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Quality and safety of locally produced chicken luncheon

Thesis presented by

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Hygiene and Control of Meat and its Products

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Contents

Dedication

To my husband and my son gamal

To my father and my mother

List of tables

List of Figures

List of photos

List of abbreviations

APC	**Aerobic plate count**
CFU	**Colony Forming Unit**
EMB	**Eosine Methylene Blue agar**
MPN	**Most Probable Number**
RCM	**Reinforced Clostridial Medium**
XLD	**Xylose Lysine Desoxycholate Agar**
pH	**Hydrogen ion concentration**
TBA	**Thiobarbituric acid**
TVBN	**Total Volatile Base Nitrogen**
ESS	**Egyptian Standard Specifications**
MDPM	**Mechanically Deboned Poultry Meat**
FAO	**Food And Agricultural Organization**
APHA	**American Public Health Association**
FSIS	**Food Safety And Inspection Service**
RTE	**Ready To Eat**

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Abstract

(**Key words:** Chicken luncheon sausage, pH, TBA, *E. coli*, Salmonella, Bone, Cartilage, skin and Egyptian standard specifications)

Ninety samples of traditional Egyptian chicken luncheon sausage produced by six different meat processing plants (Fifteen samples each) were collected from different production lots within one month after processing from the supermarkets in Giza and Cairo. These samples were subjected to sensory investigation, determination of deterioration criteria, bacteriological examination as well as detection of non-meat tissues by histological examination to assure their quality and safety. The obtained results revealed that all samples had deteriorated sensory attributes, high TBA and pH value. While, result of bacteriological examination showed that all chicken luncheon sausages samples were highly contaminated with aerobic and anaerobic bacteria counts. This indicates that production, handling and processing of the examined samples were performed under neglected sanitary measures, post processing contamination and bad storage of this product. However, the examined chicken luncheon sausages were free from *E. coli* and Salmonella. The results of histological examination showed that low muscular tissues and high fat content were evident in all samples. Moreover, bone particles, cartilage particles, skin tissue with feather and other non meat tissue such as digestive tract were also observed. Therefore, most of the investigated chicken luncheon sausages were not copy with the Egyptian standard specifications for chicken luncheon sausage.

INTRODUCTION

Poultry meat and its products have experienced increasing popularity and become widely spread all over the world ***(Sallam et al., 2004*** and ***Karpinska, 2014)***. The increasing consumption of this meat can be attributed to low production costs, rapid growth rates, high nutritional values, and the increased production of further processed products ***(Barbut, 2002)***. Moreover, poultry meat has received much of its good reputation on the basis of its high protein, low fat contents and relatively high concentrations of polyunsaturated fatty acids which are considered to be positive and healthy for consumers ***(Bonoli et al., 2007*** and ***Hwang et al., 2011)***.

For several reasons, people prefer poultry meat products as compared to beef or pork. The manufacture of such products usually costs less than that of similar beef and pork products ***(Guerrero-Legarreta*** and ***Hui, 2010)***. An added benefit is that poultry meat is not restricted by most cultural and religious laws, and it is consumed by both Jews and Muslims ***(Deumier*** and ***Collignan, 2003)***. Further processing of poultry meat involves conversion of raw poultry carcasses into value added products ***(AL-Dughaym and Altabari, 2010)***. Moreover, advantages of further processing of poultry meat are improving juiciness, flavor, shelf life and water holding capacity ***(Sahoo et al., 1996)***.

The production and consumption of chicken sausages has been increasing globally in particular chicken emulsion sausage ***(Bonoli et al., 2007*** and ***Hwang et al., 2011)***. These sausages are becoming more popular due to their sensory characteristics and ease of preparation, which reflects the development of more functionality enhanced chicken emulsion sausages with added dietary fiber ***(Park et al., 2012)***. Emulsion based product is one such technology which can convert meat of low organoleptic value into a highly acceptable product without tenderization ***(Ilayabharathi et al., 2012)***.

The rapid growth in consumer demand for poultry and poultry products over the last decade and increased international trade in these products have focused attention on objective measures of food safety and quality ***(Bhaisare et al., 2014)***. Moreover, the first consumer right is to have a product of good quality and not constituting any health hazard. Quality products are those that meet some need or expectation of consumers and are safe and wholesome as well. The acceptance of further processed chicken meat products depends upon overall-acceptability, color, odor, taste and consistency. Therefore, consumers had given much greater choice over the foods which are more selective, of high quality and cheap. Finally, the product quality became more significant factor in meat products marketing ***(Potter, 2001*** and ***Agamy and Hegazy, 2011)***.

Contamination of poultry meat with food borne pathogens remains an important public health issue, because it can lead to illness if there are malpractice in handling, cooking or post cooking storage of the poultry meat and product. Chickens naturally carry a wide variety of bacteria, which can be transferred to the surface of carcasses during processing ***(Bremner and Johnston, 1996)***. The bacteria adhering to the skin are the main sources of contamination of the underlying tissues during portioning, skinning and deboning. Some of these bacteria may be food borne pathogens capable of causing illness or even death in humans; and others are non-pathogenic, they may adversely affect the shelf-life of raw poultry and further processed poultry products ***(Waldroup, 1996)***.

