

VISUAL SELECTION FOR MUSCLING IN A BREEDING HERD

Brian Sundstrom

Producers have long been concerned that selection for heavier muscling in a breeding herd would bring penalties in the performance of females. Fears include poorer fertility, lower milk production and greater calving difficulty.

This article outlines a long-running experiment with a commercial breeding herd set up by NSW Department of Primary Industries and now included in the Beef CRC. It aims to establish the progress that can be made in improving the value of steers and examine any negative impact of extra muscling on the breeding females.

Muscling selection experiments

Bill McKiernan, NSW DPI Livestock Research Leader (Orange) and Greg Meaker, Beef Officer from Goulburn, have been running a selection program for and against muscle score since the early 1990s, concentrating on selection for muscling and measuring the consequences.

The experiment was started at NSW DPI Elizabeth Macarthur

Agricultural Institute at Camden in 1991. It continued there until 2002 when drought and alternative demands on the site necessitated moving the herd to the DPI's Glen Innes Research Station. Since then there has been increasing CRC involvement.

Originally a random selection of Hereford females were used, representing breed average muscularity. High and Low muscle score Angus bulls were selected visually and used to produce progeny for comparison. In 1997 females from these matings were selected on their High or Low muscle score pedigree and on their own muscle score, to form High and Low female lines. They have been subsequently run as separate breeding groups, mated to High or Low muscle score Angus bulls respectively, sourced from industry herds. Subsequent generations of females have been selected on muscle score to be replacements for the respective herds.

Currently two herds of more than 70 cows are being run. The average muscle score

of the Low herd is D muscle score and the High cattle are a little over muscle score C (i.e. one full muscle score separation, average of both male and females).

A third, related herd is also run at Glen Innes and includes cows carrying the 'double muscle gene' (myostatin deletion gene). This research is helping to understand the biology of muscling and the potential use of DNA tests to improve retail yield. Information from this herd is reported independently, but also compared with the two selection lines described above.

Selection line results and implications

- There is now a full muscle score difference between the herds in both males and females, which has given a clear economic advantage to the High muscling herd. In saleyard terms, one full muscle score advantage across all stock categories attracts a premium of 10c to 20c per kg liveweight, currently worth more than \$100 per animal sold.



Producers viewing the muscling experiment at NSW DPI's Glen Innes Research Station

Implications:

- ◆ Visual muscle scoring by experienced people does work – it is repeatable and heritable
- ◆ Selection adds substantial value to sale stock in an average commercial herd
- Selecting for cows and sires on muscle score has also increased the eye muscle area (EMA) of progeny. Measured at any age up to slaughter, there is a difference of 5 to 10 cm² between the lines at the same weight.

Implications:

- ◆ The objective measure, eye muscle area, is correlated to visual muscle score.
- ◆ The two can be used as alternative or preferably complementary, selection tools.
- ◆ BREEDPLAN EBVs for EMA can be used in bull selection for herds and breeds with this information of sufficient accuracy.
- ◆ Visual selection becomes more important for breeds without accurate EBVs.
- Fatness has decreased in the High muscling line, although the decrease is only marginal at the rib site. Results from over 200 steers slaughtered from these lines show a decrease of about 2mm at the p8 site on a 350kg carcass from the High muscling line at 2 years of age. Rib fat has been relatively constant. Marbling fat has slightly decreased in the High muscling line.

Implications:

- ◆ Selection for muscling results in higher-yielding cattle that are more attractive for most markets
- ◆ For the high quality long-fed Japanese and Korean markets, to avoid losing marbling, watch EBVs for marbling and use the

Japanese market \$index

- Compared to the Low muscling line, High line steers after three generations of selection had: 1% extra dressing percentage; 1.25% better retail yield percentage and the proportion of hindquarter primal cuts was over 1% higher.

Implications:

- ◆ These changes combine for a very significant increase in beef value per kg liveweight or dressed weight.
- ◆ This is in keeping with crossbreeding experiments using heavily muscled breeds such as Limousin, but had not until now been so clearly shown for a British breed.
- ◆ The widely held view that “selection on conformation cannot change the distribution of cuts” is not always true.
- There has been little or no effect on growth rate between the lines. High line cattle are however shorter as measured by hip height.

Implications:

- ◆ Selection for muscling need not reduce growth – a common industry concern.
- ◆ Weight can also easily be monitored via BREEDPLAN weight EBVs
- ◆ The shorter stature is in keeping with industry perception of “dumpiness” in more heavily muscled animals. However, the experimental lines are the same weight at any age.
- ◆ Contrary to common industry perception, heavier-muscled, ‘dumper’ animals are in fact the same maturity pattern if not later maturing than their low muscle counterparts.
- ◆ Store steer buyers should not only rely on animal height as a gauge of maturity and growth potential but should consider muscularity in combination with height and weight to assess finishing performance.

- Possibly the most difficult trait to measure accurately is female fertility and performance, as very large numbers of calvings are needed.
- ◆ There is currently no difference in weaning weight of progeny between the High and Low muscle lines, indicating that milk production has not been adversely effected.
- ◆ Serial ovary scanning of weaner and yearling heifers found no differences in “active ovaries” as heifers achieved sexual maturity. This indicates sexual maturity of females from the two muscle lines is the same.
- ◆ There has been virtually no calving problems within the muscle line herds. The Low muscle line has slightly heavier calves at birth – the opposite to what most producers would expect.
- ◆ Overall fertility, number of calves born or weaned relative per cow mated, is effectively the same in each herd.

At a recent field day, Bill McKiernan summed up, “We are now confident of the results that selection for muscling within British breeds, at least to these levels, will result in substantial economic benefit with little impact on other herd productive traits”.

He also stressed: “This is an experiment to study the effects, by selecting on a single trait. This does not imply that single trait selection should be pursued commercially. We recommend that muscling can and should be included in multiple trait selection programs. This can be either by straight or cross breeding, depending on the situation”.

- Further information, see related articles:
- The value of muscling (pg 23)
 - Myostatin gene promises higher yield (pg 27)
 - Muscle scoring beef cattle – NSW DPI Primefact available at www.dpi.nsw.gov.au