



# Microbiological Test of Chicken Liver Product in Baghdad Supermarkets

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**Abstract** | Easily metabolization of foods makes it suitable for accretion of microorganism. Many organisms could be growing in the liver due to its moisturizing media, nitrogenous compound enrichment and presence of growth factors. This study was conducted to investigate microbial contents of liver from Baghdad markets. Specific culture media were used to identify and isolate the bacterial organisms (nutrient agar, mannitol salt agar, salmonella shigella agar). One hundred samples from ten different chicken products companies were collected (ten for each company). *Staphylococcus* spp., *Escherichia coli* and *Salmonella* spp. represent the common pathogenic types which isolated in this study. 30% of those companies had mixed infection of all types of bacteria, 10% had an infection with two types, and there maining percentage (60%) showed single infection with *Staphylococcus* spp. This study also revealed that the liver was a polluted organ with pathogenic bacteria and the mean of infection was near the maximum standard limit. Therefore it is an important to improve the diagnostic and inspection techniques to identify the contaminated liver which sold in marketplaces.

**Keywords** | Microbiological test, Chicken, Liver products, Supermarkets.

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## INTRODUCTION

Food is chemically complex matrixes contain sufficient nutrients that support microbial growth. Water availability, pH, and temperature in foods may encourage, prevent, or limit the growth of microorganisms (Easa, 2010). The liver is a vital organ which had a high percentage of unsaturated fatty acids, proteins, vitamins and minerals could be used for human consumption as food; this organ is eaten partially or wholly cooked (Adams and Moss, 1999; Wiesenfeld et al., 2005). Dishes like liver pate and liver parfait have been determined as a transmission tollin outbreaks of food-borne disease (Firlieyanti et al., 2016). Because it is highly spoilage dietary material contains many non-pathogenic or pathogenic pollution if it stored in bad circumstance (Molla and Mesfin, 2003; Molla et al., 2003). There is combination between the incidence of food-borne outbreaks and consumption of the poultry meat (Lunden et al., 2003; Prakash et al., 2005). Food-borne diseases are

primary public health problem conduct to increase morbidity and mortality worldwide (Thanigaivel and Anandhan, 2015). Liver could be contaminated during the slaughter of animals with many microorganisms like *Escherichia coli* (Thanigaivel and Anandhan, 2015). High significant morbidity and mortality in the poultry industry were responsible from pathogenic avian *Escherichia coli* (Ewers et al., 2003; Antao et al., 2008). *Salmonella* spp. considered as a serious food-borne pathogens, during last few years food-borne salmonellosis outbreaks being increased markedly in several Europe countries including Spain, Italy, England and in America (Thanigaivel and Anandhan, 2015). The wide occurring outbreaks of *Staphylococcal* and *Bacillus cereus* food poisoning may be due to inclusive handled and insalubrious cooked meat products (Zakki et al., 2017). In most of the countries, poultry and poultry products are better foods to be correlated with the diseases (Zakki et al., 2017). The cooking may decrease or avert the earnest risk, from another hand microorganism origin may enter inside

**Table 1:** The collected trademark samples from supermarkets

No	Sample	Origin	Date of production	Date of expiry	Weight	Notes
1	Mayda	Emirates	2016/12/29	2017/3/28	450 gram	Frozen chicken livers
2	Hanana	Iran	2016/11/24	2017/5/24	450 gram	Frozen chicken livers
3	Bakpi	Turkey	2016/11/15	2017/2/14	450 gram	Frozen chicken livers
4	Al-Bayader	Jordan	2016/12/4	2017/3/6	450 gram	Frozen chicken livers
5	Randa	Emirates	2016/12/16	2017/3/17	450 gram	Frozen chicken livers
6	Sadia	Brazil	2016/12/7	2017/3/6	450 gram	Frozen chicken livers
7	Al-Kawther	Iraq	2016/1/7	2017/4/6	450 gram	Frozen chicken livers
8	Koko	Jordan	2016/12/2	2017/3/1	450 gram	Frozen chicken livers
9	Al-Halal	India	2016/11/30	2017/2/29	450 gram	Frozen chicken livers
10	Al-Faris	Iran	2016/1/15	2017/4/14	450 gram	Frozen chicken livers

