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THE PROCESSING AREA AS A SOURCE OF SALMONELLA CONTAMINATION OF POULTRY MEAT.

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SUMMARY

A total of eight hundred samples from incoming broiler flocks, (100 each of chilled chickens, , frozen chickens, liver, gizzard, bile, scald water, feathers and cecum content) were collected and examined for incidence and seovars of salmonella. Level of salmonella incidence ranged from 4% in frozen chicken to 38% in cecum content. The incoming flocks were tested for salmonella antibodies by ELISA Positive cases of salmonella were detected in 5% of birds. Hundred swab samples of each salughter house equipments were collected and examined for presence of salmonella. The obtained results revealed that salmonella level ranged from 2% in scalding tank to 33% in evisceration / spoon. Enurmeration of salmonella (mpn / log 10g) by LICNR indicated that the level of false positive ranged from 79% in cecum content to 99% in frozen chicken. Effect of chlorination in the processing plant at high concentration on the incidence of salmonella was studied . Incidence rates of salmonella reduction were 65% and 75% in chilled and frozen chicken respectively.

INTRODUCTION

Food-borne human infection, particularly salmonellosis are very common in all parts of the world. In 1979 more than 40.000 cases of notification of clinical cases of salmonellosis have been reported to the health authorities on the basis of the German Federal Health Regulations (Bockemhl, 1980). Poultry and poultry products are frequently contaminated with salmonellae and as a consequence they are often involved in cases of human food poisoning (Cohen and Blake, 1977, and Pohn, 1979). Salmonella typhimurium was considered the most serotype in broiler chickens (Matthes, 1981). The contamination of poultry meat with salmonellae takes place during processing and handling in the slaughter house and due to the commonly used techniques at the processing plant only very few infected bords are

necessary to contaminate a lot of broiler carcasses (Galton et al., 1955, Scarofondi, 1957, Stewart, 1965, Bryan et al., 1968, Thoronton, 1980 and Cecile et al., 1981). Elliott (1969) stated that the defeathering machine was one of the main method of spreading salmonella from the faeces of carrier birds to the surface of other birds . Salzer et al. (1967) and Cox (1987) stated that high incidence of salmonella could be isolated from "giblets. Allen (1961) and Kotulae et al. (1974) stated that using high concentrations of chlorination in the washing processing causes high reduction of many type of M.O. Hobbs (1971) and Smith (1971) stated that young chicks are highly susceptible to salmonella infection, the organism spreads rapidly amongst them during the brooding state by the faecal contamination of food and water and some of them become carries and as such , may be the source of contamination with salmonella or subsequent infections in breeding flocks, thus maintaining the infection cycle and may be the source of future outbreaks of food poisoning if destined for broiler plants. Hellig (1989) stated that Salmonella enteritidis was taken over from Salmonella typhimurium as the main serotype recognized as a cause of human food poisoning in UK.Cox (1987) stated that to control, salmonella in poultry processing plant some physical and chemical treatment should be applied in the chill tank in order to have a chance to reduce, if not eliminate the incidence of carcasses carrying salmonella. Wabeck (1991) reported that food-borne illness outbreaks over the last five year period showed that salmonella is the number one poultry food-borne illness causing organisms. Cecum, crop, liver and spleen appeared to be a potential reservoir of persisting infection at all ages, and the major site movement oof salmonella to poultry meat w crop and cecum (Faddoul and Fellows, 1 Brownell and Sadler, 1967 and Turbull Snoeyenbos, 1974).

MATERIAL AND METHODS

PART 1:

The incoming flocks were tested for salmon antibodies (carrier birds) in a modern pou processing plant. About two hundred se samples were collected and examined by using enzyme linked immunosorbant assay (ELISA detect the antibodies of salmonellae carrier bi according to the technique recommended Dadrast (1990) Timoney et al. (1990), Nicholas and Cullen (1991).

PART 2:

A total of eight hundred samples from incoming flocks were tested for salmon incidence, 100 each of chilled chicken , fro chicken, liver, gizzard, bile, scald water, feath and cecum content were collected and subjec to the following examination:

I. ISOLATION AND IDENTIFICATION SALMONELLA:

The technique recommended by Rappaport et (1956), Vassiliadis et al., (1976 and 1983) ISO method NO. 6579 (1996). Suspected colo were identified morphologically according Cruickshank et al. (1975), biochemical according to Edwards and Ewing (1972) an

serologically according to Kauffman-White Scheme (Kauffmann, 1974).

