

# Packaged and aged lamb

The data-based confirmation of chilled lamb (held for up to 20 weeks) quality and safety, using novel smart packaging and spectroscopic technologies

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## Project description

Plastic packaging is an important issue for lamb processors and industry stakeholders. Its disposal represents a cost, in economic and environmental terms, and community expectations have shifted so that 'sustainable practice is also considered to be best practice'. However, meat packaging and its disposal are not the only factors underpinning 'sustainable practice'. Extended periods of preservation, wherein lamb meat retains its safety and quality, are required to reduce food waste and to improve supply chain efficiencies. Within this context, new and sustainable plastic packaging must also deliver a shelf-life that meets or exceeds conventional practice for long-term chilled lamb meat products. This project investigated whether 'sustainable' packaging preserve microorganism populations, meat quality, and oxidative stability measures (including fatty acid concentrations) to acceptable levels in lamb meat held chilled for up to 20 weeks.

## Project content

A total of 384 lamb *longissimus lumborum* muscles (LL) were selected at random from the boning room of a commercial Australian abattoir. These were used to complete 2 independent repeats of an 8 × 4 factorial designed experiment that captured the effects of 8 storage periods (Week 0, 1, 2, 6, 10, 14, 18, and 20) and 4 packaging types (PACK 1, Eco-tite® Recycle Ready Shrink Bag; PACK 2, Cryovac® Barrier Shrink Bag; PACK 3, a foil pouch; and PACK 4, Biovac™ Recyclable Vacuum Pouch. PACK 1 was selected due to its material properties respond to new standards for recyclable plastic film and it was untested for lamb meat preservation; PACK 2 was selected due to its representation of conventional and current industry practice; PACK 3 was selected due to its oxygen transmission rate, with < 1 CC/m<sup>2</sup>/24 hours offering a proof of concept packaging to determine whether 20 weeks of chilled storage was a valid hypothesis; and PACK 4 was selected due to its 'biodegradability' and being marketed for red meat preservation. All the LL were packaged at 24 hours post-mortem and visually inspected to assure packaging integrity, placed into cardboard boxes, and held on-site under chilled storage temperatures of -1.2 ± 1.1 °C (mean ± standard deviation).

## Project outcome

This project has demonstrated that new and sustainable plastic packaging can deliver the shelf-life of conventional practice for long-term chilled lamb meat products. It demonstrated that vacuum packaged lamb meat can be held chilled for up to 20 weeks and therefore 10-15% longer than has been previously recommended in the literature. This project also demonstrated that Raman spectroscopy can provide non-destructive information of the in-pack microbial status of lamb meat.

## Benefit for industry

This project provides evidence as to the practical advantages to using 'sustainable' packaging in place of conventional packaging systems. This is expected to provide industry stakeholders and policy makers the knowledge to protect Australia's clean and green brand, leverage a more competitive market position, deliver upon market expectations, and affirm sustainable practices that reduce meat wastage and spoilage over long-term storage periods. The concurrent investigation of spectroscopy is expected to provide evidence for its application as a non-destructive means to quantify the in-pack population of microorganisms, thereby inform supply chain efficiencies and ensure consumer wellbeing.