

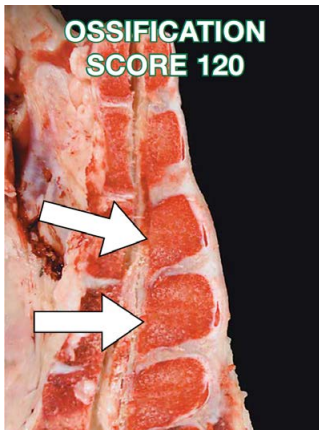
TIPS & TOOLS

MEAT STANDARDS
AUSTRALIA

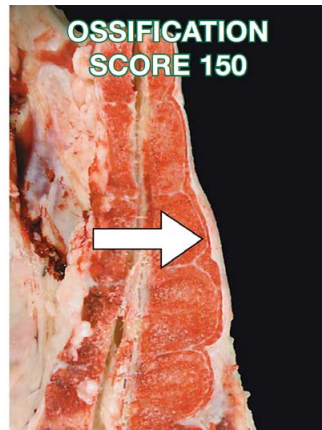
Ossification and beef eating quality

What is ossification?

Ossification is a measure of physiological maturity of the beef carcass. As an animal matures, cartilage present around bones gradually fills with blood and develops into bone. Although this development occurs in association with the animal's chronological age, it is affected by nutrition and development. Ossification is measured visually in the chiller by the MSA accredited grader.



In a young animal these bones (vertebrae) are separate.



As the animal matures these 'caps' begin to appear... and the individual bones begin to fuse together.

The scale of ossification runs from 100–590 in mostly 10 point increments and follows a similar scale developed by the United States Department of Agriculture grading service.

The three areas of the backbone examined to determine ossification are the sacral, lumbar and thoracic vertebrae. The sacral vertebrae are the last five vertebrae on the tail end of an AUS-MEAT standard carcass. The lumbar vertebrae are the six vertebrae in the loin region of the carcass. The thoracic vertebrae are the 13 vertebrae to which the ribs are attached. Ossification begins in the sacral region (shown in the above pictures) and continues through the lumbar and then thoracic regions.

The following table shows the descriptions for the three vertebrae regions at selected ossification scores. It is important to note that the approximate age in months is only a guide in an optimum-condition carcass.

Key points

- Eating quality declines as ossification increases.
- Ossification increases as the animal ages but can also increase with nutritional or health stress.
- Producers can manage their animals to prevent accelerated ossification.
- MSA grading evaluates ossification in relation to carcass weight.

Ossification score	Approx age in months	Sacral vertebrae	Lumbar vertebrae	Thoracic vertebrae
100	9	No ossification	No ossification	No ossification
110	10	Capping starts	No ossification	No ossification
130	15	Advancing capping; separation still visible	No ossification	No ossification
150	20	Capping completed but some cartilage still visible	No or minor ossification	No ossification
170	24	Capping completed; sacral closing	Ossification clearly evident	No ossification
200	30	Completely fused	Nearly completely ossified	Some evidence of ossification
300	42	Completely fused	Completely ossified	Partially ossified
400	72	Completely fused	Completely ossified	Outlines plainly visible
500	96	Completely fused	Completely ossified	Outlines barely visible

Why does maturity need to be determined?

Beef is made up of muscle fibre groups surrounded and supported by connective tissue. Connective tissue is made up of elastin and collagen fibres. Collagen fibres form crosslinks to stabilise and strengthen muscles. As the animal matures, the fibres in the meat become progressively stronger and more rigid and are less likely to break down during cooking. This results in tougher meat. This process of physiological maturation is not always reflected by chronological age.

