MEAT & LIVESTOCK AUSTRALIA

tips&tools

MSA10 MEAT STANDARDS AUSTRALIA

The effect of the pH–temperature decline on beef eating quality

What is the pH–temperature decline?

The pH decline is the rate at which the carcase pH level falls from 7.10 (live animal pH) to the level at which it will not fall any further (this is known as the ultimate pH). Temperature drops as the carcase is processed and then chilled. The ideal 'window' is a specification used to describe the relationship between carcase pH and temperature from slaughter to when ultimate pH is reached. If the rate of pH–temperature decline does not fall through the ideal window, then carcase eating quality can be severely compromised. With over 400 meals produced from every carcase it is an important consideration. The ultimate pH alone is also important for eating quality (See *MSA Tips & Tools: The effect of pH on beef eating quality*).

Where is the pH–temperature window assessed?

The window is assessed at the abattoir as part of MSA licensing conditions. The pH temperature decline begins on the slaughter floor and finishes in the chiller when the carcase has reached its ultimate pH. It is assessed by taking sequential pH and temperature readings using a combined pH/temperature meter. Readings are taken from a number of carcases as they come off the slaughter floor and then at timed intervals until the pH reading is at the ultimate level in the chiller. The time the carcase takes to reach its ultimate pH level determines the rate of pH decline.

The pH–temperature window is periodically checked at every MSA licensed abattoir to ensure that it is always maintained for MSA cattle.

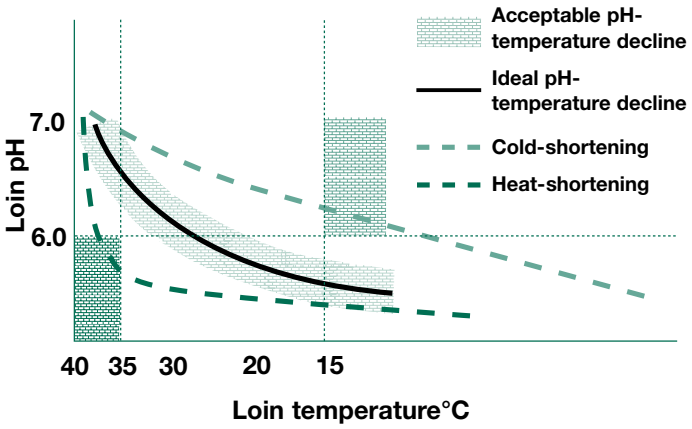
Key points

- The pH–temperature decline must fall through the ideal 'window' for eating quality.
- A pH–temperature decline that falls above the window will result in cold-shortening.
- A pH–temperature decline that falls below the window will result in heat-shortening.
- Both heat and cold-shortened meat are tough and unsatisfactory for the consumer.
- Electrical stimulation is a tool that can be used to manipulate the pH–temperature decline.

What is the pH-temperature decline specification?

The window requires the carcase pH to pass through 6.0 between 15°C and 35°C. This is shown in Figure 1 (over the page). The readings taken on the carcases at the abattoir are plotted into a graph to determine the rate of the pH-temperature fall. If the current rate of pH-temperature decline falls through the window, no adjustments to the system are required. If it does not fall through the window, then a number of alterations can be made including the use of electrical stimulation, which accelerates the rate of pH decline. The rate can be adjusted by varying stimulation frequency and application duration.

Figure 1 pH-temperature decline window.



What happens if the decline does not fall through the ideal window?

If the pH decline is too slow, remaining high while the temperature falls, the carcase will cold-shorten. This is detrimental to the quality of the meat and will result in:

- Extremely tough meat (cold-shortened meat is described as inedible).

The widespread use of electrical stimulation has reduced the likelihood of cold-shortening in most processing plants.

If the pH decline is too fast and the ultimate level is reached while the temperature is still high, heat-shortening will result. This does not make the meat as tough as cold-shortening but has undesirable effects including:

- An increase in toughness
- Pale and sometimes watery meat (known in industry as Pale Soft Exudative – PSE – meat)
- 'Two-toning' in some cuts leading to unattractive retail appearance
- The prevention of ageing (the enzymes that enable meat to become more tender with age are denatured and will no longer work)
- Reduced water-holding capacity.

How does electrical stimulation work?

Electric currents applied to the carcase make the pH fall faster. It is not a tenderisation process by itself. In fact, if too much stimulation is used, the pH falls too fast resulting in heat-shortening. There can be a number of electrical inputs on the slaughter floor, all of which need to be taken into account. For example, rigidity probes apply an electric current to the carcase to keep it rigid while the hide puller removes the hide.

This in itself can begin to increase the rate of pH fall. When determining abattoir requirements to maintain the ideal pH-temperature window, the amount of stimulation is varied to meet the window specifications.

Does anything else need to be considered?

The rate of pH decline varies with the pre-slaughter state of the animal, the number and type of electrical inputs used during processing, the speed of the slaughter-floor chain, chiller conditions and carcase weight and fatness. The amount of glycogen in the animal is very important in the pH-temperature relationship (See *MSA Tips & Tools: The effect of pH on beef eating quality*). It is also important that the abattoir has handling and receival facilities that minimise the amount of stress the animals' experience. MSA accredited graders consider all of these inputs in determining the requirements for the abattoir to maintain an ideal pH temperature decline and optimise the eating quality of the beef produced.

Can the producer play a role in keeping the pH-temperature decline in the window?

Yes! It is important that the animals reach the abattoir in as normal condition as possible. Minimising stress and ensuring animals have enough energy reserves will assist in achieving an ideal pH-temperature decline. By following the MSA guidelines (see *MSA Tips & Tools: MSA requirements for handling cattle*) and ensuring the cattle have adequate finish, producers can give their consignment the best possible opportunity to provide a satisfying eating experience for the consumer.

For more information

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

MEAT & LIVESTOCK AUSTRALIA

Level 1, 40 Mount Street
North Sydney NSW 2059
Ph: +61 2 9463 9333
Fax: +61 2 9463 9393
www.mla.com.au

Released: September 2018
ISBN: 1 74036 391 4

ABN 39 081 678 364