WHAT'S NEW

Summaries of recent publications

Meat technology-What's new

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Retail colour stability of lamb

Several experiments have been carried out in New Zealand to determine the effects of processing and storage conditions on the colour stability of lamb cuts during retail display. A high proportion of lamb is now being exported in chilled, vacuum-packed form due to the longer storage times attainable under modern processing practices, and the higher prices achieved compared with frozen product. The studies explored (1) processing conditions of electrical stimulation and temperature at rigor; (2) storage temperature prior to retail display and (3) the effect of ageing prior to freezing on retail display life.

Electrical stimulation was found to have no effect on meat-colour stability, but display life in high-oxygen MAP was reduced when the meat entered rigor at a high temperature of 42°C. There was little difference in colour stability between rigor temperatures of 5, 15 and 25°C. The largest influence on display life was the storage temperature for 7 weeks prior to display. The colour stability of lamb was significantly reduced at a chilled storage temperature in vacuum of 2°C, compared with the ideal of –1.5°C. Even one week at 2°C at the end of the storage period, which might typify what happens during distribution at the receiver's end, had a substantial effect on display life.

Lamb loins were aged for periods of up to 3 weeks prior to freezing and storage for a total of 9 weeks, and then their display life was compared to those stored chilled at –1.5°C. The aged frozen loins and the aged-only loins displayed in high-O_2 MAP had similar surface redness, colour intensity and discolouration. The unfrozen loins had higher lipid oxidation indicating that ageing loins prior to freezing will provide equivalent colour stability and better lipid-oxidation stability than chilled-only loins under high-O_2 MAP.

Effect of cattle temperament on meat quality

Recent research in Australia and the United States has investigated the relationship between the temperament of cattle and carcase and meat quality. In both cases temperament was assessed by measuring the speed of exit from a crush (flight speed or exit velocity in m/s) and scoring the degree of agitation while in the crush using a standard 5-point scale for crush score (CS).

The Australian study included both Brahman and Angus cattle. The flight speed and crush scores were higher for Brahman cattle, and increased scores were associated with reduced growth rate during backgrounding and in the feedlot, lower carcase weight and poorer objective meat-quality characteristics. Carcases from flightier cattle had darker meat colour; higher pH, loin muscle shear force and compression; and higher cooking loss. Angus cattle were calmer and showed less effect of temperament on growth rate, but there was a stronger relationship between tenderness and temperament. Relationships between measures of temperament and productivity and meat quality were stronger when temperament was measured at an early stage of production.

The American study, in contrast, found no relationship between temperament scores and growth rate, but did agree that early measures of temperament showed a stronger relationship with meat-quality measurements. Less docile animals had a lower marbling score and higher Warner Bratzler shear force for the rib eye muscle.

Both studies found no relationship between measures of animal temperament and genetic markers for tenderness or docility.

Bacterial community analysis of cattle feedlots

The surface material of cattle feedlot pens consists mainly of compacted manure, and is an important reservoir for bacteria that can influence animal health and human food safety. Despite its importance, surprisingly little is known about the bacteria that inhabit the feedlot surface. Samples were obtained from the top 5 cm of a feedlot pen in the US, and the bacterial community compared with that of cattle faecal material collected at the same time from animals in the pen.

It was found that the surface material housed a bacterial community that was distinct from that of the faecal source material. Only 25 (18%) of 139 total genera from faeces and surface material were present in both habitats. Twenty-one (15%) were found only in faeces and 93 (67%) were exclusively in the surface material. *Bacteroides* were the only bacterial genus that were frequently identified from both habitats. These are a gram-negative intestinal anaerobe and it is likely that their presence in the feedlot surface is a result of large numbers being deposited via faeces.

The results indicated that the feedlot pen surface is microbiologically distinct from the faecal source material. This suggests that pathogens in cattle faeces face different selection pressure and survival challenges during their tenure in the feedlot pen compared with their residence in the bovine intestinal tract.