	Ossification Score 100		Ossification Score 150		Ossification Score 200		Ossification Score 350	
	MQ4	MSA Index	MQ4	MSA Index	MQ4	MSA Index	MQ4	MSA Index
Tenderloin	77	64.65	77	59.99	77	57.64	77	56.17
Cube Roll	65		61		59		56	
Striploin	60		57		55		53	
Rump	57		53		51		49	

The above data is taken from a standard MSA carcass with the following specifications: 290kg HSCW; male; no HGP-treatment; 150 ossification; 320 MSA marbling; 6mm rib fat; 5.60 pH; 7.1°C loin temp, AT (Achilles tendon) hang; and aged 5-days. Meat eating score (MQ4) is the predicted eating quality score of the individual cuts in the carcass, based on consumer ratings of tenderness, juiciness, flavour, and overall liking. Each cut is allocated an MQ4 out of 100, and a beef cut must achieve a minimum of 46 points to be allocated an MSA star rating.

Ossification measures the physiological age of the carcass and gives an indication of collagen fibre development. The effect that physiological maturity has on eating quality is shown in the table above.

Ossification and growth rate

MSA grading relates carcass weight to ossification, effectively a weight for age measure. Cuts from carcasses with lower ossification at the same weight are graded higher. Faster growth rates produce higher carcass weights without a significant increase in ossification levels.

Why not use dentition to measure age?

Actual age (chronological age) is not predicted accurately by either ossification or dentition. Tooth eruption is often delayed in cattle under nutritional stress which can lead to lower dentition scores in poorer quality carcasses. In contrast ossification is accelerated by nutritional or other stress reflecting the associated lower eating quality.

Further advantages are that ossification can be assessed in the chiller during grading and described in 10 point increments from 100–590, a much finer option than the 0, 2, 4, 6 or 8 permanent incisor, dentition options.

What factors can influence ossification?

Ossification rates will vary slightly between animals, but all cattle can be managed to minimise the rate of increase. Nutrition plays a significant role. Cattle that are fed a poor diet are likely to have increased levels of ossification.

Ossification development cannot be reversed so if cattle suffer early nutritional setbacks and then have access to good feed they are still likely to show increased ossification, compared to animals of a similar age that had a steady growth rate. This is particularly evident in cattle that have come off scrub or low nutrition country into a feedlot. The carcass weight will improve considerably and the rate of ossification may slow but the effects of the early poor nutrition cannot be reversed.

Heifer carcasses often have higher ossification scores than steers. This may partially reflect earlier sexual maturity

and associated stresses. It often reflects management differences with steers being fed for maximum growth and early sale versus heifers being grown for joining weight targets. The heifers which fail to get in calf, or lose their first calf, are often sold as meat with much higher ossification scores than their more favourably treated steer counterparts.

Health may also affect ossification with chronically sick or injured animals showing higher rates. These animals will also have a restricted nutritional intake associated with their illness.

What can be done to keep ossification scores low?

Low ossification scores mean better eating quality and better compliance in cattle presented for grading. Cattle with fast growth rates will reach slaughter weight at a younger age and reduced ossification. By selecting for 200 and 400-day weight EBVs producers are able to reduce the time taken for cattle to reach finished weight, having lower ossification scores at the time of slaughter. Ensuring cattle have ample energy and protein for every stage of growth will assist ossification management.

Heifers selected as culls should be managed the same as steers destined for slaughter however it may be necessary to turn the heifers off early to avoid over fat carcasses.

Sick injured animals should be isolated from the consignment and treated or sent separately as a suspect animal.

Producers should monitor ossification over time to observe improvements made by genetic and management decisions. This can be done by looking at carcass feedback from the processor, or accessing carcass data within myMSA. As an increase in ossification can impact negatively on the eating quality, this effect can be observed in the MSA Index. Ossification has a high relative importance when considering the traits that influence the MSA Index. As ossification increases by 10, the MSA Index decreases by around 0.6 units. To find out more about the MSA Index see *MSA Tips & Tools: Using the MSA Index to optimise beef eating*.

Further information

Visit mla.com.au/msa or contact MSA 1800 111 672



Level 1, 40 Mount Street,
North Sydney NSW 2060
P: 1800 023 100
mla.com.au

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