2. ENURMERATION OF SALMONELLA:

The technique recommended by Litchfield , (1973) and Hargrrove et al. (1971) by using Lysine Iron Cystine Neutral Red (LICNR).

PART 3:

Poultry slaughter house equipments were examined for the presence of salmonella by swabbing (sterile cotton swab and template were used to delineate an area of $10cm^2$. Seven hundred swabs (100 each of scalding tank, plucker fingers, vent opener, evisceration/spoon "cropping machine, gizzard gutter and liver gutter) were collected and recovery of salmonela was carried out as described before.

PART 4:

After using high concentration of chlorine (100 ppm), A total of two hundred samples, 100 each of chilled and frozen chickens were collected and examined for the incidence and serotypes of salmonella as prescribed before.

RESULTS AND DISCUSSION

It is evident from the results achieved in table (1) that the incidenc e of salmonellae was 20% in chilled chickens and 4% in frozen chickens. Nearly similar results were reported by Bryan et al., 1968), Elliott (1969), Surkiewicz et al., (1969, Crabb and Walker (1970) and Safwat et al., (1984), while lower results were reported by Sadler and Corstvet (1965) and Matthes (1981). The variation in the salmonellae incidence may be attributed to sanitary condition of production, handling and preparation. (Galton et al., 1955, Scarofondi, 1957, Thornton, 1980 Stewart, 1965, Bryan et al., 1968, Barnes and Mead, 1971, ICMSF, 1980 and Cecile et al., 1981), Lower salmonellae incidence in frozen chickens may be attributed to the blast freezing (-40°C to 0°C) while storage period (-20°C) can be responsible for some decrease in microbiol load due to metoblic injury of bacterial cells. Viable cells immediately after frezzing die gradually on storage in frozen state (Ingram, 1951, Elliott and Michner, 1961 Rey et al., 1972 and ICMSF, 1980). The isolated serovars were S. typhimurium, S. enteritidis. S. thompson and S. reading. Nearly similar results were reported by Jones, Mackel et al. (1959), Byran et al. (1968), Werner et al. (1969), Matthes (1981) Ferrish and Frerich (1988), Anon (1989) Calenk et al., (1991) and Sockett and Roberts (1991). WHile other serovars were reported by Townsend et al. (1967), Hill (1969), Markakis et al. (1969). Kamei et al., (1970), Payne (1969) and Cecile et al., (1981). Outbreaks of salmonellosis can follow inadequate cooking. Raw poultry can also serve as a source of cross-contamination of cooked poultry or other food processed in the same kitchen, (Hobbs, 1971 and ICMSF, 1980).

It is evident from the results achieved in table (1) that the incidence of salmonellae was 19% in liver and 33% in gizzard. High incidence rates of salmonellae were reported by Gould and Rhodes (1969) and Matthes (1981). The isolated serovars

were S.typhimurium, S.enteritidid and S.thompson.

Nearly similar results were reported by Gould and Rhodes (1969), Matthes (1981) and Safwat et al., (1984). In most outbreaks giblets were shown directly or indirectly to be the source of food poisoning from poultry (Hobbs, 1971 and Cox, 1987). It is evident from the results achievend in table (1) that the incidence of salmonella was 38% , 11%, 8.0% and 25% in cecum content, feather, scalding water and bile respectively. Bryan et al. (1968), Morris et al. (1969) Surkiewicz et al. (1969) and Matthes (1981) could isolate salmonella serotypes from the same examined samples. High incidence of salmonella isolated from cecum content and bile indicated that during evisceration salmonella can be transferred from carcaess to carcass by workers and equipments (Galton et al., 1955 Faddoul and Fellows, 1966, Brownell and Sadler, 1967, Bryan et al., 1968, Turbull and Snoeyenbos, 1974, ICMSF 1980 and Matthes , 1981). Therefore, great care should be taken to prevent cross contamination especially when intestine or bile were damaged (Barnes and Mead, 1971 Smith, 1971 and ICMSF, 1980)..

It is evident from the results achieved in table (2) that the incidence of ELISA salmonella antibodies positive cases (carrier birds) were 5%. The incidence of salmonellae in the final products depends on the carrier rate of the living birds as salmonellae can spread from carcass to carcass during processing (Bryan et al., 1968, Moris et al., 1969 and ICMSF, 1980). It is evident from the results achieved in table (3) that MPN (log 10/gm) ranged from 3.6 in frozen chicken to 39 in cecum and By testing each solution showing co changes (suspected salmonellae + ve) to cor salmonella isolation, it is evident that the leve false positive ranged from 79.0% in cec content to 99% in frozen chicken. Therefore, method can not be recommended a presumptive test for salmonellae. Nearly sim results were reeported by D, Aoust (1977) Susan (1981).

