Chapter 57
Application of the Dietary Processed Sulfur Supplementation for Enhancing Nutritional and Functional Properties of Meat Products

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ABSTRACT

In recent years, the consumer demands for healthier meat and meat products with reduced level of fat, cholesterol, decreased contents of sodium chloride and nitrite, improved composition of fatty acid profile and incorporated health enhancing ingredients are rapidly increasing worldwide and prevent the risk of diseases. This review focuses on strategies to investigate the changes in physical, physicochemical and microbial properties of meat and meat products in dietary processed sulfur fed animals. Overall, this review focuses on sulfur supplementation to pigs, growth performance of pigs and meat quality, enhancing the nutritional and functional values, shelf-life extension, improve sensory quality characteristics and health benefit etc. This review further discusses the current status, consumer acceptance, and market for functional foods from the global viewpoints. Future prospects for functional meat and meat products are also discussed.

INTRODUCTION

Meat and meat products are important sources for protein, fat, essential amino acids, minerals and vitamin and other nutrients (Biesalski, 2005). Pork meat is usually consumed than any other meat products in South Korea. In 2012, approximately, 50% of the total meat consumption was pork compared to 22% of beef meat and 28% of poultry meat. Meat consumption has increased from 17.8kg per person to 19.3 kg per person in 2010 (Ministry for Food, Agriculture, Forestry and Fisheries. 2011). Recently, there

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has been a major shift in Korean consumer's preference for leaner and more functional meat. Especially, consumers become more concerned about nutrition and functional health that changed the consumption patterns of meat and meat products. The carcass and meat quality attributes could be affected by the differences in dietary components, such as fatty acids composition, genetic type, age, and other supplements including green tea, Korean ginseng, garlic etc. Limited scientific reports are available for the effects of the processed sulfur concentration of the diet on meat quality. Especially, garlic is an important spice which is inevitable in Korean food. Garlic contains plentiful di-allyl sulfide of pungent taste and is generally found in plant compounds that give certain distinguishable odors to onions, a green onion, leek, garlic (Stanley *et al*., 1998). Garlic has been used by Koreans for major spices in ordinary diets. Sulfur has been used as a traditional healing material for infirm patients (Stanley *et al*., The Miracle of MSM., a Berkley book/published by The Berkley Publishing Group, New York 10014). Recently, consumers prefer to the animal functional foods with low fat and high meat quality products rather than high saturated fatty acids containing meat products. The palatability of pork is positively associated with oleic acids of marbling fats (Kim *et al*., 2015). Therefore, advanced technology needs to be considered for increasing the oleic acid, amino acids with umami, and water holding capacity with meat quality, and for decreasing the saturated fatty acids in pig performance and pork products.

Dry-cured ham was made of pork, solar salt, fresh air, and fermentation in Southern Europe 2000 years ago, and hind leg surface was rubbed with salt and other additives to remove moisture (Mikami *et al*., . 2007). Drying typically took 6–12 months or more (Mikami *et al*., 2007). Dry-cured ham reduces weight by about 18% during ripening periods (typically 20–35% for Spanish ham) and concentrates the unique taste and aroma (Mikami *et al*., 2007). The unique aroma and flavor is produced by enzymatic action and chemical reactions that occur during the long ripening period (Mikami *et al*., 2007).

Sulfur has four isotopes with atomic numbers of 16, 17, 18 and 20. Processed sulfur was made by heating and melting to material or light mineral, separated the upper liquid sulfur and cooled material. It usually contained selenium and tellurium (Lee *et al*., 2010). In Chinese medicine, sulfur has effects on homeostasis, nerve paralysis, and cold hands and feet and promotes a stronger muscle skeletal system (Stanley *et al*., 1998). Western medicine has used sulfur for local irritants, constipation, hemorrhoids and skin diseases. It was also used to treat for dysentery, cholera, and typhoid before the development of antibiotics as it inhibits the growth of pathogenic microorganisms (Stanley *et al*. 1998). However, sulfur is highly toxic, and it is necessary to process the sulfur to remove toxic property for use as a medicine. Sulfur can cause side effects if ingested by humans or animals (Lee *et al*., 2010). Methyl sulfonyl methane is found *Allium hookeri*, garlic, and green onion. (Lee *et al*., 2009). Sulfur is also a component of sulfuric amino acids, collagen, polysaccharides, glycoproteins, and glutathione.

This review was to investigate the changes in physical, physicochemical and microbial properties of carcass and meat products in dietary processed sulfur fed pigs.

EFFECTS OF THE PROCESSED SULFUR SUPPLEMENTATION ON THE GROWTH PERFORMANCE AND MEAT QUALITY IN PIGS

When weaning pigs and growing-finishing pigs take sulfur supplementation, two different level of 0.1% (T1), 0.3% (T2) processed sulfur was added to commercial feed (control) to study the effects on the productivity and meat quality of pigs (Ha Young Noh. 2014). The weight, daily gain, daily feed intake and feed efficiency of weaning pigs by taking processed sulfur supplementation showed no significant