Because of an increasing awareness of health and obesity associated with excess dietary fat, the demand for poultry meat has increased rapidly. Therefore, there are surpluses of by-products such as skin **(*Sheu and Chen, 2002)*.** Chicken skin is used in chicken sausages, chicken burger, chicken nuggets, and patties. Its main value is in boosting the typical chicken flavor, juiciness, and for cost reduction. On the other hand, it has the tendency to impart a slightly off-white color to these products and contributes to high microbial risks, especially when the product is not fully cooked and promotes oxidative rancidity ***(Ukabam, 1998)***.

Mechanically deboned poultry meat (MDPM) is a paste- or batter-like product frequently takes the form of meat and fat homogenate characterized by high contents of fat, connective tissue, haem pigments, as well as bone residue and calcium ***(Yang and Froning, 1992*** and ***Serdaroğlu et al., 2005).*** It is commonly used as a major ingredient in producing of emulsified and comminuted meat products such as chicken sausages, frankfurters and burger either as a binding agent or as an inexpensive source of meat to reduce the cost of the products. Moreover, it offers the food industry with a raw material with excellent nutritional (high protein content), good technological and functional properties ***(Daros et al., 2005*** and ***Püssa et al., 2009)***. However, it has some disadvantages, such as rapid onset of oxidative rancidity resulting in off-flavours and off-odours, colour and texture problems ***(Freitas et al., 2004)*** and the high microbial load, which makes it a highly perishable raw material ***(Gill, 1988)***.

The increasing demand for meat products as well as the relative shortage in raw meat has led to its adulteration with various tissues and non-meat ingredients ***(Emara and Nouman, 2002)***. Based on ***E.S. (1696/2005)*** view point, the use of undesirable organs of slaughter animals, including the visceral organs, hyaline cartilage and bone instead of meat in heated meat products is considered as fraud. Due to the economic value of meat, the likelihood of using this unauthorized tissue is possible and formulation used in the preparation of meat products does not respect the standard and hygiene food regulation. Moreover, addition of inedible offals such as udders, lung, spleen, etc into most products which is sometimes used by producers only can be detected histologically ***(Rezaian and Rokni, 2003*** and ***Latorre et al., 2015)***.

Most of research in Egypt Concerning the poultry luncheon concentrated on the bacterial quality, however the work on sensory, technical quality is rare, therefore, the present study was designed to:

1. Examine the marketed chicken meat luncheon for its quality and safety for human consumption through assessment for bacteriological quality with special reference to some food poisoning microorganisms.

2. Analyze the sensory parameters and deterioration criteria to assure quality in the aspects of consumer acceptability and degree of freshness.
3. Detect the presence of bone and cartilage of MDPM and the non meat tissues through histological examination.
4. Compare the obtain results with the Egyptian standard specification of poultry meat luncheon.

LITERATURE

I- Poultry meat and meat products

Bean and Griffin (1990) reported that poultry and poultry products ranks first or second in foods associated with disease in most of the countries all over the world, while in the USA, it ranked third of the reported food-borne disease outbreaks.

Knight (1992) reported that mechanically deboned poultry meat (MDPM) has a dark color, undesired textural properties and is susceptible to lipid oxidation. Therefore, its amount which can be incorporated into most processed poultry meat products is limited.

Meullenet et al. (1994) found that although MDPM has good nutritional and functional properties and is suitable for use in many meat products, manufacturers still have to address its negative effects on the texture (soft or mushy texture) of the final cooked product.

Bonifer and Froning (1996) stated that growing consumption of chicken in increasingly varied and ready-to-serve forms has led to an oversupply of by-products such as skin. Chicken skin is incorporated into meat emulsions or used as a source of fat. However, the large amount (3%) of collagen contained in chicken skin offers much greater potential for value-added products.

Sahoo et al. (1996) stated that the advantages of further processing of poultry meat are improving juiciness, flavor, shelf life and water holding capacity. On the other hand, such products offer ideal medium for microbial growth as they highly nutritious, have a favorable pH and are normally lightly salted or not salted at all.

Osburn and Mandigo (1998) stated that chicken skin connective tissue could be used as a potential water binder and a texture-modifying agent in meat products.

Shedeed (1999) stated that chicken and chicken meat products are good sources of animal protein of high biological value, which contains all the essential amino acids required for human nutrition, besides that they contain higher proportion of unsaturated fatty acids and less cholesterol especially when skin is removed.

MAPA (2000) stated that MDPM can be added to emulsified sausage, comminuted meat products (bologna and frankfurters) at rate of up to 60%.

Barbut (2001) stated that chicken meat and its products have experienced increasing popularity and become widely spread all over the world. Chicken sausage is one of the popular foodstuffs among these products.

Farhat et al. (2002) claimed that avian skin constitutes serious public health hazards not only due to its high contamination with various pathogens but also due to its association with chemical residues e.g. hormones, mycotoxins and pesticides.

Sheu and Chen (2002) reported that the demand for poultry meat has increased rapidly in recent years, and the increasing demand for further processed poultry products has become the market trend.

Bakalivanova and Grigorova (2005) followed lipid per-oxidation during production and 30 days storage of chicken breast, and found that lipid per-oxidation processes took place during technological treatment. The authors added that the secondary oxidation products, defined as free malonic dialdehyde does not exceed 1g/g product, which is much below the standard for foods.

CABI (2007) found that as globalization of trade and industrialization of food processing increases, the apparent consumer interest in the quality of processed poultry products with greater emphasize on microbial, nutritional and sensory characteristics of poultry products is more justified.