
Quality, safety, cooling time – meat producers find the balance

Improved technique for rapidly cooling cooked meat will not compromise on quality. For food producers and consumers alike, time is of the essence. Production processes are constantly refined to bring consumers better products faster.

Consumers too have been increasingly demanding quality products that are ready-to-eat and convenient for their busy lifestyles. Pre-cooked meat is a very popular foodstuff in the average European diet.

However, for meat producers, cooling the meat once it is cooked poses a real challenge: conventional methods for cooling meat are very time consuming and do not enable producers to meet with 'cook-cool' guidelines to minimise the growth of any pathogens that may have survived the cooking process.

In light of this, the meat industry continuously seeks rapid cooling methods. To this end, four meat producers and equipment manufacturers from Europe have teamed up with three research providers in order to work together on a two-year project funded by the European Commission's Seventh Framework Programme to develop a meat cooling system based on a novel technique known as immersion vacuum cooling (IVC).

Building upon existing research into IVC conducted by the University College Dublin, the project aims to produce a system that can cool meat safely and rapidly without compromising the meat's flavour and texture. Originally used in agriculture to pro-



long the shelf life of leafy vegetables after harvest, vacuum cooling is now being used in many other sectors of the food industry including bakery, fishery, sauces and particulate food processing.

Recent trends in the food industry highlight a growing interest in integrating vacuum cooling into the processing procedures of a number of prepared consumer foods, such as cooked meats and ready meals.

The major characteristic of vacuum cooling is its exceptionally fast cooling rate, which is typically 400% faster than conventional cooling methods.

Due to this exceptionally fast cooling rate, vacuum cooling can provide many benefits to the food processing industry, such as

shortening product hold up time, increasing production throughput, reducing energy consumption and minimising microbial growth for cooked meats.

However, despite these advantages, there are a number of limitations to vacuum cooling that have prevented its widespread use in the meat industry, such as loss of meat mass, tenderness and juiciness, as well as the darker appearance of vacuum cooled meats compared to meats obtained using conventional cooling methods.

A group of SMEs and research providers have come together in an effort to overcome these obstacles. The SMEs include cooked meat processors McCarren & Co

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Ltd (Ireland) and Stephens Fresh Foods Ltd (UK), food processing and packaging equipment supplier The Food Machinery Co Ltd (UK) and process engineering company Dunreidy Engineering (Ireland). They will collaborate with research providers Innovació i Recerca Industrial i Sostenible (IRIS) from Spain, University College Dublin from Ireland and the Danish Meat Research Institute on a project known as Coolmeat.

Led by IRIS, the project will research and develop an IVC rapid cooling technique, which cools the product in its own cooking brine. Research conducted by University College Dublin to date has found that IVC can reduce the loss of tenderness and juiciness in meat normally associated with vacuum cooled samples.

While cooling rates are lower than vacuum cooling without water, the final product is of comparable sensory quality to those cooled conventionally. A prototype system will be built during the project and will be extensively tested in meat production facilities. If successful, the Coolmeat project will provide the thousands of cold meat producers in Europe with a technologically advanced, robust and affordable means of rapidly cooling cooked meats.

Raising quality standards

Combining rapid processing times with lower mass losses will enable producers to obtain an overall high quality product in terms of its safety, sensory and physical characteristics. All these advantages will heighten their productivity and profitability, while at the same time raise quality standards. European consumers will benefit from safer cold meats.

The project was officially launched in Barcelona in October 2010.

“Coolmeat represents a very exciting project for the European cooked meats sector,” Oonagh Mc Nerney, Director of IRIS, told International Meat Topics. “The great thing about this research project is that it will build on a wealth of knowledge already gathered by University College Dublin in the field of IVC. We aim to channel and tailor this knowledge into an industry where it is much needed. I really think that a project such as Coolmeat, which is funded under a highly useful programme called ‘Research for the Benefit of SMEs’, enables industry to benefit from the years of research that is being carried out in academic spheres. To be able to tap into such a programme is a godsend for industry.”

IRIS is a research centre specialising in the design, engineering and development of custom system designs for industry, especially in the fields of electrical, electronics and computer engineering and mainly serving the agro-food, water and environmental sectors.

For more information please visit www.iris.cat or email info@iris.cat

Odour scavenging packaging

Reinforcing its long standing reputation as a leader in fresh food packaging, Sealed Air has introduced Cryovac Freshness Plus Odour Scavenging technology which is ideal for processed meats, particularly poultry based items.

This new active packaging material eliminates off odours or confinement odours that may be mistaken for spoilage.

This unique material contains additives that scavenge various sulphur and aldehyde volatiles from the food package to maintain freshness and aroma.

