Chapter 7
Non-Thermal Food Preservation Methods in the Meat Industry

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ABSTRACT

The most commonly used meat preservation methods include cooling, freezing, drying, vacuum packing, and curing. Meat quality is impaired by a wide range of changes including physical, chemical, microbiological, and enzymatic reactions. Food manufacturers focus on processes that require fewer chemical additives to meet the increased demand of consumers and to obtain more natural, healthy, and nutritious meat products. Non-thermal food preservation methods are one of the new trends to minimise thermal effects on texture, nutritional value, and flavor losses of meats. The chapter focuses on two novel approaches; non-thermal (Pulsed Electric Field) and Atmospheric Pressure Cold Plasma (APCP) Technologies.

INTRODUCTION

Containers or cases made of special materials such as metal, glass, plastic, which protect the products against external factors and facilitate the marketing and consumption of foods are referred to as food packages. The main purpose of food packaging is to ensure food safety by preserving the overall quality during the production, shelf life and consumption of products (Cutter, 2006).

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The UK Packaging Institute defines packaging in three different ways (Gawith & Robertson, 2000):

1. Preparation of products for transportation, distribution, storage, retailing and final use in a coordinated manner,
2. Safe and cost-efficient delivery way of products to the final consumers,
3. Technological and economic function of the goal of minimizing delivery costs while maximizing sales and profits.

Food packaging is being developed day by day, upon the demands of the consumers and the novel trends applied in food industry. Four important functions should be considered when developing a food package: storage, protection, convenience and communication. In other words, package should be able to protect the product against external factors such as water, gas, odor, microorganisms, dust and pressure. They also have to contain information about the product and should be constantly improved to adapt to varying living conditions (Gawith & Robertson, 2000). Since milk and dairy products are particularly prone to physical, chemical and biological changes in a short time, the packaging technologies have been being developed in order to extend the shelf life of them.

The novel methods used in packaging technology can be listed as follows (Patel, Prajapati, & Balakrishnan, 2015):

1. Nanotechnology
2. Modified Atmosphere Packaging
3. Active Packaging
4. Intelligent/Smart Packaging

Nanotechnology

Nanotechnology is an applied science that provides the control of occurrences at atomic or molecular level below 100 nm (Anonymous, 2019). It is implemented in many food fields such as increasing food safety, reducing agricultural inputs and preventing the nutritional factors (Schnettler et al., 2013). In food science, food packaging is known as the most common field where the nanotechnology is applied (Sürengil & Kılınç, 2011) and dairy products are not exception.

Nanotechnology in food/dairy packaging can be used in three different ways (Duncan, 2011):

1. Producing synthetic polymer and biopolymer based packaging materials with improved barrier and mechanical properties.
2. Developing active packaging materials having properties antimicrobial or oxygen absorption such as Ag, ZnO, TiO_2.
3. Monitoring the storage conditions in which food products are exposed by use of different nanoparticles such as Fe_2O_3, TiO_2 in intellegent packaging technology and to produce markers that inform the manufacturer, seller and consumer.

Nanotechnological applications, in food/dairy technology, have various advantages and disadvantages as indicated in Figure 1.