AMPC/Sheep CRC/MLA Case Study

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Fact sheet – Meat colour and shelf life

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The basis of meat colour

When meat is sliced, the surface is exposed to oxygen and will change in colour from dark purple to bright red. This is because the colour of meat depends mainly on the pigment myoglobin. Myoglobin exists in three different chemical forms and colours, deoxymyoglobin (purple), oxymyoglobin (red) and metmyoglobin (brown).

Blooming *is the oxygenation of the myoglobin at the meat surface and is represented by the colour changing to red. This takes approximately 15–30 minutes.*

Over a period of several days, the red colour on an exposed surface of meat will change to brown. This process is more rapid for lamb than beef (Figure 1).

Meat that is stable in colour remains red for longer periods due to most of the myoglobin remaining in the red oxymyoglobin form. These products tend to have a longer shelf life.

Colour stability *is represented by the colour of meat at the end of a retail display period.*

Figure 1: Lamb leg chop showing the colour change as the pigment in the meat surface changes from oxymyoglobin (red) to metmyoglobin (brown).

Colour influences meat purchasing decisions

Whilst colour is not included in any carcase grading systems for lamb, unlike beef, it is still considered an important issue driving lamb meat sales. Consumers' choice of meat is influenced by colour, with a preference for bright red meat.

Firstly, bloom is important and is considered less desirable if it is darker. Secondly, the rate at which the colour changes from red to brown is important as this determines the length of time the meat can be displayed for sale and is often referred to as 'colour stability'.

41% of customers said they would not eat meat that appeared brown, even when the use-by date had not been exceeded, according to Sheep CRC survey result. As a consequence, retailers often discount meat to prevent the display period extending beyond 2 days, after which lamb can begin to appear brown.

Supply chain factors affecting lamb meat colour

Factors important for colour stability are also important for bloom colour and are influenced at different points along the supply chain, including lamb production, processing and retail.

Lamb processing factors

Electrical stimulation

Electrical stimulation is used to accelerate the rate of tenderisation due to ageing and to prevent 'cold shortening', the irreversible contraction of muscles due to chilling. The use of electrical stimulation increases the rate of pH decline post mortem. A fast rate of pH decline will generally make the bloom colour lighter and more attractive to consumers.

However, over stimulation can also reduce colour stability by causing a very low pH when the carcase temperature is still high. This is known as heat toughening, and mainly occurs in beef carcasses that have large masses of meat that cool very slowly compared to lamb carcasses.

Ageing period

The ageing period refers to the time from slaughter to retail sale. This can vary from a few days for meat sold domestically to 70 days for some export markets.

Ageing can increase bloom colour, however, can also reduce colour stability at the same time. This effect is seen for meat aged longer than 10 days and the maximum time suggested for ageing without substantial detrimental effects on colour stability is 20 days.

Cuts that are normally stable in colour, such as the leg (silverside), become very unstable in colour when aged for longer than three weeks prior to slicing for retail sale. Differences due to other factors, such as the effect of electrical stimulation, on bloom colour may disappear as the ageing period increases.

If meat is to be aged for extended periods of time, vitamin E status of the lambs should be adequate. Methods for extending shelf life such as modified atmosphere might also need to be considered, however, recent research is suggesting this form of packaging can decrease eating quality outcomes.

Processor check list for managing meat colour

Optimising factors across the supply chain is important for managing bloom colour and colour stability. Producers, processors and retailers all have a part to play in achieving the best outcome for meat colour at the point of retail sale.

Area	Action	Reason
Electrical stimulation system	1. Optimise electrical input settings for plant chiller conditions.	Plants vary for rates of chilling and types of animals slaughtered.
	2. Check pH decline data regularly and use MSA lamb and sheepmeat guidelines.	An optimal rate of pH decline is important for bloom colour and colour stability.
Lairage	3. Minimise lairage periods prior to slaughter.	Stress causes meat to have a high ultimate pH.
	4. Provide adequate trough space for water in lairage.	Dehydration makes meat dark in colour
Lamb Source	5. Source lambs that have grown faster than 100 grams/head/day.	Bloom colour and colour stability depend on lamb production factors.
Vitamin E	6. Make sure vitamin E is included in rations for out of season lambs in summer months	Vitamin E significantly improves the colour stability of lamb meat at retail display.

Further information

For further information refer to the Meat Colour Stability fact sheet.

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