**Table 2:** Detection of *Staphylococcus* spp., *Escherichia coli* and *Salmonella* spp. from Chickens liver.

No	Samples	<i>Staphylococcus</i> spp. CFU/g	<i>Escherichia coli</i> CFU/g	<i>Salmonella</i> spp.
1	Mayda	11×10 <sup>2</sup>	NIL	NIL
2	Hanana	14×10 <sup>3</sup>	NIL	NIL
3	Bakpi	21×10 <sup>4</sup>	13×10 <sup>2</sup>	NIL
4	Al-Bayader	33×10 <sup>3</sup>	1×10 <sup>1</sup>	Positive
5	Randa	2×10 <sup>2</sup>	NIL	NIL
6	Sadia	18×10 <sup>1</sup>	NIL	NIL
7	Al-Kawther	6×10 <sup>1</sup>	NIL	NIL
8	Koko	11×10 <sup>2</sup>	NIL	NIL
9	Al-Halal	4×10 <sup>1</sup>	9×10 <sup>1</sup>	Positive
10	Al-Faris	23×10 <sup>2</sup>	5×10 <sup>2</sup>	Positive

Nil= NO growth

liver during slaughter, dressing and cutting of carcass from intestinal tract, knives, cloths, air, workers, carts, boxes and equipment in general, and huge variety of organisms types are supplement and it could be created the most kinds of subsides (Abdellah et al., 2008). Regardless of the modern hygienic slaughtering and processing techniques, food safety had been the major public health problem (Zakki et al., 2017). Several studies were done to investigate the microbes' contamination in the chicken product in Iraq (Al-Hissen, 2005; Al-Hemairi, 2011). Due to the presence of many types of frozen chicken livers from different sources without health control, this study was designed to modernize our knowledge about microbial contaminants in chicken liver inside Baghdad markets.

## MATERIALS AND METHODS

### SAMPLES

One hundred chicken liver samples from ten different companies (ten from each company) (Table 1), were obtained randomly from supermarket inside Baghdad City during the period extended from January to March 2017. All samples were transferred immediately into the microbiology laboratory at the Market Research and Consumer

Protection Center in Baghdad University and frozen at -18C° until use.

### TRAINING OF SAMPLES

Under aseptic condition, twenty five grams from each liver were suspended in 225 ml of peptone water (0.1%). A sequential decimal dilution was made using the medium and plated onto nutrient agar then incubated in 37C° for 24 hrs. *Staphylococcus* spp. and *Salmonella* spp. microbial groups were resolute. This is agrees with American Public Health Association for foodstuff examination (Downes and Ito, 2001).

### MICROBIAL COUNTING WAS INCLUDED THE FOLLOWING METHODS

Total *Escherichia coli* counting: 10<sup>-6</sup> diluted samples added to 1 ml of Violet Red Bile agar and another layer of the medium was added to make an anaerobic atmosphere. The dishes were incubated for 24 hrs. at 37C°. The counting of developed colonies was done.

### STAPHYLOCOCCUS ENUMERATION

*Staphylococcus aureus* recorded by positive coagulase then the affirmation was done using mannitol salt agar that in-

incubated at 37°C for 24-48 hrs., then the results recorded.

### SALMONELLA DETECTION

The 10<sup>-6</sup> diluted samples with 0.1 ml mixture were used to detect with Salmonella Shigella agar and Deoxycholate citrate agar, then incubated at 37°C for overnight. Colonies were submitted to biochemical reactions (Triple sugar iron agar, Lysine decarboxylase, Urease, Indole, methyl red, simmon citrate) to confirm the presence of *Salmonella* spp. The *Salmonella* colonies appear as large glassy or completely block.

All these methods were done according to (AOAC, 1998; Santos et al., 2003).

## RESULTS

The examinations of 10 different companies that product chickens' liver were done to detect the bacterial pathogens presence. These livers were bringing from different market-places in Baghdad City. The main bacterial which isolated was Staphylococcus spp., the maximum count was obtained between Bakpi21×104CFU/g, Hanana 14×103CFU/g, Al-Bayader33×103CFU/g and Al-Faris23×102CFU/g (Table 2). *Escherichia coli* were also obtained among Bakpi13×102CFU/g followed by Al-Faris5×102CFU/g and Al-Halal9×101CFU/g (Table 2). Table (2) also recorded positive *Salmonella* spp. in three types namely Al-Bayader, Al-Halal and Al-Faris. Mixed infection detected in Al-Bayader, Al-Halal and Al-Faris, and less in Bakpi company.

