty and 600d weight EBVs.

Fig. 1 displays a strong positive relationship between the sire's EBV showing that as age at puberty EBV increases, so does the EBV for the weight of the heifer at puberty. This indicates that those sires with daughters that were older at puberty were also likely to have heifers that were heavier at puberty. Conversely, younger age at puberty would be associated with lighter pubertal weight. However, Fig. 2 shows there was no observed relationship between 600 dW EBV and AP EBV and identifies sires (in the circle) that have early age at puberty as well as above average 600 dW. Further analyses could confirm these relationships through the estimation of genetic correlations between the traits allowing for development of multi-trait evaluations. The study could be expanded to estimate the relationship with other traits such as heifer fatness and body condition.

This study has shown it would be possible to select sires with EBVs for early age at puberty and heavier weights at mating, and therefore we expect a larger proportion of heifers that reach target into mating weights will also be pubertal. This will accelerate reproductive genetic improvement within the herd, resulting in increased conception rates, fewer instances of lighter pubertal heifers conceiving with associated risk of calving difficulties, and ensure above average growth genetics when selecting for early age at puberty.

References
Gilmour AR *et al.* (2009) ASReml user guide, release 3.0. VSN International Ltd, Hemel Hempstead, UK.
Johnston D *et al.* (2009) Genetics of heifer puberty in two tropical beef genotypes in northern Australia and association with heifer- and steer-production traits. *Animal Production Science* **49**, 399–412.
Johnston D *et al.* (2017) The Repronomics Project – enabling genetic improvement in reproduction in Northern Australia. *Association for the Advancement of Animal Breeding and Genetics* **22**, 385–388.