Bacteriological assessment of poultry slaughter house at Sharkia Governorate

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Abstract

A total of 80 samples from poultry slaughter house at Sharkia governorate from a (scalding water , after plucking, after evisceration and pre wash, after chilling and from final product). Also samples were collected from tools and labor hand , samples were examined bacteriologically for total bacterial count, coliforms count, faecal coli form *Staphylococcus aureus* and salmonella spp. Salmonella could not be isolated in the present study. The mean values of total bacterial count were $2.4x10^3$, $3.4 x10^7$, $6.5x10^6$, $4x10^5$and $7.4 x 10^4$ cfu/g respectively in the examined samples. While mean values of coliform count were $5,2 x 10^2$, $1.7x10^3$,$3.9x10^3$, $9.4x10^2$ and $8x10^2$ cfu/g respectively. Faecal coliform and *Staphylococcus aureus* could not be isolated from used water and the mean count value of *Staph. aureus* was $2.6x10^2$ cfu /g in the final product. Bacteriological evaluation for used tools and labor hands, critical control points and its correction at different stages in the plant were discussed. As well as public health importance and recommendations to produce safe products.

Key words: *Staphylococcus aureus, Sharkia governorate , Faecal coliform , safe products.*

Introduction

The overgrowth of poultry production to meet the increasing demands of consumers had necessitated the establishment of hygienic poultry processing plant capable of providing the safe and high quality products.

Poultry and poultry products are common vehicles of food borne illness. microbial risks associated with raw poultry products include salmonella species and other enterobacteriacaea (**Brayan and Doyle, 1995**)

Hazard Analysis and Critical Control Points (HACCP) is a systematic food safety programme used mainly to identify and control food borne pathogens. Complete elimination of hazardous microorganisms as well as such microorganisms for processed foods is the primary goal of HACCP.

The U.S. Food and Drug Administration (**FDA, 1978**) recommended that the food should be prepared with the least possible manual contact, with suitable utensils, and on the surfaces that prior to use have been cleaned, rinsed and sanitized to prevent cross-contamination..

Russel (2001) mentioned that sanitation swabs and APC are generally conducted as part of a processing plant's sanitation standard operating procedures as required by the USDA. He also suggested that to maintain the sanitary quality and safety of poultry products, US companies regularly monitor food contact surfaces and various poultry products for indicator groups of bacteria, such as total aerobes, total coliforms, and E. coli.

WHO (2002) mentioned that to ensure that the food is microbiologically safe, both the manipulators and food need to be monitored. It revealed that the cleaning procedures for the food contact surfaces should be evaluated and special attention should be given to the utensils used during the processing, such as gloves, baskets, kitchen towels and hand tools.

Legnani *et al.* (2004) stated that the microbiological quality of food and equipment has been improved after the application of HACCP principles and widespread educational programs for the food staff over a ten years period in the catering establishments in district of Ferrara and the knowledge of problems is essential for the improvement of the control system of food production establishments and to adjust the

staff training programs, in order to obtain greater safety in mass catering services. Management of meat safety risks involves all sectors: from the producer through the processor, distributor, packer, retailer, food service worker, and consumer

Sousa (2008) stated that unsanitary food handling is a major public health hazard, but for over a century, developments in the food production and new control philosophies have contributed to the food safety systems in most developed countries perceived by many to be efficient in the prevention of the food borne diseases. Nevertheless, a number of problems still remain dominant, one of these being the high level of the food borne microbiological diseases which seem, for some pathogens, to have increased over the last decades. She suggested that reliable means to assure the food safety and protect consumer's health are the basis for the Hazards Analysis and Critical Control Points (HACCP) concept based in plant control programs rather than sporadic microbiological monitoring of end products.

Mukhopadhyay *et al*. (2009) stated that intermittent microbial analyses and constant monitoring are necessary to produce hygienic and wholesome meat to ensure safe public health.

Therefore, the present study was designed to study the bacteriological load during processing in poultry slaughter house to determine critical control points and how to correct it.

Material and Methods:

1-collection of samples: A total of 80 samples from poultry slaughter house at Sharkia governorate from (scalding water after , plucking, after evisceration and pre wash ,after chilling and from final products). Also samples were collected from knives, grinders, labor hands, tables, foam dishes and polyethylene.

2-Preparation of samples: The samples were aseptically transferred to the laboratory with a minimum of delay and were examined for:

- Total bacterial count (**APHA,1984**).
- *Staphylococcus aureus* count (**I C M S F ,1978**)
- Determination of salmonella and E, Coli (**Holt *et al* 1994**).

Results and Discussion:

The result obtained in table (1,2) declare that the mean bacterial count was 2.4 x 10^3 , 3.4 x 10^7, 6.5 x 10^6, 4 x 10^5 and 7.4x 10^4 cfu/g in scalding water ,after plucking, after evisceration and prewash ,after chilling and final product.

