Vet.Med.J.,Giza. Vol.46, No.4. A (1998): 363-368.

INCIDENCE OF STAPHYLOCOCCUS AUREUS IN BROILERS DURING PROCESSING

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SUMMARY

A total of 240 broiler chicken were sampled for determination of the incidence of *S. aureus* during various stages of processing (30 samples each) in a large poultry processing plant in Cairo. *S. aureus* could be recovered from broiler carcasses at all stages of processing in a percentage ranging from 10 % to 96.6 %, which may be attributed to the bad condition of the birds at arrival to the plant and the neglected hygienic measures adopted during processing. 43.9 %, 72.1% and 29.7 % of the isolated *S. aureus* strains showed positive results with Coagulase, DNase, and TNase test respectively. The importance of contamination of broiler meat with *S. aureus*, as well as the suggestive control measures to prevent contamination of poultry with the organism were discussed.

INTRODUCTION

Broilers represent an important source of high quality protein, they have a considerable sharing as a source of meat in the diet of people all over the world, due to their high meat yield, ease of preparation, cooking and digestion, low shrinkage during cooking, as well as, the competitive price with that of other meat. The intensification of poultry production to meet the increasing demands of the consumers, has necessitate a rapid expansion in poultry processing plants. In these plants, poultry meat may be subjected to contamination from a variety of sources during processing, handling, storage and distribution, which make the hygienic quality of such product is questionable (21).

S. aureus continues to be a major cause of food-borne intoxications, and its presence in food constitutes a major problem for food processors, food service workers and consumers (13, 15, 19).

In recent years, an increasing number of food-borne outbreaks have been traced to the

consumption of poultry meat, where *S. aureus* is one of the main etiologic agents (1, 16, 17, 18).

The aim of the present study was to determine the incidence of *S. aureus* in broilers during differnt stages of slaughtering and processing.

MATERIAL AND METHODS

1- Collection of samples:

A total of 240 broiler chicken were sampled for determination of the incidence of *S. aureus* during various stages of processing in a large poultry processing plant in Cairo.

According to HACCP (Hazard Analysis Control Point System) (8, 10), swab samples were taken from the live birds and carcasses using the techniques recommended by (5, 11, 21). The stage of processing, number and source of samples are given in Table (1).

Table (1): Stages of processing, number and source of samples.

Stages of processing	No. of sampels	Source
Ante-mortum	30	Under wings and nostrils
Picking	30	Wole body
Evisceration	30	Wole body
Inspection	30	Wole body
Hock cutting	30	Wole body
Preparation	30	Wole body
Chilling	30	Wole body
Packaging	30	Wole body
Total	240	----

Collected swab samples were dipped directly into 10 ml of sterile peptone water and then directly transferred to the laboratory, where they were used for the isolation of *S. aureus*.

II- Isolation of *S. aureus*:

The isolation technique recommended by ICMSF (7) was carried out by spreading 0.1 ml of the sample on the dried surface of Baird Parker plates (Oxoid, cod CM275). Inoculated plates were incubated at 37°C for 48 hours. Typical *S. aureus* colonies were picked and stored for further identification.

III- Identification:

Purified isolates were examined microscopically and biochemically according to Cowan and Steel (3)

Identified *S. aureus* strains were further subjected to Coagulase test (3), Deoxyribonuclease (DNase) activity (2) and Thermostable nuclease (TNase) production (7).

RESULTS

Table (2): Incidence of *S. sureus* in examined broiler samples during different stages of processing.

Stage	No. of sampels	Positive samples	
		No.	%
Live bird	30	3	10
Picking	30	29	96.6
Evisceration	30	24	80
Inspection	30	27	50
Hock cutting	30	25	83.3
Preparation	30	24	80
Chilling	30	23	76.6
Packaging	30	10	33.3
Total	240	165	68.7

Table (3): Coagulase, DNase and TNase activity of isolated Staphylococci.

Stage	No. of sampels	Coagulase + ve (++) or more		DNase positive		TNase positive	
		No.	%	No.	%	No.	%
Live bird	20	9	45	15	75	2	10
Picking	60	11	18.3	38	63.3	4	6.7
Evisceration	60	52	86.6	50	83.3	31	51.6
Inspection	60	29	48.3	36	60	17	28.3
Hock cutting	60	15	25	47	78.3	28	46.6
Preparation	60	30	50	51	85	15	25
Chilling	40	15	37.5	24	60	11	27.5
Packaging	20	6	30	13	65	5	25
Total	380	167	43.9	274	72.1	113	29.7

DISCUSSION

The microbiological condition of processed broiler carcasses is related to the numbers and types of microorganisms carried into the processing plant by the live bird and to the effectiveness of control measures within the plant. Although the slaughter processes used for all meat animals pose similar hygiene problems, the processing of poultry has a number of unique features which are specially significant in relation to hygiene control.

