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Influence of Saline on Salmonellae as a Contaminant of Dressed Chicken

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THE use of sodium chloride solution in controlling salmonella contamination of poultry meat during slaughter and processing will reduce and inhibit the growth of salmonella contamination.

For human consumption treated frozen chicken meat by NaCl and washed by tap water did not change the palatability of meat.

Salmonellosis is to day one of the important food born diseases in nearly all parts of the world. To reduce Salmonella contamination, efforts have been made in several countries but no significant effort have so far become apparent. Studying some factors controlling the growth and death of Salmonella was one of the efforts. Christian and Scott (1953) reported that Salmonella will not grow on food stuffs when water activity is below about 0.94. However, on food with a water activity below this value Salmonellae can survive for quite long periods without growth occurring. There have been innumerable references to the finding of salmonellae in dried eggs, flour, powdered milk and on the surface of sausages whose water activity is considerable less than 0.90 (Kampelmacher, 1983).

Banwart and Ayres (1957) studied the effect of pH on the growth of Salmonellae and mentioned that Salmonella can grow in food with in a pH range about 4.5 to 8.5. While Mossel (1963) reported that the rate of death is determined mainly by the temperature and the type of acid present, the higher the temperature, the more rapid is the death rate.

The use of chlorine in destroying salmonellae had been studied by Dixon and Pooley, (1961) Nilsson and Regner, (1963) and Patterson, (1972). Who mentioned that dose of 20 P/M — 200 P/M of chlorine in chill taulss will reduce the numbers of salmonellae considerably but do not eliminate them completely on duck skin.

The aim of this experiment is to study the influence of sodium chloride on salmonella organisms (*S. typhi-murium*) as a mean for controlling salmonella contamination in poultry meat during dressing.

Material and Methods

Exp. No. I

S. typhi-murium adjusted to Macferland tube No. 1., 1 ml containing 16 microorganisms was inoculated into different concentration of NaCl to 0.8%, 1%, 2%, 3%, 4%, 5%, 6%, 7%, 8%, 9%, 10%, 15%, 20%, 25%, 30% and 35% then subcultured on MacConkey agar were done after instant inoculation and after 24 hr.

The same test applied but using 100,000 micro-organisms per dose.

Exp. No. II

30 frozen chicken were contaminated by *S. typhi murium*. Every chicken was contaminated by 1 ml containing 100,000 micro-organisms *S. typhi-murium* on the surface of skin and the abdominal cavity and leave for 10 min to dry. Then instant immersion into different concentration and saturated solution of NaCl followed by tap water (Table 3).

Samples from saturated solution of NaCl and the tap water after use were taken for reisolation of *S. typhi-murium*. Five frozen chicken after being infected by *S. typhi-murium* were immersed, only into the tap water as a control.

For isolation of salmonellae, the indirect method using selenits F broth for 18 hr as well as MacConkey's agar plates for 24 hr incubation at 43° were used. The suspected non-lactose fermenting colonies were picked up, purified and identified biochemically according to Edwards and Ewing (1972).

Salmonella isolates were subjected to the slide agglutination test using Salmonella polyvalent and monovalent diagnostic antisera according to Kauffmann white scheme (1973).

Results

Recovery of *S. typhi-murium* (10,000,000 micro-organisms) from solutions of different concentrations of NaCl 0.8, 1% ... and saturated one showed that the immersing of the organism for instant dipping gave positive reisolation for *S. typhi-murium*. Recovery after 24 hr from concentrations 0.8%, 1% till 20% gave positive results. Reisolation from concentrations 25%, 30% and (35% saturated solution) failed after 24 hr Table (1).

Table (1) : Reisolation of S. typhi-murium after being treated by different concentration of NaCl.

Time of exposure to NaCl	Concentration of NaCl %														
	Saline	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	15%	20%	25%	30%	Saturated 35%
5 seconds	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
24 hours	+	+	+	+	+	+	+	+	+	+	+	+	+	-	-	-

* Concentration of S. typhi-murium 10,000,000 ml.

