GeneNOTE 11
GeneSTAR® Tenderness 4
A multi-marker DNA test
for beef tenderness

Why select for tenderness of beef?

Inconsistency in beef tenderness, leading to an unsatisfactory eating experience, is a major problem for beef demand around the world. Consumer surveys have consistently shown tenderness to be the single most desired criteria for meat quality. Recent taste panel research in Australia and USA suggests that consumers can discern between tenderness levels and are willing to pay a premium for tender beef. Studies have shown that variation in beef tenderness is twice as important as juiciness and flavour factors in leading to a satisfactory eating experience.

While nutritional regime and post-slaughter treatment impact strongly on the tenderness of a steak, the advent of genetic tools that allow us to select for tenderness now means that all sectors of the supply chain can work towards more tender beef.

Why the GeneSTAR® test for Tenderness?

GeneSTAR® Tenderness was the first multi-marker single trait test commercially available to the beef industry. In its current form it combines four DNA markers that are independent in their effect but cumulative for their overall effect on tenderness.

GeneSTAR® Tenderness 4 identifies animals that are more likely to produce tender beef. It is a test for 4 markers for two important genes (Calpastatin and Calpain) that have major impacts on the post-slaughter tenderisation process of beef. The test detects two different forms of each marker; one associated with increased tenderness and the other with increased toughness.

## The effect of GeneSTAR® Tenderness 4 on tenderness of carcases

We tested and analysed large sets of carcase results with objective measurements of meat tenderness using mechanical shear force in Kgs as the objective measure, where lower shear force is more desirable. The results showed that the four markers are independent and the effects of the STARS for the 4 markers on tenderness are additive (Figure 1). The implication of this is that individual results for each marker can be added together to assess the potential impact of 0-8 STAR results.
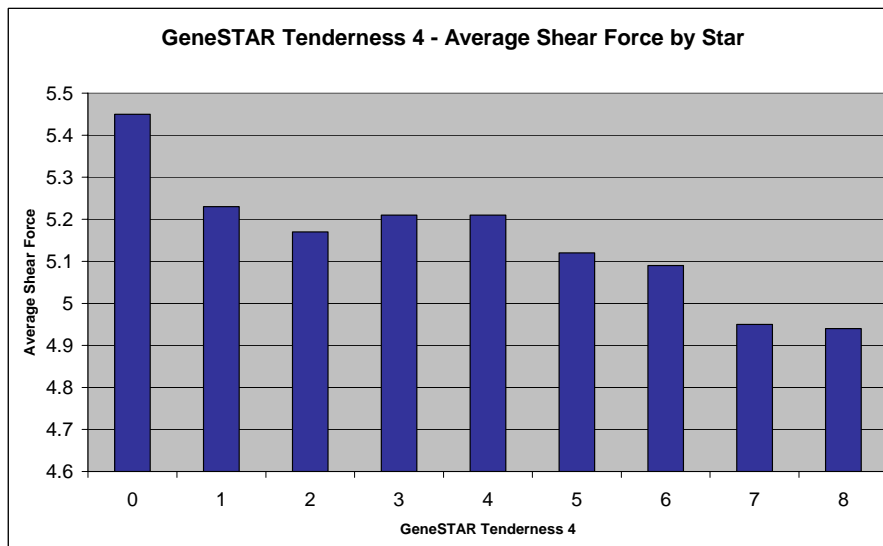
**Figure 1: The effect of number of STARS on tenderness (Shear Force measured in Kgs) of beef carcases**

Figure 1 shows the decrease in toughness as the number of STARS increase in the total data set of over 3000 carcases from 7 breeds. Shear force results greater than 6 Kgs are the toughest and results less than 4 Kgs are the most tender. There is some variation in the 2, 3 and 4 STAR carcases however the progressive effect of the increasing number of STARS is significant.

Figure 2 (overleaf) shows there is an important increase in the percentage of more tender carcases as the number of STARS for GeneSTAR® Tenderness 4 increases, and also a significant reduction in the percentage of tougher carcases.
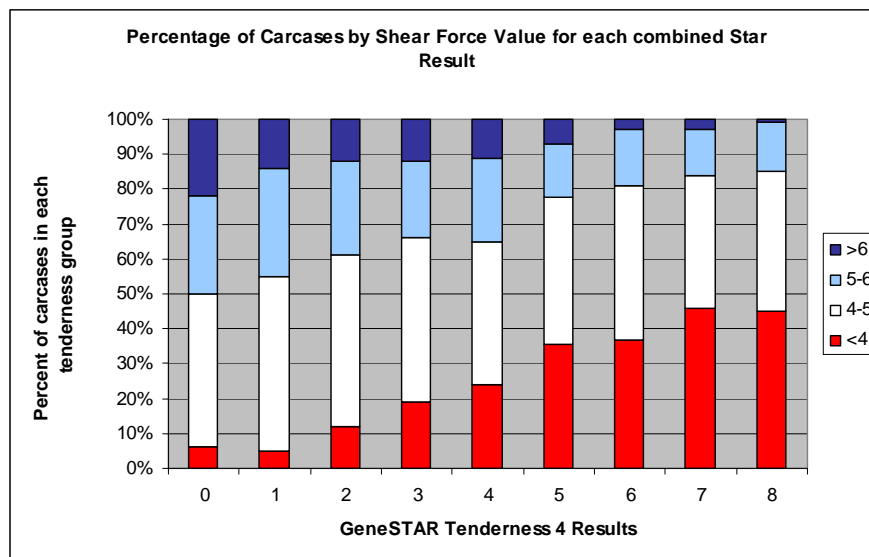
Figure 2: The percentage of carcases by Shear Force value at different STAR scores

