

On tips & tools

Meat Standards Australia : MSA07

The effect of marbling on beef eating quality

What is marbling and why does it vary between carcasses?

Marbling is the intramuscular fat which appears as fine flecks within the muscle. It is deposited unevenly throughout the body, increasing through the carcass towards the neck and decreasing towards the tail. It is the last fat to be deposited and the first to be utilised by the animal as an energy source. Therefore, to maximise marbling, cattle must be on a high nutritional plane. Stress or fasting pre-slaughter can quickly reduce the marbling score. CRC research indicates that marbling potential can also be adversely affected by growth restriction much earlier in life. Marbling is also affected by genetics. Breeds such as the Wagyu marble extensively in relation to European breeds. British breeds are generally intermediate although it should be remembered that there are strong individual animal differences within each breed and breed type.

Does marbling ensure eating quality?

Marbling has a very positive effect on the eating quality of some cuts but it is only one of the many factors affecting eating quality. High quality cuts from young cattle that have low marbling can have good eating quality however, cuts from high marbling carcasses can fail to grade if other factors are poorly managed. All factors that interact to determine eating quality need to be managed together. However, where all else is equal, enhanced marbling will improve the eating quality of the prime cuts.



The effect of marbling on eating quality

MSA research has related increased marbling to higher eating quality scores for many cuts. The effect is greatest in the high value loin cuts. It is not clear to what extent this relationship is caused by improved tenderness versus juiciness.

KEY POINTS

- Marbling is the small flecks of fat scattered throughout the muscle.
- Marbling has a positive effect on eating quality in many high value cuts.
- Marbling is affected by genetics and nutritional management.
- It is possible to achieve good eating quality without marbling.

The table below shows MSA eating quality scores for three cuts from a carcass at a range of marbling scores. As can be seen, the marbling effect for each cut is different.

US marbling	Blade		Striploin		Topside	
	MSA Score	MSA Grade	MSA Score	MSA Grade	MSA Score	MSA Grade
200	54	3	49	3	42	Ungrade
400	57	3	54	3	45	Ungrade
600	60	3	59	3	47	3

The above data is taken from a standard MSA carcass with the following specifications: HSCW 240kg, male, 25% *Bos indicus*, AT hang, ossification 160, meat colour 1C, rib fat 7mm, pH 5.55, loin temp 7.0°C, ageing 5 days, cooking method roast.

Assessing marbling

Marbling is assessed at either the 10th/11th rib or at the 12th/13th rib on the carcass. The exposed rib eye is the assessment site used by the MSA grader for marbling, pH, rib fat and meat colour measurement. The United States Department of Agriculture (USDA) marbling scores are used by MSA as these measurements provide a finer scale than the AUS-MEAT scores. Each USDA standard photograph is divided into tenths for grading, creating a score range from 100 to 1000 in increments of 10. Graders carry visual standards for USDA and AUS-MEAT marbling and determine each score independently.



Both the USDA and AUS-MEAT scores are provided on the feedback. However, there is no formula to compare USDA marbling scores to AUS-MEAT marbling scores as the assessment criteria are different. The picture below shows an MSA grader measuring marbling against a USDA marbling standard photograph.



MSA feedback provides the AUS-MEAT marbling score reported in tenths within each score. This enables producers to see how far they are from their market target. For example a 0.9 AUS-MEAT score (mb) indicates that the carcass had a significant amount of marbling and was close to a 1 mb, whereas a 0.2 is not displaying much marbling at all.

Marbling should be assessed according to the AUS-MEAT requirements for chiller assessment when the rib eye temperature is below 12°C. However, the lower the temperature is the more solid the marbling fat will be, which may marginally improve the visual assessment.

Marbling and genetic improvement

Marbling can be improved by genetic selection. Many breeds now publish EBVs for IMF (intramuscular fat %) which can assist selection. Actual data from carcass feedback is also very helpful although it may be difficult to accurately interpret if it is collected from cattle finished to different market specifications, killed at different abattoirs or even on different days at the one abattoir.

On-farm management

Detailed knowledge of farm management effects on marbling is lacking at present, although there is an indication that adequate and consistent growth in the phases from birth to weaning and weaning to feedlot entry is important. Suggested target growth rates for these periods are 0.9kg/day from birth to weaning and 0.6kg/day from weaning to feedlot entry. As stress is believed to have a negative impact on marbling, good temperament and management should also be considered. Marbling generally increases as an animal matures and lays down fat. While each individual animal will have more rib fat with increased marbling, the relationship is different between animals, ranging from virtually zero marbling at excessive rib and P8 fat depth to heavy marbling with moderate external fat. This creates huge differences in profitability for feedlots and others utilising long feeding regimes to target markets which desire heavy marbling.

Is rib fat important?

Rib fat is used in MSA grading as both a minimum requirement for grading and as a prediction input. The 3mm minimum standard aims at reducing temperature variation through the carcass muscles during chilling. Even chilling throughout the muscle produces more consistent and predictable eating quality as well as improved visual appearance. A small eating quality improvement also occurs as rib fat increases from 3mm to 18mm. This is in addition to the much larger effect of marbling.

Marbling in the feedlot

Accurate knowledge regarding the marbling potential of purchased feeder cattle will add considerable value when available. Rations, days on feed, HGP use, targeted growth rates and stress minimisation can all impact on marbling potential. Whereas most feedlot practices, including high energy intake, higher fat scores at exit and longer days on feed improve marbling scores, HGP use will reduce them. Most feedlots will target their feed and management programs to maximise the marbling for the target market specifications.

Factors affecting marbling assessment

The factors likely to influence marbling scores recorded at the abattoir are stress management in lairage, carcass chilling in terms of both temperature and time and the temperature of the eye muscle at grading. MSA graders monitor these factors within MSA licensed abattoirs.

For more information

Visit the MLA web site at www.mla.com.au

Or contact your nearest MSA grading office or MLA for other tips & tools on the factors that affect eating quality.

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