Table (2): Reisolation of S. typhi-murium* after treated by different concentration of NaCl

Time of exposure to NaCl	Saline	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	15%	20%	25%	30%	Saturated 35%
5 seconds	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-
24 hours	+	+	+	+	+	+	+	+	+	+	+	+	-	-	-	-

* Concentration of S. typhi-murium 100,000 per 1/ml.

Reisolation of *S. typhi-murium* (100,000 micro-organisms) showed that in instant dipping negative reisolation began from concentrate of 25% till to saturated. Also negative reisolation after 24 hr from the concentration 25% to saturated solution positive reisolation of *S. typhi-murium* from the treated chicken meat and the NaCl solution used in different concentrations (10%, 15%, 20%, 25%, and 30%) could be attained. Also from the tap water used for washing.

S. typhi-murium could not be reisolated from treated chicken meat by saturated solution of NaCl and also from the saturated solution and the tap water used for washing.

Discussion

The use of sodium chloride solution in controlling Salmonella contamination of poultry meat during slaughtering and processing will reduce and inhibit the growth of salmonella contamination.

The achieved results agreed with that reported by Cruickshank (1970) who stated that sudden exposure of bacteria to solution of high salt concentration (25% sodium chloride) may cause plasmolysis *i.e.* temporary shrinkage of the protoplast and its retraction from the cell wall due to the osmotic withdrawal of water. This occurs much more readily in gram negative than in gram positive bacteria. Sudden transfer from a concentrated to a weak solution, or to distilled water, may cause plasmoptysis *i.e.* swelling and bursting of the cell as a result of excessive osmotic inhibition of water. It will be necessary to use saturated solution of NaCl in large scale in processing poultry plants to avoid dilution of the solution during dipping poultry carcasses. Also after that dipping again in running clean water to remove residues of salts from poultry meat and to cause plasmoptysis of salmonella cell.

TABLE 3. **Reisolation of S. typhi-murium from experimentally infected chicken meat followed by instant dipping in different concentration of NaCl.**

Concentration of NaCl	No. of examined frozen chicken	No. of reisolation from chicken meat	Reisolation from NaCl solution	Reisolation from tap water
10 %	5	5	+	+
15 %	5	5	+	+
20 %	5	5	+	+
25 %	5	5	+	+
30 %	5	5	+	+
Saturated solution	5	0	-	-
Tap water	5	5	not used	+

* Concentration of S. typhi-murium 100,000 micro-organisms per/chick.

The treated frozen chicken meat by NaCl and washed by tap water can be used for human consumption by boiling and frying. The results obtained showed that such treatment did not change the palatability of meat.

On other hand, the use of sodium chloride solution in controlling salmonella contamination of poultry meat during slaughter and processary excells the use of chloride in that no growth of salmonella had been obtained after instant dipping in saturated NaCl while it is reduced in numbers when using 20-200 P/M of chloride after 10-60 min, as mentioned by Dixon and Pooley (1961), Nilsson and Regner (1963) and Patterson, 1972). This plus the odour of chloride during processing.

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تأثير محلول صوديوم كلوريد على ميكروبات السالمونيلا الملوثة للحوم الدواجن .

السيد الصاوى صفوت وحسنى السواح

معهد بحوث صحة الحيوان

استخدم محلول الصوديوم كلوريد فى تقليل نسبة السالمونيلا فى لحوم الدواجن أثناء الذبح والتجهيز . ووجد انه يقلل ويمنع نمو ميكروبات السالمونيلا فى لحوم الدواجن .

ـ وجد ان استخدام لحوم الدواجن المعاملة بمحلول صوديوم كلوريد ثم غسيلها بالماء العادى تعتبر صالحة للاستهلاك الآدمى ولا تؤثر على الخاصية الطبيعية للحوم ولا على المذاق .