Consumer response to new beef packaging technologies

The appearance of meat and the way it is packaged have a strong influence on a purchaser's decision. The type of packaging is selected by the industry for reasons of meat safety, and preservation of attributes of the meat (such as colour) which influence the decision to purchase. New packaging technologies are often introduced without providing full

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information to consumers. A survey was undertaken in Europe to determine the consumers' response to different beef-packaging technologies, especially those that improve the safety of the product.

An online survey of 2520 people was conducted in five European countries to measure consumers' responses to the meat-safety benefit of five different packaging technologies, namely: modified-atmosphere packaging, vacuum packaging, packaging containing protective bacteria, packaging releasing preservative food additives, and packaging containing natural agents.

Vacuum packaging was the most accepted with 73% acceptance followed by modified-atmosphere packaging (54.7%). The least accepted was the one releasing preservative additives (23%). Two technologies were highly rejected compared to the others. They were: adding protective bacteria; and, especially, packaging releasing preservative additives. Analysis revealed that familiar technologies were clearly preferred over non-familiar ones, but there was a significant group of about one third of the sample who were opposed to the idea of enhancing beef safety at the packaging stage. Therefore, it was concluded that differences in consumer acceptance levels should be taken into account when considering new packaging, and communicating its benefits to customers.

Bacterial survival during composting and burial of dead cattle

A disease outbreak or natural disaster could lead to the need to dispose of large numbers of dead animals. There are several options available for disposing of large numbers of carcases including: surface disposal, burial, rendering and composting.

Surface disposal involves leaving the carcases on the surface of land to naturally decompose. This is only really viable in isolated areas and could still lead to transmission of disease, pollution of water supply and increases in scavengers. Burial is an expensive option as it requires excavation of a large pit and subsequent containment and ongoing monitoring. Rendering will require transport to a rendering plant which may not be convenient, and the products from diseased animals may not be marketable. Static pile composting involves placing carcases on a bed of compostable material and completely covering with further material and leaving to decompose. When done properly, high temperatures develop, which kill most types of pathogens.

In order to evaluate composting with alternative procedures under Australian conditions, a trial was set up at Camden in NSW to compare composting with above-ground burial and surface disposal. A total of 35 beef cattle were slaughtered at an abattoir and their intact carcases were allocated to the three treatments. Three were placed on the surface as controls, 16 were composted and 16 buried in a similar manner to composting by laying the carcases end to end, but on a bed of soil and covering them with soil instead of the shredded green waste used for composting. Bacteriological reference samples (faeces and cultures) were placed above and below each carcase and the temperature also monitored over a 26-week period from March to September.

Composting was highly effective in destroying coliforms in faeces and *E. coli* in ampoules within 28 days, while burial was no different to the controls for the first 84 days. Reference bacteria placed above the buried bodies was still viable after 182 days. The buried carcases were also slowest to decompose and emitted a strong putrid odour when examined. Temperatures above 55°C were maintained in the compost windrows for the first 77 to 84 days; whereas, the temperature of the buried carcases did reach 30°C.

Static pile composting is an effective method for disposing of carcases of large numbers of animals that had been culled or had died of disease or disaster. Above-ground burial was not satisfactory for this purpose.

Electrolysis-enhanced anaerobic digestion of wastewater

An increased number of anaerobic digesters have been installed partly due to the ability to collect biogas as a renewable energy resource. Studies have demonstrated that the production of methane, the major biogas constituent, can be enhanced and the removal of chemical oxygen demand (COD) increased by maintaining a low dissolved-oxygen concentration in the reactor.

A laboratory-scale study was conducted to evaluate the effect of water electrolysis to generate micro-aerobic conditions on anaerobic digestion of a synthetic wastewater.

A bench-scale upflow anaerobic sludge bed (UASB) was fitted with electrodes in the sludge bed and a voltage applied to generate hydrogen and oxygen. The oxygen reduced the release of hydrogen sulphide to the biogas and a portion of the hydrogen escaped to the biogas increasing its combustion properties. Another portion of the hydrogen was converted to methane. Methane production was increased by 10–25% and H_2S reduced to below the detectible level, while COD removal efficiency was similar.

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Contact us for additional information

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