The most important improvement in the hygiene of the evisceration process is the automated transfer of carcasses from the slaughter line to the evisceration line and, when appropriate, to the chilling line. This reduces product handling and thus cross contamination of course cross contamination may occur due to the number of machines involved in the evisceration process.

The mean coliform count was after plucking 1.7 x 10^3 while at scalding water 5.2 x 10^2 after chilling 9.4 x 10^2 and 8 x 10^2 cfu/g in the final product.

Table (1) declared that the mean of *Staphylococcus aureus* was 8.4 x 10^2 cut/g after plucking and 2.6 x 10^2 cfu/g in the final product **Mead *et al*., 1993** demonstrated that the colonization of plucking equipment with *Staphylococcus aureus*, by the increase levels of contaminated carcasses with this organism in a model system.

It's evident from the above that, from the hygienic point of view, scalding is hazardous operation- carcasses with a huge load of organic material and microbes, are submerged there by donating faecal material to the water (**kotula and pondya 1995**).

Similar results obtained by **Elshorbagy & Jihan (2002)** who could not isolate salmonella from 400 freshly slaughtered samples collected from Sharkia supermarkets. Also **El-said (2001)** who found that total counts of aerobes and coagulase positive *Staphylococcus aureus* were 9.82 $\pm$ 1.38 x 10^2 and 8.97 $\pm$ 1.53x 10^2 organisms /cm^2 of fresh carcasses.

Higher results were obtained by **Abo Elenien *et al*., (2012)** who found that average count of *Staphylococcus aureus* were 2.39x 10^3 /gram in the examined chicken carcasses collected from poultry slaughter houses.

Similar results were obtained by **Elshorbagy**

et -al (2007.)
Incorporating Hazard Analysis Critical Control Points (HACCP) in the initial stages of food product development allows assessment of the risk and severity of hazards, which may be associated with the raw materials used, their processing, the system of distribution and the intended use.
This failure to isolate salmonella species from all examined samples may be due to the presence of high number of contaminants of other enterobacterial species especially proteus which overgrowth on the expanse of salmonella microorganism so decreased or even eliminated the probability for salmonella isolation.
From public health of view, most of the isolated microorganisms in this study constitute public health hazard to the consumer as they have been incriminating in cases of gastrointestinal food poisoning and bacterial dysentery, fever and vomition **Akhtar *el al*. (1982), Rufus, (1988)** therefore, these results declared that importance of application of hazard analysis critical control point system (HACCP) which control the technological line of production at all points from the farm to table including production, transportation, slaughter, processing, storage, retail and food preparation to eliminate or even decrease the microbial loads in both chicken products and parts.
Also, **Ivan (2000)** found that the cooling of carcasses in 4% citric acid or in 4% tartaric acid reduces the count of microorganisms 190 times compared to the control carcasses.
Adams (1990) demonstrated that, the HACCP system was designed to ensure the safety of meat and poultry products by controlling all steps of production. Moreover, she divided the slaughter process to several steps, (i) slaughter the live bird or animal which is raw ingredients in a traditional HACCP system, (ii) inspecting the carcasses and internal organs for diseases and chemical residues, (iii) cut – up the carcasses, this is the most step critical in the HACCP scheme, since the handling may introduce pathogenic microorganisms or other contaminants. This step can be controlled by some procedures such as sanitary of handling procedures, clean of contact surfaces and the environment which control the presence of foreign materials and/or microorganisms. The last step is packaging which is just as important as any other operation in the system, and must be done in an equally sanitary manner.
It can be concluded that the highest bacterial count was after plucking and we couldn't isolate salmonella from the examined samples so we recommend such applications to introduce poultry products and parts of high sanitary and hygienic standards for consumption.

Table (1). Bacterial load during chilled chicken production (cfu/g).

Microbial analysis	Scalding water			After plucking			After evisceration and pre-wash			After chilling			Final product		
	Count			Count			Count			Count			Count		
	Min	Max	mean	Min	Max	mean	Min	Max	mean	Min	Max	mean	Min	Max	mean
Total bacterial count	$1.8x10^3$	$2.6x10^3$	$2.4x10^3$	$2.6x10^7$	$4.3x10^7$	$3.4x10^7$	$5.4x10^6$	$7.4x10^6$	$6.5x10^6$	$3.3x10^5$	$4.6x10^5$	$4x10^5$	$7.3x10^4$	$7.8x10^4$	$7.4x10^4$
Coliform	$3.6x10^2$	$8.3x10^2$	$5.2x10^2$	$1.7x10^3$	$1.8x10^3$	$1.7x10^3$	$2.2x10^3$	$6.8x10^3$	$3.9x10^3$	$1.1x10^2$	$9.7x10^2$	$9.4x10^2$	$6.3x10^2$	$9.2x10^2$	$8x10^2$
Faecal colifrom	0	0	0	2x10	7.6x10	4.3x10	$2.7x10^2$	$1.3x10^2$	$8.9x10^2$	0	0	0	0	0	0
Staph. Aureus count	0	0	0	$7.6x10^2$	$9.2 x10^2$	$8.4x10^2$	$5.4x10^2$	$6.6x10^2$	$6.1 x10^2$	$4.2 x 10^2$	$4.9 x 10^2$	$4.5 x 10^2$	$1.9 x 10^2$	$3.6 x 10^2$	$2.6 x 10^2$
Salmonella SPP.	- ve	- ve	- ve	- ve	- ve	- ve	- ve	- ve	- ve	- ve	- ve	- ve	- ve	- ve	- ve

