

THE APPLICATION OF THE COLD CHAIN ENGINEERING IN MEAT INDUSTRY IN CHINA

Ai Jia Tian and Wang Qing

Tianjin Food Research Institute, Tianjin, 300381, The People's Republic of China

Key words: cold chain, fresh meat, chilled meat

Background:

In recent years, food and food products processed by lower temperature were developed rapidly with the increasing of the standard of people's material and living and the development of economy in China, especially in meat and meat products. A lot of food and food products will be replaced by food products of low temperature to meet the requirement of the consumers.

This is a great change in the concept of consumption for Chinese consumers, because supermarkets have been appearing one after another throughout every city of the whole country. And household appliances are very popular in every family in China, for example, refrigerator, microwave oven and roasting oven, etc.

Food and food products of lower temperature means food and food products processed by lower temperature and circulated in the condition of lower temperature. However, the cold-chain engineering is the guarantee facility of product quality and safety for food and food products of lower temperature using the temperature control continuously from the point of production to the consumers.

This paper focuses on the advantages of the application of the cold-chain engineering in meat industry in China through making a comparison of meat quality between with the cold-chain and without the cold-chain.

Materials and Methods:

The experimental samples of pork were obtained from a commercial slaughter plant and supermarkets in Beijing and Tianjin respectively. They were taken from carcasses 24 hours post chilling. The skin of pork samples was removed in the boning room. Then they were cut into appropriately sized pieces as required. A part of samples from plant were packaged in plastic bags consisted of polyvinylidene chloride. Another part of samples from the refrigerated display cabinet at 0-4 degree centigrade were packaged in plastic dishes. These samples we collected were packaged in vacuum box with ice inside to being taken to our laboratory. Then these samples were put into chilling room at 4 degree centigrade for preparing of microbiological examination and sensory evaluation. And we selected random 12 panel from different work position in our Institute including scientists, technicians and administrators, to taste samples for sensory evaluation.

Results and Discussions:

As the result of microbiological testing we carried out, the chilling of carcasses is the most important procedure in the cold-chain processing of the extension of shelf life of meat. We made a comparison of both samples between with the cold-chain and without the cold-chain. Figure 1 showed a significant different on the growth of total viable count of bacteria. The total count of organisms of the samples without the cold-chain reached $10^5/\text{cm}^2$ after 3 days. However, another samples with the cold-chain were only $10^3/\text{cm}^2$ after 3 days.

On the other hand, the results demonstrating multitaste panel testing are shown in Figure 2. It illustrated obviously that aroma of pork samples without the cold-chain occurred unusual after 3 days, even being stored at the condition of 4 degree centigrade. But we found that the samples processed by the cold-chain still maintained normal aroma after 5 days. It is clear that the control of microbial growth on carcasses during the first 18-24 hours of chilling is relatively easy. But it is very difficulty to control microbial growth and products quality stored at 4 degree centigrade after 24 hours without the cold-chain technology.

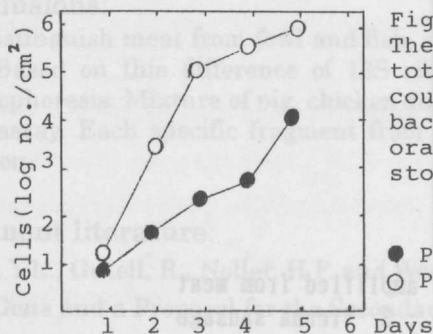


Figure 1. The growth of total viable count of the bacterial flora on pork stored at 4°C

● Pork by the cold chain
○ Pork without the cold chain

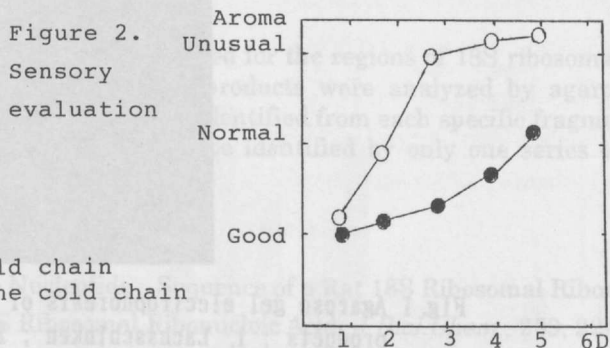


Figure 2. Sensory evaluation

For fresh meat processed without the cold-chain, it is stored at 4 degree centigrade after chilling, most pathogens will not grow, but psychrophilic organisms will continue to grow slowly and ultimately cause spoilage of meat. For chilled meat processed by the cold-chain technology, even it also has the same problems as meat processed without the cold-chain, however it has a ideal shelf life, at least, it can maintain quality of chilled pork for 4-5 days. Certainly, for chilled meat, lifetime is dependent on carcass quality, handling, packaging method and temperature. Chilled pork has a relatively short life.

Conclusion:
The cold-chain engineering is the most important and critical processing technology in meat industry, especially in the circulation field between processing and commerce from the point of the production to the consumers. Its effectiveness will influence the ultimate shelf life of the meat, carcass appearance, eating quality, even weight loss, etc. Through our experiments and study, by far the most important factors in the application of the cold-chain technology are the control of the temperature and the point of connection from the processing plant to the consumers.

In this paper, we discussed only the contents of microbiological testing and sensory evaluation between fresh pork and chilled pork in the cold-chain engineering in China. The cold-chain technology should be widely adopted in the meat industry and other field of food industry in China in the future.

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