

# Meat technology-What's new

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## Contribution of lean, fat and degree of doneness to meat flavour

Tenderness, juiciness and flavour are the three factors on which consumers judge cooked meat. Flavour is often rated the most important, but is also the least understood. Meat flavour intensity can be affected by the lean-to-fat ratio, degree of doneness, lipid oxidation and other factors.

A US study had the multiple objectives of determining the influence of: (i) species lean and fat source and degree of doneness, (ii) the fat level, and (iii) light and dark muscles, on flavour of ground product.

Patties were formed from lean and fat from pork and beef according to the experimental design, frozen, then stored in vacuum packs until evaluated by a sensory panel. Panellists scored cooked samples for the intensity of beef flavour, pork flavour, metallic/serumy or acidic/sour flavours.

Flavour was not affected by the degree of doneness (66°C vs 71°C). Beef flavour was highest in samples made with beef lean regardless of the species of the fat; and pork flavour was highest in samples made with pork lean. Beef flavour was not increased in all-beef patties formulated with higher fat levels, whereas increased fat in pork patties did increase pork flavour. Using light or dark meat did not impact flavour in either species.

The species-specific flavour has historically been attributed to the fat in meat products; however, these results indicated that the lean tissue may be the principle contributor to species flavour. Therefore increased fat content in meat products may not always lead to increased flavour.

## Carbon dioxide stunning of lambs

Trials have been conducted in Spain with CO<sub>2</sub> stunning of lambs. One set of trials was with suckling lambs which were only 30 days old with an average live weight of 12.8 kg. The other trial was with 70-day-old lambs of 25 kg live weight. Four different CO<sub>2</sub> treatments and electrical stunning were assessed for their effect on the meat quality of suckling lambs, and the effectiveness of stunning the 70-day-old lambs. The combinations were: (i) 80% for 90 s; (ii) 90% for 90 s; (iii) 90% for 60 s; and (iv) 80% for 60 s. The electrical stunning parameters were 110 V at 50 Hz for 5 s.

None of the gas-stunned suckling lamb carcasses had haematomas (bruises) or blood splash (ecchymosis), whereas all carcasses from the electrically stunned animals showed both

haematomas and petechial haemorrhages. It is important to note, however, that the electrical stunning parameters used for the study would not be used commercially on lambs in Australia because high incidences of ecchymosis would be expected with these settings.

There was no effect of the different stunning methods on pH, water-holding capacity, cooking loss or colour; however, after 7 days storage in a vacuum pack, there was an effect on drip loss. The highest drip loss was from samples stunned with 80% CO<sub>2</sub> and the lowest from 90% CO<sub>2</sub>. There were small differences in tenderness, with samples from the gas-stunned groups being more tender than those stunned electrically.

It was concluded that the high (90%) concentration of CO<sub>2</sub> would be the best method of stunning suckling lambs.

In the case of 70-day-old lambs, a concentration of 90% CO<sub>2</sub> applied for 60 s was equivalent to electrical stunning with 100% of lambs correctly stunned. Only 50% of lambs were correctly stunned in treatments (i) and (ii), and 30% in treatment (iv). Each stunning method was associated with an increase in certain blood parameters, in particular: electrical stunning was associated with an increase in levels of glucose, LDH, CK sodium and potassium; while 80% CO<sub>2</sub> for 90 s resulted in the highest levels of lactate and hormonal concentration.

## Prevalence of *Salmonella* in Australian goats

The national *Escherichia coli* and *Salmonella* monitoring (ESAM) program identified a potential issue with *Salmonella* on goat carcasses. A study was initiated to investigate the prevalence and serotypes from goat carcasses at two Australian abattoirs.

A total of 121 feral goats, processed skin-on, were sampled on two different days at each of two abattoirs. Rumen, faecal and carcass samples were collected and analysed for *Salmonella* using the Australian Standard method.

*Salmonella* was isolated from the rumen of 59.5% of carcasses, from the faeces of 56.7% and from the carcasses of 32.2% prior to chilling. Carcass samples were significantly more contaminated in the afternoon than in the morning, at both abattoirs. There was no significant difference in prevalence of *Salmonella* on carcasses between the two plants.

*Salmonella* Saintpaul was the serovar most commonly isolated from carcasses in this study, with *S. Typhimurium* being the one next most commonly isolated. There was a positive correlation between the prevalence of *Salmonella* in faeces and on carcasses, indicating that faeces are a greater hazard than rumen liquor for contamination.