Table (2). Microbial load on tools, materials and labor hands used during the production of different chicken products. (No. three samples from each).

Sample source	Knives		Grinder		Labor hands		Tables		Foam dishes		Polyethyelene	
	Count	Mean of counts	Count	Mean of counts	Count	Mean of counts	Count	Mean of counts	Count	Mean of counts	Count	Mean of counts
Total bacterial count	$1.9×10^2$	$1.1×10^2$	$3.2×10^2$	$4.0×10^2$	$3.0×10^2$	$2.1×10^2$	$6.4×10^2$	$5.4×10^2$	$1.7×10^2$	$1.2×10^2$	$1.6×10^2$	$1.4×10^2$
	$7.3×10$		$4.5×10^2$		$2.4×10^2$		$4.8×10^2$		$1.3×10^2$		$8.0×10$	
	$7.7×10$		$4.4×10^2$		$9.3×10$		$4.9×10^2$		$5.7×10$		$1.7×10^2$	
Coliform	0	0	0	0	0	0	0	0	0	0	0	0
	0		0		0		0		0		0	
	0		0		0		0		0		0	
Faecal coliform	0	0	0	0	0	0	0	0	0	0	0	0
	0		0		0		0		0		·	
	0		·		0		0		·		·	
Staph. aureus	$0.3×10$	$0.8×10$	$1.3×10$	$1.1×10$	$7.3×10$	$7.6×10$	$6.7×10$	$4.8×10$	0	0	0	0
	$1.0×10$		$0.7×10$		$8. 7×10$		$4.3×10$		0		0	
	$1.0×10$		$1.3×10$		$6.7×10$		$3.3×10$		0		0	
Salmonella spp.	-ve	-ve	-ve	-ve	-ve	-ve	-ve	-ve	-ve	-ve	-ve	-ve
	-ve		-ve		-ve		-ve		-ve		-ve	
	-ve		-ve		-ve		-ve		-ve		-ve	

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التقييم البكتريولوجي لمجازر الدواجن بمحافظة الشرقية

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البكتريولوجي – صحة الأغذية المعمل الفرعي بالزقازيق

معهد بحوث صحة الحيوان – الدقي

الملخص العربي

أجريت هذه الدراسة علي 80 عينة من أحد مجازر الدواجن محافظة الشرقية من الماء المستخدم وبعد عملية نزع الريش والتجويف، قبل الغسيل بالماء وبعد عملية التبريد ومن المنتج النهائي كما تم أخذ عينات من الأدوات المستخدمة وأيدي العاملين، تم فحصها بكتريولوجيا للعدد الكلي للبكتريا الهوائية والكوليفورم والكوليفورم البرازي وميكروب المكور العنقودي الذهبي وأنواع السالمونيلا علي التوالي:

وكان متوسط العدد الكلي للميكروبات:

2.4×10^3 ، 3.4×10^7 ، 6.5×10^6 ، 4×10^5و 7.4×10^4 خلية/ جرام على التوالى

بينما كان متوسط العد الكلي للكوليفورم:

5.2×10^2، 1.7×10^3 ، 3.9×10^3 ، 9.4×10^2 و 8×10^2 خلية/ جرام فى العينات الفحوصة على التوالى

ولم يتمكن من عزل الكوليفورم البرازي من الماء المستخدم وبعد التبريد ومن المنتج النهائي وتراوح العد الكلي للميكروب المكور العنقودي 2.6×10^2في المنتج النهائي بينما كان 8.4×10^2 خلية/جرام بعد نزع الريش ولم نتمكن من عزل ميكروب السالمونيلا في جميع المراحل.

كما تم التقييم البكتريولوجي لبعض الأدوات المستخدمة وأيدي العاملين، وتم تحديد نقاط الخطر وكيفية معالجتها في المراحل المختلفة داخل المجزر هذا وقد تم مناقشة الأهمية الصحية للميكروبات والإجراءات الواجب اتخاذها للحصول علي منتج صحي سليم.