



Guidelines for the measurement of pH in lamb

Background

There are two types of muscle shortening which result in tough meat. These can be monitored by measuring pH/temperature changes with time

Cold shortening

This is more likely in conventional operations where electrical stimulation is not used.

To completely avoid cold shortening the pH should be below 6 before muscle temperatures reach 18°C or less.

To avoid severe cold shortening the pH should be below 6 before muscle temperatures reach 8°C or less. In this case additional post slaughter practices to improve meat quality are recommended (eg extended ageing or hip suspension)

Avoidance of cold shortening can normally be achieved by ensuring that no muscle temperature falls below 10°C in the first 10 hours post slaughter. Measuring the pH/temperature relationship, however, is recommended to validate the process.

Hot shortening

There is a risk of hot shortening where electrical stimulation is applied.

To avoid hot shortening the pH should remain greater than 6 until the temperature has reached 35°C or less.

pH / temperature measurement programme

It is recommended that a programme of measurement be adopted to ensure that neither cold nor hot shortening is induced.

Initial benchmark and annual review

Initial benchmarking should be undertaken to establish the appropriate daily monitoring:

- where electrical stimulation is not applied, pH and temperature measurement should be at 45 minutes post slaughter and regularly thereafter (every half hour or so) until pH 6 is achieved. This could be used to estimate the temperature at which pH 6 is achieved. The chilling rate should be adjusted to ensure that the temperature is above 18°C (or preferably 8°C) at pH6. From this initial exercise the target temperature fall can be set.
- where electrical stimulation is applied, pH and temperature should be measured immediately before and after stimulation (to check how effective the stimulation is) and then regularly (every half hour or so) until pH 6 is achieved. The information should be used to adjust the stimulation applied to ensure the pH does not fall below 6 until the temperature has reached 35°C or less, and set a target pH after stimulation.

An annual review is recommended.

Ongoing monitoring

Ongoing monitoring should be daily if possible:

- where electrical stimulation is not applied, temperature profiles should be monitored with use of data loggers to ensure that they meet the targets set following the initial benchmarking. pH measurements should be made at a fixed time post slaughter on a sample of (say 10) carcasses a day to monitor over time for any changes in pH fall. Any changes should result in a review of the target chilling rate to ensure that the temperature is above 18°C (or 8°C) at pH6.
- where electrical stimulation is applied, pH and temperature should, be measured immediately after stimulation. Any post-stimulation pH outside the range set should trigger a review of the stimulation applied.

Guidelines for measurement

Instrument selection

Wherever possible use an electrode that is non-breakable. There are models available that are coated in plastic for robustness. If using a plain glass electrode, ensure that it is used with an adequate protection tool/knife.

Use of pH probe

Follow the manufacturers instructions for reliable use of the probe. The following are important points to note:

- Keep the probe tip moist when not in use, using the small teat supplied and the correct storage fluid supplied by the manufacturer.
- A build up of salt deposits can affect the accuracy during long term storage - wash with de-ionised water.
- It's important that the probe is kept clean during pH measurements, as a build up of protein will affect the readings.
- Sterile wipes (not halogenated hydrocarbons, petroleum ether, acetone etc.) will reduce contamination between carcasses and help remove any build up of residues.
- Air bubbles can be present. These must be removed by shaking the electrode in a downward motion.
- Calibration should be done daily and be **checked regularly** (every couple of carcasses).
- Buffers of 7.0 and 4.0 should be used for calibration.
- Static electricity can be a problem this is caused by rubbing the electrode when cleaning, this makes calibration difficult - to reduce this run under clean water and dab dry using a paper towel.

Measurement location

pH is normally measured in the *Longissimus lumborum* (loin muscle) at the head of the last rib. It is important to ensure that the probe tip is deep enough into the muscle to measure e.g. in the *Longissimus* muscle not the intercostals (between the ribs). Insert the probe, if possible from the medial surface (inside) as this should help with getting less fat on the probe.

Measurements

Take three measurements and average them out. If one of the three measurements "looks" odd the probe may have entered a piece of fat or a different muscle so probe again. If only two measurements are taken it is difficult to determine the correct value if they differ greatly.

Conclusion

Effective monitoring of pH in a sample of carcasses is a useful tool to improving consistency in meat quality, through reducing the risk of shortening.