Meat technology - What’s new

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Self-sterilising surfaces

Antibacterial surfaces and packaging have been available for some time and many operate on the principle of releasing heavy metals, such as silver, as anti-bacterial agents. Most commonly nanoparticles of metallic silver are incorporated into a support material. Presently, the release of silver is limited by the solubility of metallic silver. An ideal antimicrobial agent is inactive unless required so, should only release silver if bacteria are present.

Swiss researchers have developed a system based on bacteria requiring trace elements—such as calcium, phosphates and other ions—for growth and reproduction. The microorganism’s ingestion of specific ions triggers the release of nanoparticles of silver (1–2 nm) from the surface of a phosphate-based biodegradable ceramic. If present, microorganisms ingest the carrier, triggering the release of the silver nanoparticles; therefore, silver is only released into the environment when there is microbial contamination.

An antimicrobial film containing silver-doped calcium phosphate was prepared and tested for antimicrobial activity on a range of bacteria, including A. niger, S. aureus, P. aeruginosa and E. coli. Initial tests using E. coli showed that there was a 5 to 6-log reduction in numbers after 24 hours. The film was more effective than two commercially available antimicrobial films which achieved no more than a 2-log reduction in E. coli.

The film also achieved better than 6-log and 4-log reductions respectively against P. aeruginosa and C. albicans but was ineffective against gram-positive S. aureus and spores of A. niger.

The researchers claim that self-sterilising surfaces could be prepared for use in areas such as food and pharmaceutical production.

Comparison of conventional and radio frequency tempering

Tempering is the process of warming frozen meat to a temperature in the range minus 5 to minus 2°C so that it can be further processed. Tempering in air is the most commonly utilised method, but has the disadvantage that it takes an excessively long time due to the slow process of conducting heat through the product to the interior. Processes that have been developed to try to accelerate the process include vacuum and resistive heating, and microwave and radio frequency (RF) tempering.

Due to a lack of information on RF tempering of meat, Irish researchers compared RF at 27.12 MHz with conventional tempering and microwave tempering at 2450 MHz—the upper extreme of electromagnetic radiation frequency used in dielectric heating of food.

Fibreboard boxes (20 x 20 x 10 cm) were filled with 95% lean: 5% fat; or a 50:50 mixture. To evaluate the effect of comminution, lean was prepared in three forms: whole, minced (10 mm) and finely comminuted. The cartons were frozen to −20°C and tempered using one of the three methods. At the conclusion of tempering, the meat temperature was measured at 25 locations within the sample.

The finely comminuted meat had more uniform temperature distribution after tempering than minced or whole meat (where there was potential for runaway heating). In order to compare the systems, finely comminuted meat was used for all subsequent experiments although cartons of meat pieces are more likely to be tempered in industry. The composition of the meat also had an effect on uniformity of temperature—the higher the fat content, the greater the range in temperature after tempering.

Conventional air tempering took 5 hours or longer, while tempering with microwave and RF took 14 and 11 minutes respectively; however, there was a tendency for runaway heating with microwave tempering. RF and conventional tempering both resulted in a similar range of temperatures within the meat, but the RF system utilised required only about one-ninth the amount of energy of air tempering.

Influence of vacuum-packaged ageing on bloom development

When a freshly cut surface is exposed to air, beef slowly turns to a bright cherry-red colour. This process is typically referred to as blooming. This is the result of oxygen binding to the iron atom; in this state, the myoglobin molecule is referred to as oxymyoglobin. The time taken to oxygenate the cut is called blooming time. Most studies on bloom development have been conducted on ribbed carcases, but this US study investigated the effect of post-mortem vacuum-ageing period on bloom development in the *gluteus medius* (GM) in the sirloin butt and the *longissimus thoracis* (LT) in the striploin.

The vacuum-packaged primals were aged for up to 35 days at 2°C and sampled at weekly intervals. Steaks were cut from each primal and the colour measured instrumentally at 10-minute intervals for two hours while the steaks were stored at 3°C.