“A key part of the consumer’s experience with a food product is the first impression when opening the package,” Scott Beckwith of Sealed Air’s Cryovac Food Packaging told International Meat Topics.

“This can be a defining moment for the decision to purchase or not the product again. Freshness Plus Odour Scavenging material ensures a fresh aroma again and again to enhance the quality and flavour of packaged meats.”

Safer and more economical than sachets, Cryovac Freshness Plus Odour Scavenging technology can be integrated into bags, forming films and lidding materials. This technology incorporates the scavenging mechanisms into the packaging material making it invisible to the consumer.

The improved quality life of products packaged in Freshness Plus active packaging helps reduce shrink and provides a longer selling window for retailers.

For processors the extended shelf-life from Freshness Plus Odour Scavenging allows for new or wider distribution channels.

This material requires no activation step and so it can run on existing equipment such as roll-stock, thermoformers and vacuum chamber equipment.

The Cryovac Freshness Plus line of active packaging technologies enables a focus on product quality and life through active packaging, not by product formulation.

This includes inhibiting mould growth, colour degradation, nutrient loss and flavour and odour changes. ■



Reducing E. coli O157

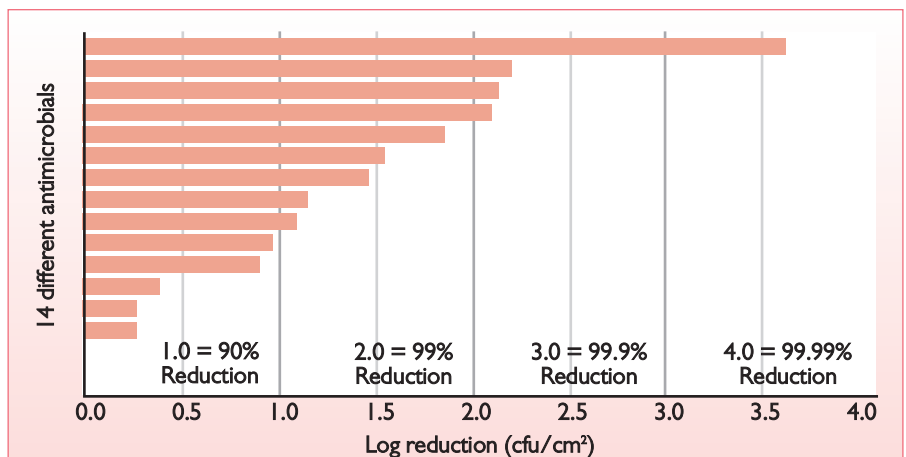
In recent times the USA has seen several product recalls associated with mechanically tenderised meat products that have been associated with cases of human illness.

In fact, since 2000 a dozen or so product recalls of non-intact meat products have

occurred. The costs of such a recall can be devastating to a business with the costs of the actual recall, loss of brand status, loss of business/customers and legal actions associated with illness or even deaths.

The FSIS of USDA has stated that blade

Fig. 1. Reduction of E. coli O157:H7 on lean beef wafers sprayed with various antimicrobials in a Ross Tenderiser with Integral Intervention.



tenderising could increase the risk of transfer of zoonotic pathogens such as *E. coli* O157:H7 from the meat's surface to the interior of a product. A similar risk also occurs with needle injected, marinated, tumbled and cubed products.

Nowadays this risk can be significantly managed by intervention and the processing division of Ross Industries Inc have developed an intervention based on the application of a product surface antimicrobial treatment that reduces the risks associated with bacterial contamination on the surface of a product. This technology sprays an antimicrobial on to the entire outer surface of a meat product to minimise its surface bacterial load including zoonotic food-borne pathogens, such as *E. coli* O157:H7 contained therein. The antimicrobial product is typically a food grade organic or inorganic acid and this treatment is completed prior to any further processing of the meat.

Ross Industries have now developed a new tenderiser with Integral Intervention which is an inline blade tenderiser with an integrated antimicrobial spray system.

The effectiveness of the system has been assessed by Oklahoma State University and funded by various antimicrobial manufacturers. A test protocol using real equipment under real commercial conditions was used.

Some 14 commercially available antimicrobials were evaluated using similar dosage rates, same spray dwell times and application temperature (40°F). The results show pathogen cell count reductions of more than 99% – a level which significantly reduces the risk of translocated pathogen contamination and, so, effectively controls the hazard. Unfortunately the antimicrobial with a 3.61 log reduction is not available in a form suitable for use in the system. ■

Reducing meat drip loss

According to a zootechnical study undertaken by Italian researchers in beef cattle organic selenium supplementation with Lallemand's Alkosel R397 can improve meat processing and organoleptic qualities, when compared to inorganic selenium.

