

Meat technology-What's new

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Effects of hormonal growth promotants on meat quality

A team of Australian scientists has studied the effect of hormonal growth promotants (HGPs) on meat quality, especially in relation to palatability of meat from cattle for the Australian market under the MSA grading scheme. In one trial the effect of HGPs on palatability of different muscles and on ageing ability was examined. In another experiment, the effect on the palatability of a range of muscles from *Bos indicus*—*Bos taurus* cross cattle was reported.

There is considerable research confirming the benefits of HGP implants on liveweight gain and carcass yield, but there are conflicting results for the effect on meat quality, and most of these relate to only one muscle—the *M. longissimus dorsi*.

Eighty Angus yearling cattle—40 steers and 40 heifers—were allocated to control or treatment groups, then implanted and finished in a feedlot for 55 or 65 days prior to slaughter. After chilling, the striploin, silverside, rump and blade primals were removed for sensory analysis.

In terms of weight gain, the HGP implants were more effective in steers than in heifers as steers gained almost twice as much weight as heifers. Carcasses from implanted steers were 17 kg heavier than the controls and heifer carcasses 8 kg heavier. The HGP treated steers had higher ossification scores than the control steers, but there was no effect with the heifers. HGP treatment had no effect on marbling score, fat depth or ultimate pH.

Carcasses from implanted heifers and steers showed lower sensory scores and greater shear force and compression measurements than carcasses from control animals. The differences were significant for the *M. longissimus dorsi* and, to a lesser extent, for the proximal end of the *M. biceps femoris*; but, for other muscles, the differences were not statistically significant. The differences were smaller after 21 days ageing.

In the other trial heifers and steers with three-eighths *Bos indicus*, five-eighths *Bos taurus* were divided into groups and given combinations of one, two, three or no implants, at weaning, while being backgrounded on pasture and at the commencement of feedlotting. Heifers were fed a high concentrate diet in a feedlot for 73 days, while steers were fed a similar diet for 113 days.

After slaughter and overnight chilling, primal cuts were removed for packaging, ageing and sensory assessment.

The results showed that the sensory scores for muscles from all HGP implant strategies were similar, but they were lower

than palatability ratings for the control treatment. With the exception of the *M. psoas major*, all muscles tested had lower tenderness scores for HGP-treated carcasses than controls. The HGP-treated carcasses had lower marbling and higher ossification scores, which partly accounts for the lower scores; however, an adjustment for HGP implant status would still be necessary in grading schemes such as MSA.

Cutting meat and bone with an ultrahigh pressure abrasive water jet

Attempts have been made in the past to cut meat using high-pressure water jets, but success has been limited by speed, depth of cut and inability to cut bone. The addition of abrasive particles to ultrahigh pressure water jets has enabled abrasive water jet (AWJ) cutting to be applied to a wide range of materials. A study was undertaken by the University of New South Wales into the use of AWJ for cutting meat, meat incorporating bone and bone alone.

The series of trials used fine salt as the abrasive in a system that allowed pressures of up to 415 MPa to be generated at a cutting head with an orifice of 0.254 mm diameter. The use of the abrasive significantly improved the cutting action of the water jet resulting in a much smoother cut surface. The quality of the cut improved as water pressure and salt flow rate increased, and decreased as traverse speed increased. A very good quality cut was achieved when slicing 150 mm thick meat using a traverse speed of 66.67 mm/s and a pressure of 320 MPa.

Beef rib bones 44 mm thick could be cut at a speed of 20 mm/s and a pressure of 400 MPa. The cut resulted in a kerf width of less than 1 mm and no bone dust or debris on the surface. It was considered that the results indicated ice-waterjet cutting could be developed for cutting meat.

Performance of oxygen scavengers with low O₂ MAP

The greatest extension of shelf life of retail meat cuts occurs if they are stored in an environment of less than 0.05% oxygen. However, some commercial modified atmosphere packaging (MAP) equipment leaves residual oxygen levels of up to 1%, which are too high for extended storage. The rate of production of the undesirable brown metmyoglobin is at its maximum at these low oxygen levels. It has been demonstrated that the use of oxygen scavengers in MAP packs can extend the storage life of beef cuts. A team of researchers from Ireland evaluated four different iron-based scavengers for their ability to remove oxygen at 3°C and 10°C.

