INCIDENCE OF SALMONELLAE IN DUCK EGGS IN THAILAND

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Abstract. Detection of salmonellae was performed on egg shells and egg contents of duck eggs. Five hundred and sixty-four tested samples were came from 1,128 eggs, 2 eggs in each sample. Eggs were collected from retail markets in Bangkok, Chon Buri, Chachoengsao, Lop Buri, Ang Thong and Nakhon Ratchasima provinces during January through June 1992. The percentage of salmonellae contamination on the egg shells only, egg contents only and both shells and contents were 12.4%, 11% and 0.2%, respectively. Twenty three serotypes were identified from the 133 salmonellae isolates. The common serotypes found from duck eggs were *Salmonella typhimurium, S. cerro, S. tennessee, S.amsterdam, S.agona* and *S. infantis* accounting for 5.5%, 4.1%, 2.8%, 2.1%, 1.4% and 1.1%, respectively.

INTRODUCTION

Ducks are an important economic avian species in many countries. Nine million ducks for meat and 6 million duck eggs, respectively were recorded as being consumed in 1992 in Thailand. Foods prepared from duck meat and eggs were commonly served in this country. It is well known that foods of animal origin are major vehicles of human salmonellosis worldwide. Among them, poultry meat has been reported to be the most common source of infection (Bryan, 1980; Khakria *et al,* 1983; Humphrey *et al,* 1988; Oboegbulem *et al,* 1990). Outbreaks of human salmonellosis caused by *S. enteritidis* associated with hen eggs has recently been recognized (Anon, 1988; 1992; Cowden *et al,* 1989; Perales and Audicana, 1989; Humphrey, 1990). The prevalence of salmonellae in poultry meat and eggs has been well recognized (Wilder and MacCready, 1966; Baker *et al,* 1980; Green *et al,* 1982; Bernardo and Machado, 1989; Izat *et al,* 1991).

Salmonella has been considered to be the cause of various diseases in ducks, *eg* arthritis (Bisgaard, 1981), mortality in ducklings (Scott *et al,* 1984) and infertility of eggs (Safwat *et al,* 1984). The transmission of the disease from ducks to humans has been suspected. Ali *et al* (1987) in Bangladesh detected *Salmonella* in 4.34% of clean duck eggs. This contamination rate was markedly higher than in chicken eggs in other countries (Baker *et al,* 1980; Perales and Audicana, 1989; Humphrey *et al,* 1988). This study aimed to determine the prevalence of salmonellae in duck eggs in Thailand, in order to provide information of importance in the control and prevention of diarrheal disease related to salmonellae.

MATERIALS AND METHODS

Duck egg samples

One thousand one hundred and twenty-eight duck eggs were purchased from open markets in Bangkok, Chon Buri, Chachoengsao, Lop Buri, Nakhon Ratchasima and Ang Thong Provinces during February through June 1992. Most of the eggs were visibly contaminated with duck feces. Samples were immediately tested after arrival in the laboratory or otherwise kept in a refrigerator for no more than 2 days prior to testing.

Isolation and identification methods

Eggs were grouped in pools of 2, and 564 samples were obtained from 1,128 eggs for analysis. Methods for isolation and identification were essentially the same as the previous report (Saitanu *et al,* 1994).

RESULTS

The contamination rate of salmonellae on duck eggs shells and in egg contents is given in Table 1. Salmonellae were recovered from the egg shells (12.4%) and egg contents (11%). Only 1 sample was contaminated with *Salmonella* in both tests. The detection rate was variable among the sources of the egg samples. Table 2 shows the

Table 1

The detection rate of salmonellae from duck eggs, collected from retail markets in 6 provinces.

Sample location	Bangkok (233)	Chon Buri (182)	Chachoengsao (20)	Lop Buri (40)	Nakhon Ratchasima (25)	Ang Thong (64)	Total (564)
Egg-shells	22/9.4*	3/1.6	3/15	5/12.5	1/4	36/56.3	70/12.4
Egg-contents	10/4.3	35/19.2	4/16	1/2.5	3/12	9/14.1	62/11
Shells and contents	1/0.2	-	-	-	-	-	1/0.2
Total	33/14.2	38/20.8	7/35	6/40	4/15	45/70.3	133/23.6

* Number of positive samples/percentage positive.
Number in bracket indicated number of tested samples.

Table 2

Prevalence of salmonella serotype from 564 pool duck eggs samples.