The trial showed that organic selenium, not only enhanced the animal's anti-oxidant status, but also the meat's visual aspect and tenderness, and reduced drip loss for the processor.

This is an excellent illustration of the 'farm-to-fork' benefits of a natural feed additive, and additional proof of the superior bioavailability of organic selenium over a mineral source.

This trial was performed in a commercial fattening unit on Charolais beef during the finishing period (210 days supplementation), and meat quality was evaluated after 10 days of maturation.

First of all, this study confirmed that, when compared to the mineral source, Alkosel significantly improves the animal's selenium status (higher blood and tissue selenium concentrations: +81% in muscle (see Fig. 1), confirming the superior bioavailability of the organic form of selenium.

But, most interestingly, the organic selenium also improved several aspects of meat quality when compared to the non-organic form (selenite):

- Reduction of meat drip loss during maturation by 25% after 10 days ageing, offering better yield for the slaughterhouse.
- Improved meat visual aspect, an important decision criteria for customers and part of meat organoleptic qualities (meat colour

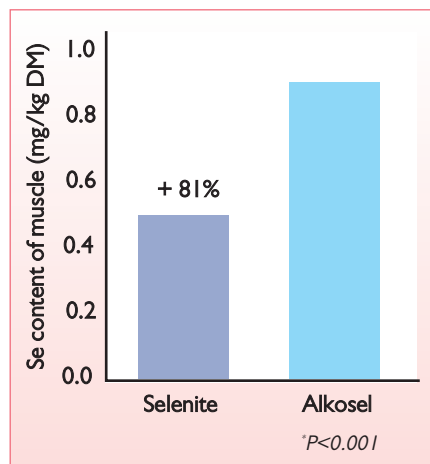
improved by +3.8% as compared to selenite).

● Improved meat tenderness, as measured by muscle shear force (17% reduction of muscle shear force, reflecting increased tenderness). Described as the first quality criteria sought by consumers, meat tenderness is another key organoleptic quality.

Moreover, the effect of organic selenium supplementation had already been shown to improve organoleptic quality in ham.

Recent scientific studies have also shown similar benefits on lamb meat: Alkosel R397 provides higher selenium level in muscle (in particular *L. dorsi*) as compared to inorganic selenium. ■

Fig. 1. The effect of the selenium supplement form on muscle selenium content (*L. thoracis*) (Charolais beef, Italy).



Chill chain research project

Chill-On is a multi-national research project, partly funded by the European Commission, aimed at satisfying consumers' expectations of safe and high quality food.

Temperature sensitive foods such as meat and fish need to be handled with care. The chilled food supply chain has to be maintained to ensure that at all stages, high temperature does not facilitate the growth of bacteria and their toxin production that will pose a severe safety risk.

Furthermore, temperature abuse leads to a decrease in product quality and subsequent economic losses.

Monitoring of the chilled food chain through continuous temperature recording is therefore essential to ensure product quality and safety, calling out for the use of novel smart labels such as radio frequency identification (RFID) based labels or time temperature indicators (TTIs).

RFID chips allow wireless transfer of prod-

uct ID. If they are coupled to temperature or other sensors, they are also able to transmit these data.

Readers can be located within transport vehicles or warehouses, allowing real-time temperature monitoring. A second option is to have read outs at hand-over points, so that responsibilities for temperature abuse in the respective part of the chain can be determined.

So called time-temperature indicators or integrators (TTIs) can reflect the time-temperature history of a food product. The principle of the labels is based on enzymatic, chemical or microbiological reactions which cause colour changes of the labels depending on time and temperature conditions.

With the Chill-On project, researchers want to go one step further and combine TTI technology with passive RFID chips for wireless transfer of the signal. These labels will deliver an optical signal as well as an

electronic signal, both indicating the temperature history of the product.

With the help of RFID readers along the supply chain, the TTI signal can be fed into a software program to calculate remaining product shelf life. The main innovation of the label will be the possibility for temperature recording without the use of a battery.

The integration of TTIs or RFID-TTIs in the cold chain allows every participant of the chain to control the right handling of a product in a simple and inexpensive manner. By using TTIs, processing companies, wholesalers and retailers have an additional information tool which allows a quick response to extreme situations along the chill chain.

In total, 25 partners from 12 different countries are working within the Chill-On research project towards the common aim of delivering technologies and approaches which will improve food quality, safety, and traceability.

The various technologies to be developed within the project are dedicated to food supply chain participants, from producer up to the retailer. ■