Individual oxygen scavenger sachets were placed in pouches and filled with 1%, 2%, 6%, 12% or 22% oxygen, 40% CO₂ and the balance nitrogen. A set of packs was also prepared containing a drip pad infused with 3 mL of water to create a

high humidity. The performance of the different scavenger types varied considerably, with the Atco performing better than the others. While all four scavengers were effective in removing oxygen, they did not absorb their nominal capacities of 200–210 cc in the 24-hour period. This rate of oxygen removal would not appear to be fast enough to create the anoxic conditions required to prevent metmyoglobin formation on susceptible meat cuts. The performance of the scavengers was also highly variable, particularly at low oxygen concentrations. Therefore, to obtain consistent results, it was recommended that several scavengers be used in each pack.

Packaging film may be an effective antimicrobial

An extruded composite packaging film, based on polylactic acid (PLA) and containing pectin and nisin, was developed in the US to inhibit *Listeria monocytogenes*. Nisin is a bacteriocin that has been shown to be effective against a range of microorganisms, and is widely used.

The film was evaluated for its antimicrobial effect using a microbial growth medium, orange juice and liquid egg white to represent neutral, high acid and low acid foods, respectively. The film was found to be effective in reducing *L. monocytogenes* by 2.1, 4.5 and 3.7 log units per mL in brain heart infusion broth, liquid egg white and orange juice, respectively, over 48 h at 24°C.

Further investigations will take place to determine the effectiveness of the film against *L. monocytogenes* for solid foods such as meat products.

Physical distribution & characteristics of meat and bone meal protein

Meat and bone meal (MBM) has been restricted in its use as a feed ingredient due to concerns related to bovine spongiform encephalopathy (BSE). Therefore researchers have been investigating new applications for MBM but, other than use as an industrial fuel, no new applications have been commercially adopted.

Most of the applications proposed would utilise the proteins that comprise about 50% of MBM. Scientists from the USDA examined the physical distribution of the protein and its properties from MBM samples obtained from 18 rendering facilities.

MBM consists of bone and soft tissue particles, with the soft tissue containing >80% of the protein. The proportion of

soft tissue in the samples ranged from 36.5% to 73.9%. Only a small proportion of the MBM protein is soluble under mild conditions, and even the most aggressive non-hydrolytic conditions fail to solubilise >55% of the protein. The soft tissue protein is more soluble than that from the bone fraction, suggesting to the authors that MBM should be separated into high ash and high protein streams before it is treated to extract the protein.

The low solubility of MBM protein suggested that limited hydrolysis will be required to increase solubility, while retaining some functionality. The fact that collagen accounts for 17% of the protein in the soft tissue and 26% of the protein in bone particles, suggested that an extract of MBM protein could have some of the functional properties of gelatine.

Anaerobic co-digestion as a treatment for meat industry wastes

Anaerobic digestion is recognised as a method for treating organic wastes. Greenhouse gas emission can be reduced through the production of biogas which is a renewable energy source that can be used in combined heat and power plants. Anaerobic treatment also reduces the volume of waste, which can then be processed by an aerobic treatment such as composting.

Some wastes from slaughtering have proven to be difficult to digest due to the increase in ammonia concentration during fermentation. Co-digestion with a more readily digestible waste—such as sludge from a wastewater treatment plant—has been found to improve the stability of the process and assist performance. Spanish researchers evaluated co-digestion of various slaughtering waste with waste sludge from an activated sludge plant treating abattoir waste water.

Cow manure, rumen contents and pig and cow waste slurries were digested in various ratios with waste sludge from the activated sludge process. Cow manure and rumen contents were slowly degraded in comparison with the waste sludge, but the waste slurries were not degraded at all. The low methane yields were considered to be due to the slowly degradable lignocellulosic compounds present. The negligible yield from the slurries may be due to ammonia inhibition. Mathematical modelling showed that when increasing the amount of waste sludge in the co-digestion mixtures, the amount of inert and slowly degradable fractions decreased, leading to increased methane yields.

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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WHAT'S NEW

Summaries of recent publications