Serotype	Egg shells (S)	Egg contents (C)	S and C	Total (564 samples)
S. typhimurium	5*	26	-	31(5.5)**
S. cerro	18	5	-	23(4.1)
S. tennessee	14	2	-	16(2.8)
S. amsterdam	12	-	-	12(2.1)
S. agona	-	8	-	8(1.4)
S. infantis	3	3	-	6(1.1)
S. emek	3	1	-	4(0.7)
S. enteritidis	-	4	-	4(0.7)
S. london	1	3	-	4(0.7)
S. mbanbaka	2	2	-	4(0.7)
S. singapore	4	-	-	4(0.7)
S. havana	3	-	-	3(0.5)
S. alachua	2	-	-	2(0.4)
S. blockley	-	2	-	2(0.4)
I.6, 7:Z_{10}	1	-	1	2(0.4)
S. amsterdam	-	1	-	1(0.2)
S. anatum	1	-	-	1(0.2)
S. hadar	-	1	-	1(0.2)
S. rissen	1	-	-	1(0.2)
S. schwarzengurd	-	1	-	1(0.2)
S. virchow	-	1	-	1(0.2)
S. worthington	1	-	-	1(0.2)
I.6, 7:1, V :-	1	-	-	1(0.2)
Total	72	60	1	133(23.6)

* Number of positive samples
** Number of positive samples (%)

serotypes of salmonellae. Twenty-three serotypes was confirmed, *S. typhimurium* being the most common organism accounting for 5.5%.

DISCUSSION

Safwat *et al* (1984) recovered salmonellae from 12% of 200 infertile duck eggs and 9% from sick ducklings. In addition to this report, salmonellae were frequently isolated from infected ducks and *S. typhimurium* was the predominant serotype (Bisgaard, 1981; Scott *et al,* 1984; Bhowmik and Ray, 1987; Simko, 1988). Bisgaard (1981) suggested that as 80% of infected joints in ducks was due to *S. typhimurium,* total condemnation of the affected ducks was necessary for protection of humans from the public health hazard. Duck eggs represent an important food source in many countries in Asia. They may play a role in the genesis of human salmonellosis. *Salmonella* contamination in duck eggs has drawn little attention compared to the extensive studies on hen eggs. Ali *et al* (1987) reported that 4.34% of clean duck eggs was contaminated with *Salmonella* while clean hen eggs were negative. Baker *et al* (1980) occasionally isolated salmonella from fresh duck eggs collected from 4 out of 6 farms. Most of the positive eggs were dirty and they concluded that, proper egg washing would eliminate the problem of salmonellosis in ducklings. In Thailand salmonellae were not recovered from duck in eggs in earlier studies (Trongpanich and Dawson, 1974). In contrast to that report, we found significant contamination by *Salmonella* in duck eggs at the retail level. Salmonellae were detected on 12.4% of egg shells and in 11% of egg contents, respectively. Only 1 sample (0.2%) showed *Salmonella* both on egg shells and in egg contents. The high rate of *Salmonella* contamination on egg shells indicated contamination with duck feces. Forsythe *et al* (1967) and Cox *et al* (1973) reported that infected laying hens excreted salmonellae in feces so contaminating their eggs. The same phenomenon presumably also occurs in the case of ducks also. It is worth noting that *S. typhimurium* was the most common serotype recovered in duck egg contents in this study: thus, *S. typhimurium* was found in 5.5% (31 samples) of the eggs tested. Five samples had contaminated egg shells but the majority, of contamination, 26 samples, occurred in egg contents, suggesting that *S. typhimurium* contamination may arise from transovarian transmission. The prevalence of salmonellae in hen and duck eggs was different. Our previous report showed that from hen eggs *S. cerro* and *S.amsterdam* were commonly recovered but *S. typhimurium* was recovered in only 1.4% (Saitanu *et al,* 1994). This organism was ranked number 3 in 1989 - 90 and number 5 in 1991 - 92 among human isolates (Aroon; personal communication; Anon, 1989, 1990, 1991). Thus in conclusion, duck eggs may play a role in human salmonellosis. They should be properly cleaned for elimination of the contamination on shells. Eggs should be kept in the refrigerator for prevention of the propagation of salmonelle, and must be completely cooked before consumption.

ACKNOWLEDGEMENTS

The author wish to thank Prof RA Robinson for his critical reviewed the manuscript and Mrs Aroon Bangtrakulnonth, WHO National Salmonella and Shigella Center, Department of Medicals Science, Ministry of Public Health, for typing the strains.

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