The results indicated that 50% of the bloom development in the GM occurred within the first 10 minutes and that 90% within 60 minutes. In the case of the LT, nearly half of the total colour change had taken place during the first 30 minutes and 90% by 90 minutes. The duration of post-mortem ageing had virtually no effect on bloom development in the LT, but GM steaks aged 14 days or less had a more vivid, redder and more yellow colour than GM steaks aged 28 or 35 days. Results for both cuts indicated that bloom development had not
Completely stabilised by the end of the 2-hour observation periods. The period of ageing had no effect on the rate of bloom development in the GM, but for the LT, oxymyoglobin development was slightly faster for those primals aged for more than 7 days.

Performance and quality of lamb according to sex type

Vasectomised rams are used in sheep production as teaser rams, but little is known of the meat quality of these animals. If there was an improvement in some important aspects, farmers may vasectomise more rams instead of castrating them. Irish researchers compared the production performance and meat quality aspects of carcases from intact rams, castrated rams, vasectomised rams, and ewes—when slaughtered at the same live weights.

The three male sex-types were similar in birth weight, growth rate and dressing out percentage; they were significantly lower than ewes in dressing percentage. On an equal age basis, there were no sex-related differences in carcase weight, indicating that the difference in live weight between male and female animals was accounted for by differences in the non-carcase parts such as head, feet, pelt and organs. The longissimus dorsi muscles from all the sex types were similar in pH and sarcomere length, but those from ewes had lower cooking loss and smaller shear force values. On an equal age basis, however, there were no differences in shear force.

Under the conditions of the experiment, sheep slaughtered at 50–54 kg live weight recorded the highest carcase yield and the meat had the best redness value.

Cholesterol and lipid oxidation of minced beef under oxygen-rich atmosphere

Modified atmosphere packaging (MAP) is used to prolong the storage and display life of chilled meat. High oxygen (approx. 80%) can lead to more rapid development of lipid oxidation that can negatively affect the sensory and nutritional quality of meat. Another detrimental consequence of lipid oxidation is the generation of cholesterol oxidation products (COPs) which, according to Swedish researchers, have the potential to influence the onset of degenerative diseases such as atherosclerosis and cancer.

Minced beef was purchased from a Swedish supermarket and stored under MAP (80% O2/20% CO2) and sampled at 1, 8 and 15 days during storage at 3 to 4°C. COPs, peroxide value (PV) and thiobarbituric acid reactive substances (TBARS) were determined before and after pan frying to assess lipid oxidation.

Total COPs in cooked mince increased from 12.1 mg/kg to 103.2 mg/kg of fat after 15 days storage. There was also an increase in TBARS from 0.5 to 6.2 mg MDA/kg of muscle, but there was little change in PV—which tends to be an intermediate oxidation product that breaks down to form other compounds. The results confirmed a connection between lipid oxidation and the formation cholesterol oxides.

Consumer preference for corn- or barley-fed beef

Some studies have found that diet has little effect on the palatability and sensory attributes of beef, whereas the results of others suggest that finishing with a high-energy barley diet produces a more flavourful meat and whiter fat than from corn-fed beef. Canadian cattle are predominately barley-fed, so researchers there were interested in the preferences of the consumers in their main markets: Canada, Japan and Mexico.

Cross-bred steers were fed either a barley diet or corn-based diet for approximately 140 days before selection for slaughter based on body weight, and body fat estimations by ultrasound. Striploins from the right sides of carcases were selected for assessment by a trained panel and consumer panels. Meat and fat quality traits were also assessed instrumentally and chemically.

A trained panel found little difference in the flavour attributes of the beef from the corn-fed or barley-fed cattle; however, steaks from corn-fed beef were rated higher for tenderness and the steaks from barley-fed higher for chewiness.

The consumer panels, which were selected from Canadians plus Japanese and Mexicans who had been in Canada for less than one year and two years respectively, had some significant preferences. Canadians preferred steaks from barley-fed animals while Mexicans showed no preference. Japanese consumers showed a preference for the appearance of raw barley-fed steaks, but preferred the taste of the corn-fed steaks. It appeared that consumers tended to prefer the product with which they were most familiar. The authors considered that future consumer studies should be done in the destination countries using appropriate cooking methods.

No differences between the two feeding regimes were observed for Warner-Bratzler shear tenderness, marbling, cooking losses or colour. There were also no differences in mono or polyunsaturated fatty acids.

Contact us for additional information

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