In the present study, 240 live and processed broiler skin samples were taken from the major contamination points of the processing operations represented in Table, (1).

The rate of contamination of live chicken with *S. aureus* is largely dependent upon the degree of handling at the farms and the condition of the flock at arrival to the processing plant.

Results presented in Tables (2&3) revealed that 10 % of the exmined live bird samples proved to be contaminated with *S. aureus* on the skin, nostrils and between the feathers under the wings, but with a very high density where 20 isolates could be recovered. 45 % of the isolates were coagulase positive, 75 % were DNase positive and 10 % were TNase positive. The obtained results are in agreement with those recorded by (9). Higher incidence of the organism was detected during different stages of processing, where the percentage of recovery of the organism ranged from 33.3 % to 96.6 %.

In the picking stage, *S. aureus* could be isolated from 96.6 % of the examined samples, with a high rate of density, where 60 isolates could be recovered. 18.3 %, 63.3 % and 6.7 % of these isolates showed positive results with coagulase, DNase and TNase test respectively. Nearly similar results were recorded by (4, 5, 12). The high incidence of *S. aureus* in this stage may be attributed to the excessive handling and manipulation of the carcasses by more than one worker to ensure that all fine feathers are picked up. On the other hand, plucking machines in particular may support the build-up of an endogenous *S. aureus* flora which may cause subsequent contamination of carcasses.

During the evisceration stage, 60 isolates of *S. aureus* could be recovered from 80 % of examined carcasses. 86.6 %, 83.3 % and 51.6 % of the isolates were positive for coagulase, DNAase and TNase test respectively. The high rate of contamination of broiler carcasses with *S. aureus* during this stage may be due to contamination of the skin from the viscera and excreta, additionally, the workers may play a major role in contamination of broiler carcasses with pathogenic strains of human origin through hands and arms lesions caused by the organism or through coughing and sneezing (14). It is suggested that the carcass must be kept a whole throughout the entire processing operation so that viscera have to be removed rapidly through a small vent opening, and as far as possible without breakage in order to minimize contamination at this stage.

At the inspection point, 60 isolates of *S. aureus* could be isolated from 90 % of the examined carcasses. Isolated organisms showed positive results for coagulase, DNase and TNase test at percentages of 48.3, 60 and 28.3 % respectively.

At the hock cutting and reshackling stage 60 *S. aureus* isolates could be recovered from 83.3 % of the examined carcasses. 25 %, 78.3 % and 46.6 % of the isolates gave positive results with coagulase, DNase and TNase tests respectively.

With regard to the preparation stage, 60 isolates of *S. aureus* could be isolated from 80 % of the examined carcasses. The obtained results substantiate those reported by (4,12). Isolated strains showed positive results with coagulase, DNase and TNase test at a rate of 50 %, 85 % and 25 % respectively.

In the chilling stage, *S. aureus* could be isolated from 76.6 % of the examined broiler carcasses. Nearly similar results were recorded by (6). Out of the isolated 40 strains, 37.5 %, 60 % and 27.5 % gave positive results with coagulase, DNase and TNase test respectively. It seems that contamination of the chilled carcasses may result from the previous stages of processing and from the washing tank, accompanied with the little effect of chilling on the contaminant organism.

At the packaging stage, *S. aureus* could be isolated from 33.3 % of the examined broiler carcasses. 30 %, 65 % and 25 % of the isolates showed posi-

tive results with coagulase, DNase and TNase test respectively.

Although the vast majority of *S. aureus* food posioning strains are coagulase positive, however food poisoning outbreaks have been also traced to coagulase negative strains, therefore the latter strains should not be ignored. On the other hand, presence of coagulase negative strains indicates poor level of hygiene practice. Coagulase and DNase positive strains of *S. aureus* have been found to produce enterotoxins. There is a high correlation between the production of coagulase and TNase by *S. aureus* strains especially enterotoxins producers (20).

It is evident from the above mentioned results that *S. aureus* could be recovered from broiler carcasses at all stages of processing, which may be attributed to neglection of preslaughter care of birds at arrival to the plant and the neglected hygienic measures adopted during processing.

The rapid expansion in the production of mechanically dressed broilers attract the attention of both the consumer and the processor about the sanitary condition under which the carcasses are processed and handled. It could be concluded that HACCP could be used for food safety and quality assurance in poultry processing plants.

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