While there is a progressive increase in tenderness potential as an animal has more STARS for GeneSTAR® Tenderness 4, just as importantly there is also a positive change in the proportion of animals in each tenderness category (Figure 2). Animals or carcases can be separated into tenderness categories on their shear force result.
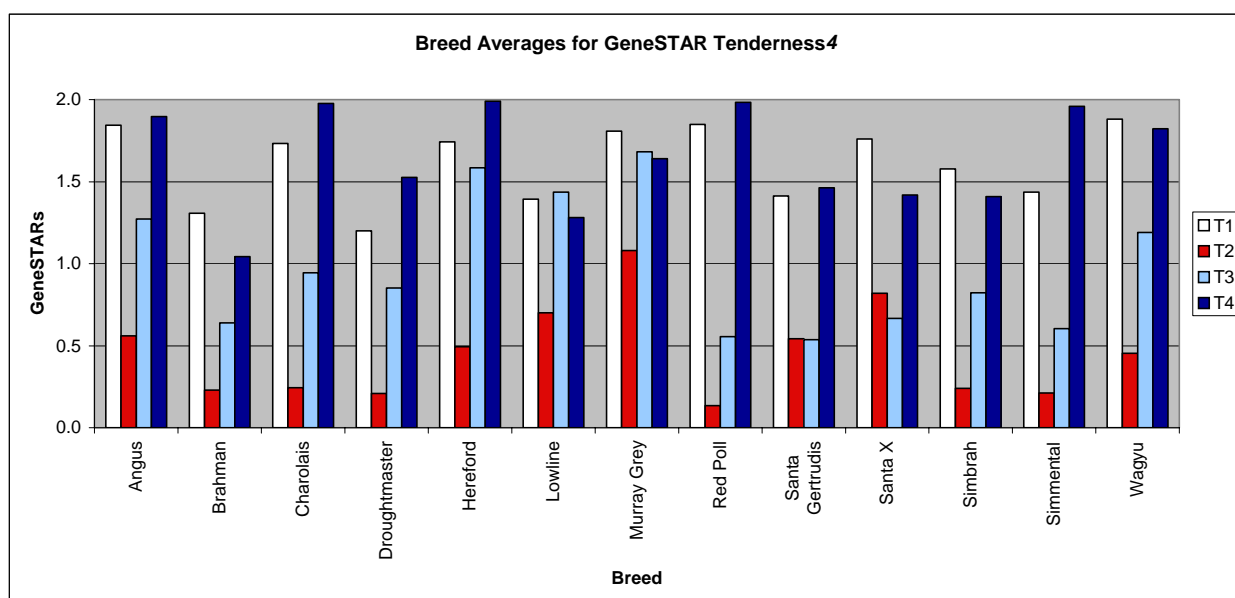
Figure 3: Breed average STAR rating for each of the markers in the GeneSTAR Tenderness 4 test STAR averages by breed for the 4 Tenderness markers

The average STAR score (0-2) for each of the 4 markers is shown in Figure 3. You will note differences within a breed for each marker as well as between breed differences. As with many traits, there can be as much or more variation within a breed as between breeds. Care should be taken in using these averages to infer differences between breeds for overall tenderness potential as these four markers represent only part of the tenderness picture; there exist other markers for genes that impact on tenderness not yet included in this test.

Conclusion

A four-marker test for beef tenderness is available as part of a combined three—trait test for Marbling, Tenderness and Feed Efficiency. Cattle breeders aiming to improve these traits should use the test in their selections to increase the number of animals with 2-STARS for individual markers, with 8-STAR animals being the highest number attainable at present for each trait, therefore most desirable.

Use of the Test in your selections

Producers can confidently select for tenderness in two ways. Firstly, selectively breed for more 5, 6, 7 and 8-STAR animals and secondly, avoid using 0-STAR animals as key breeding animals. A 0-STAR sire will leave daughters that will remain in your herd a for a decade! Seedstock breeders can fine-tune their selections by mate selection that increases the percentage of 2-STAR animals for each marker in the herd.