

Meat technology-What's new

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Red meat consumption: risks and benefits

A number of epidemiological studies have associated red and processed meat consumption with two of the major chronic diseases of the western world: cardio vascular disease (CVD) and colon cancer. This has led to a negative perception of the role of red meat in health; however, there are many health benefits from consumption of red meat as it is an important source of protein and essential nutrients. A British study has reviewed the current literature on both the risks and benefits of red meat consumption.

Despite many studies reporting an association between red meat consumption and the risk of CVD and colon cancer, several methodological limitations and inconsistencies were identified which may impact on the validity of their findings. They did not assess the degree of fat trimming or method of cooking used, and the method of assessing meat intake was potentially subject to error or bias. Not all studies were consistent in how they measured meat consumption, with many including processed meat as red meat and few studies examining lean red meat.

Overall there is no strong evidence to support the recent conclusion from the World Cancer Research Fund report that red meat has a convincing role to play in the cause of colon cancer.

A substantial amount of evidence supports the role of lean red meat as a positive moderator of lipid profiles, with recent studies identifying it as a dietary source of the anti-inflammatory long-chain *n*-3 polyunsaturated fatty acid and conjugated linoleic acid.

The authors concluded that moderate consumption of lean red meat as part of a balanced diet is unlikely to increase risk for CVD or colon cancer, but may positively influence nutrient intakes and fatty acid profiles resulting in long-term health benefits.

Dry-ageing beef striploins

Dry-ageing is the process of ageing meat unwrapped in a chiller as opposed to wet-ageing which takes place in a vacuum bag. Flavour benefits are claimed for dry-ageing although some consumers are unable to detect differences between wet- and dry-aged beef. However, dry-ageing is an expensive process because of the space and environmental control requirements and the evaporative weight losses experienced.

A new bag that has a very high water vapour transmission rate was introduced to the American market, and initial trials have shown no flavour differences between loins dry-aged traditionally and in the new bag, but less weight and trim losses for the bag-aged product.

New work has studied the effects on bone-in and boneless striploins aged for 21 and 28 days.

Bone-in shell loins and boneless striploins were either vacuum-packed in the dry-ageing bags or traditionally dry-aged on shelves in a cool room operating at 2.2°C and 50% RH for 21 or 28 days. Ceiling mounted UV lights were used to reduce microbial growth and the chiller air was filtered.

Higher evaporative weight losses were measured for the boneless striploins than for the bone-in shell loins. There was slightly less evaporative loss for the bagged product but, after trimming, the difference between the losses for bagged and unbagged loins was only small. Cooking losses were 2–3% higher for the loins aged in the bags than for those dry-aged traditionally.

There were no differences in tenderness or flavour characteristics between bagged and unbagged loins; however, aged beef flavour was higher for the boneless than for the bone-in loins. This was considered to be due to greater moisture loss and hence 'concentration' of flavours. Ageing for 28 days did not significantly increase tenderness or dry-aged flavour compared with 21 days, but evaporative and trim losses were increased.

Effect of cow type on ground beef colour stability

Selective breeding of cattle has resulted in two distinct biological types of cattle (beef-type and dairy-type) that are generally managed differently. Meat colour differences are observed between different cattle breeds and between cattle of different ages. Cow beef has a higher pH and, therefore, a darker lean colour than young beef. It is generally considered lower quality than young beef and is typically used to produce ground beef.

As beef-type and dairy-type cattle differ in many of the factors that affect meat colour, American researchers investigated the influence of beef-type versus dairy-type on the colour stability of ground beef packed in high-oxygen modified atmosphere packaging (MAP).

Topsides (insides) were obtained from beef-type cows and dairy-type cows from a commercial abattoir after chilling, and then coarse ground. Trim was also obtained from young cattle (<30 months of age) and from beef cows, and this was also coarse ground. This was used to formulate ground beef to samples of 80% and 90% lean.

Three lean combinations were prepared: (1) 100% beef cow, (2) 50% beef cow + 50% dairy cow, and (3) 100% dairy cow.

Each combination was formulated to both 90% and 80% lean using young beef trim and cow beef trim to give a total of 12 combinations. These were fine ground and formed into patties which were packaged in 80% O₂, 20% CO₂ MAP, stored for 5 days in the dark and 4 days under retail display conditions at 2°C.

The beef cow + young beef patties had the brightest initial colour, but discoloured rapidly. The dairy cow + beef cow patties were the darkest initially, but discoloured the least during display. Lipid oxidation in beef cow patties (as assessed by TBARS) was twice that for dairy cow patties at the end of the display period. Therefore dairy cow beef, although initially darker, has a longer display life and may be advantageous when packing in high-O₂ MAP.

Radio frequency heating of comminuted meats

Radio frequency (RF) heating cooks a product volumetrically by having the product form a dielectric between two plate electrodes. The electrodes are alternately charged from positive to negative several million times per second (e.g. 27 MHz) resulting in the polar molecules in the product being constantly realigned causing internal friction and heating. Quicker and more even cooking times are claimed for RF heating.

A challenge study was conducted by Irish researchers using a luncheon meat batter inoculated with *Bacillus cereus* and *Clostridium perfringens* vegetative cells and spores. The inoculation cultures were prepared from three strains of *B. cereus* and three strains of *C. perfringens* and blended with the luncheon meat before packing into a casing for cooking. The samples were cooked in a 500 W RF oven under circulating 80°C water for 33 minutes and, after cooking, placed in ice water to reduce the temperature to 4°C.

The luncheon meat did not cook to such an even temperature as achieved in previous studies with similar product. This was considered to be due to the dielectric properties of the batter being altered by the addition of the inoculum. The centre reached only 67.6°C compared with 80.4°C previously. The predicted heating protocol was not sufficient to render the product sterile with respect to the inoculated level of each

organism. *B. cereus* vegetative cells and spores were reduced by 5.4 and 1.8 log₁₀cfu/g, respectively and *C. perfringens* cells and spores by 6.8 and 4.1 log₁₀cfu/g, resp. In future RF microbial challenge studies, the product formulation should be adjusted so that the addition of the inoculum produces a product with the same composition as the normal production product.

Biopolymers for meat packaging

Waste from food packaging could be reduced by utilising biopolymers which are obtained from renewable resources and are compostable and biodegradable. Meat for retail could be packed in biopolymers which have a relatively high permeability to oxygen and water. Italian researchers have compared the retail display life of beef packed in biopolymer trays compared with packing in conventional PVC overwrapped trays. They also correlated microbial growth with development of several biogenic amines as indicators of spoilage.

Steaks from the *Longissimus lumborum* muscles from young bulls were packed into expanded PLA (polylactic acid) trays and either overwrapped with a PVC film or heat sealed with three different polymeric films: PLA; Mater-Bi-1, a monolayer film; and Mater-Bi-2, a co-extruded tri-layer film. The samples were then stored for 8 days at 4°C and assessed for microbiological quality and the production of various biogenic amines.

There were no differences between the different packaging systems evaluated based on the microbiological and chemical parameters tested. Bacterial numbers and the levels of some biogenic amines increased with storage time. The level of cadaverine was principally associated with *Enterobacteriaceae* counts while the tyramine level was correlated with numbers of *Pseudomonas* spp. and *Brochothrix thermosphacta* bacteria.

The authors concluded that the polystyrene tray/PVC film could be replaced by a PLA polymeric tray and polymeric film resulting in a reduced environmental impact and that the biogenic amines cadaverine and tyramine could be used as spoilage indicators for fresh chilled beef packed in aerobic atmospheres.

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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