## DISCUSSION

Poultry examination in the United States began as early as 1926; appear to protect public health from bad meat and poultry. Then this examination of poultry products became law in 1957, it requires examination of individual birds before and after slaughter and also during processing. Soon after that, federal inspectors must examine each chicken in 1968 (Dey et al., 2003). The current study showed that the predominant bacterial pathogens which isolated were Staphylococcus spp. followed by *Escherichia coli*. This fits with (Gill et al., 2002; Brahmhatt and Anjaria, 2007; Al-Hemairi, 2011). Introduction of Staphylococcus aureus into the bloodstream can lead to various complications including endocarditis, meningitis, and with widespread, septicemia (Easa, 2010). The percentage of *Salmonella* spp. and *Escherichia coli* isolations were different from that which recorded by (Thanigaivel and Anandhan, 2015). While it was partially within the ranged which recorded by (Abu-Salem and Abou-Arab, 2010; Zakki et al., 2017) around the world. As well Staphylococcus prevalence was near the percentage that listed by (Capita Calleja et al., 2001; Kreyenschmidt et al., 2002) 82-100%, 90% and 95%

respectively. All treated or untreated samples that free from coliform, Staphylococcus aureus, and Salmonella, were an index of proper conditions created during processing (Abu-Salem and Abou Arab, 2010). The mean of total bacterial counts in our recent study was lower than the recommended limit of bacterial contamination inside foods as recommended by International microbiological standards which are 105CFU/g for total bacterial plate count (Adams and Moss, 2000). Also the result of mean number count was below the Iraqi standard specification for frozen poultry meat from Central Organization for Standardization and Quality Control of *Escherichia coli* 1×10<sup>5</sup> and Staphylococcus aureus 1×10<sup>4</sup>. Those outbreaks were listed with variety of foods including poultry, egg, beef, fish, chicken, dairy products and chocolate (Abu-Salem and Abou Arab, 2010). Information indicated that chicken materials were infected with bacterial pathogens. This contamination increased inside cutting meat, and the bacterial count redoubled more than six times after hand dealing and reach eight times when it present in markets (Al-Hemairi, 2011). Contamination during processing during storage may later change foods microflora quantitatively and qualitatively (Easa, 2010). Also the gut is the most important source of *Clostridium perfringens*, Coliforms, *Salmonella* and Staphylococcus bacteria (Easa, 2010). Disorder in gastrointestinal and illness from food-borne which infected with pathogenic bacteria can be threatening life. The transmission to human during production, handling and consumption of meat and meat products is the main source for food-borne illness (Callaway et al., 2008). However, many outbreak caused by *Salmonella*, *Shigella*, *E. coli* and *Listeria* spp. in different parts of the world depending upon several factors including the organism, geographical factors, farming and/or meat production practices (Iroha et al., 2011). It is essential to incorporated hygienic practices in abattoirs and meat trading to ensure food safety (Al-Hemairi, 2011). The most dangerous point that *Salmonella* is not destroyed by freezing (Easa, 2010). Application of pre-cooking treatments could be lower the initial contamination level, like freezing and washing the liver with organic acid (Harrison et al., 2013; Hutchison et al., 2015). Food microbial safety is a concern with public health all around worldwide, it is evaluated that in every year within the United States there are approximately 76 million food-borne infections; most of these cases are caused by *Campylobacter* spp., non typhoidal *Salmonella*, pathogenic *Escherichia coli* (Easa, 2010). Environmental contamination in liver and processing conditions makes the diagnosis of disease etiology so difficult. So it becomes necessary to isolate pathogens inside the liver that cause a human health risk and aseptic sampling procedures will be needed before the birds enter the routine processing line (Dey et al., 2003). Dey et al. (2003) recommended that livers spectroscopic examination had 95% accuracy compared with the organoleptic examination. Training of butchers

to handler food safety practices and inspection procedures should be severely to reduce the contamination of meat, meat product, and chicken that sold in the market.

## CONCLUSION

This study concluded that the liver was a polluted organ with pathogenic bacteria and the mean of infection was near the maximum standard limit. Therefore it is an important to improve the diagnostic and inspection techniques to identify the contaminated liver which sold in market-places.

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## CONFLICT OF INTEREST

The author declares that there is no conflict of interest.

## AUTHORS CONTRIBUTION

This work is designed of the intellectual of the author, and the author has contributed to the practical methods used, to the research concept, and to the experiment designed.

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