*Salmonella* was isolated from at least one of the three sample sites (faeces, rumen or carcass) in 68% of animals, which is much higher than found in studies in several other countries.

## The efficacy of biocides in cooling water systems

Cooling towers provide ideal environments for the proliferation of micro-organisms including bacteria, algae, fungi, protozoa and viruses. Protozoa are important reservoirs for *Legionella* in cooling waters. In many outbreaks of Legionnaires disease, protozoa capable of harbouring *Legionella* have been isolated from the same source.

Chemical treatments for the control of micro-organisms have concentrated mainly on effects against bacteria, in particular *Legionella*. There is also little known about the performance of biocides in the presence of chemicals to control scale and corrosion in cooling towers. Researchers from CSIRO and Flinders University studied the efficacy of cooling tower biocides in controlling protozoa, and the effect of chemical additives on biocide activity.

A total of 62 cooling towers located at a range of business sites were studied. Culture results detected *Legionella* spp. in 10% of the towers and fluorescent *in situ* hybridisation detected the presence of *Legionella* spp. in 34% of the towers. Protozoa were detected in 30% of the cooling towers, primarily present as free-living amoeba. There was no relationship between cooling tower chemical composition and *Legionella* and protozoa concentration. There was also no relationship between concentrations of *Legionella* and protozoa.

Laboratory challenge studies showed that the current predominately used biocides (chlorine, bromine and isothiazolinones) are effective as disinfectants against common protozoa in cooling water, provided a residual concentration was maintained for at least 2 hours. The continual dilution and neutralisation of the biocides needs to be taken into account. Systems operating at higher temperatures (above 30°C) may require longer biocide residence times. The two most commonly used additives for scale and corrosion inhibition—phosphate and molybdate—may compromise the efficacy; and bromine and isothiazolinone may require higher dosage concentrations.

## Control of *E. coli* in abattoir organic wastes

Disposal of abattoir wastes can be a costly problem, especially for smaller processors who may not have sophisticated processing plant or a waste collection service. While application to land has been an important means of disposal of these wastes, it has been shown that pathogenic organisms, such as *E. coli*, can survive and even grow under these

conditions. Regulations in many countries, including members of the EU, now prohibit land spreading of these wastes.

British researchers have undertaken a laboratory study into the effects of heat or lime treatment of some wastes on survival of *E. coli*, and potential for re-growth if contaminated after treatment. The wastes used were: (i) ovine blood; (ii) an ovine waste mixture of blood, floor washings and gut contents; and (iii) a mixture of sewage sludge, bovine blood, slurry and creamery waste.

Samples of the wastes were inoculated with a non-pathogenic strain of *E. coli* to a starting concentration of approximately  $7.2 \times 10^5$  CFU/mL. Heating treatments of 50, 60 and 72°C for 10 minutes were then imposed. It was found that heating to 60°C for 10 minutes effectively eradicated *E. coli* from each of the three wastes, while treatment at 50°C for the same time led to a 2 to 4 log<sub>10</sub> reduction. Heating waste to a temperature of 72°C induced solidification. This rendered the final product impractical to use. No viable *E. coli* were recovered after treatment of wastes with lime (CaO) at a rate of 10 g/L.

The potential for regrowth of *E. coli* was slightly greater in heat-treated waste than in untreated waste, which was considered to be mainly due to reduction of competition from other micro-organisms. When treated and untreated wastes were mixed with soil and inoculated with *E. coli*, higher numbers were recovered after 4 weeks from heat-treated samples than from untreated samples in the cases of blood and ovine mixed waste.

The authors considered that pasteurisation or lime treatment of wastes may provide alternative options for reduction of the pathogen load in abattoir wastes so that they can be applied to land with minimal biological risk.

## Reduced salt meat products

Salt is added to meat products to enhance flavour, as a preservative, and to provide the desired textural properties. As reduction of salt in the diet is desirable from the health aspect, European scientists have investigated the effects of replacing some of the NaCl in a cooked ham product with a proprietary product containing a mixture of potassium lactate and sodium diacetate.

The salt content of the cooked meat product was reduced by 20% and 40%, and 2% or 3% of the potassium lactate/sodium diacetate mixture was added. The shelf life was evaluated by means of a challenge test with a mixture of two *Lactobacillus sakei* strains and *Leuconostoc mesenteroides*.

The addition of 3% potassium lactate/sodium diacetate allowed the salt content to be reduced by 40%, which resulted in no effect on flavour, and an increase in the microbial shelf life.

*The information contained herein is an outline only and should not be relied upon in place of professional advice on any specific matter.*

## Contact us for additional information

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