It is evident from the results achieved in table that the incidence of salmonella isolated fr processing plant equipments were 2% in scald tank, 9% in liver gutter, 12% in croppi machine, 14% in gizzard gutter, 16% in pluc finger, 19% in vent opening and 33% eviscerator / spoon. These results confirmed t the contamination of poultry meat w salmonellae takes place during processing a handling in the slaughter house due to t commonly used techniques at the processi plant. Only very few infected birds are neceassa to contaminate a lot of broiler carcasses (Brya 1968, ICMS 1980, and Matthes 1981). T defeathering machines were incriminated as o of the main sources of spreading salmonella fr the faeces of carrier birds to the surface of oth birds (Elliott, 1969).

It is evident from the result achieved in table (that the incidence of salmonella isolated fro chickens after using high concentration chlorination (100 ppm) in processing plant wa reduced to 7% in chilled chicken and to 1% frozen chicken. Nearly similar results we reported by Allen (1961), Dixon and Poole (1961). Nilsson and Regner (1963), Barn

Table (1): **Incidence of Salmonella organisms in dressed chicken**

Sample	positive Salmonella		SEROVARES S. TYPHIMURIUM NO	%	S. ENTERITIDIS NO	%	S. THOMPSON NO	%	S. READING NO	%
CHILLED CHICHEN	20	20	11	55	6	30	2	10	1	5
FROZEN CHICKEN	4	4	3	75	1	25	-	0	-	0
Liver	19	19	8	42.1	9	47.3	2	10. 5	-	0
Gizzard	33	33	12	36.3	17	51.5	4	12.1	-	0
Bile	25	25	8	32	7	28	10	40	-	0
Scald Water	8	8	8	100	-	0	-	0	-	0
FEATHER	11	11	5	45.5	6	54.5	-	0	-	0
CECUM Content	38	38	17	44.7	17	44.7	4	10.5	-	

Table (2): **Salmonella antibodies of incoming Broiler flock by ELISA**

SAMPLE	S/N RATIO	NO	%	salmonella antibodies
INCOMING BROILER FLOCK	0.59	5	2.50	+ve
	0.38	4	2.00	+ve
	0.27	1	0.50	+ve
	0.75	97	48.50	-ve
	0.88	56	28.00	-ve
	0.98	37	18.50	-ve

Table: (3): **SALMONELLA COUNT (MPN LOG 10/gm) FROM PROCESSING PLANT SAMPLES .**

SAMPLE	MPN (LOG 10 / g)			FALSE SALMONELLA POSITIVE
	AVERA	MIN	MAX	%
CHILLED CHICKEN	6.0	6.2	9.3	97
FROZEN CHICKEN	3.6	3.6	12.0	99
LIVER	7.2	12	19.0	96
BILE	20	24	43	89.5
GIZZARD	16	19	29	85
SCALDING WATER	9.4	13	64	99
FEATHER	15	12	39	88.5
CECUM CONTENT	39	120	160	79

Table: (4):

FREQUENCY DISTRIBUTION OF SALMONELLAE ORGANISMS ISOLATED FROM PROCESSING PLANT EQUIPMENT

EQUIPMENT	S.INCIDENCE		SEROTYPES			
	NO.	%	S.TYPHIMURIUM	S.ENTERITIDI	S.THOMPSO	S.READING
SCALDIND TANK	2	2	2	-	-	-
PLUCKER FINGER	16	16	8	7	1	-
VENT OPENING	19	19	11	8	1	-
EVISCERATOR/SPOON	33	33	13	20	-	-
CROPPING MACHINE	12	12	8	2	2	-
GIZZARD GUTTER	14	14	7	5	2	-
LIVER GUTTER	9	9	5	3	1	-

Table: (5): **FREQUENCY DISTRIBUTION OF SALMONELLAE ISOLATED FROM CHICKEN AFTER USING HIGH CONCENTRATION OF CHLORINATION INSIDE PROCESSING PLANT (100 PPM) .**

SAMPLES	S.INCIDENCE		S.TYPHIMURIUM		S.ENTERITIDI		S.THOMPSO		S.READING	
	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
CHILLED CHICKEN	7	7	2	2	5	5	0	0	0	0
FROZEN CHICKEN	1	1	0	0	1	1	0	0	0	0

(1965), Ranken et al., (1965) Thomson et al., (1967), Elliott (1969), Surkiewicz et al., (1969) and Barnes and Mead (1971).

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