PATHOGENIC BACTERIA ISOLATED FROM CHICKENS SOLD AT THE LAE MARKET

Deon Mahoney* and Ralph Yamb†

ABSTRACT

Cloacal swabs were taken from live poultry sold at the Lae market and screened for the presence of pathogenic enteric bacteria.

Salmonella *was isolated from less than 1% of birds, while* Clostridium perfringens *type A and* Campylobacter jejuni/Campylobacter coli *were recovered from 15.5% and 35.9% of birds respectively. Although the carrier rates for these organisms are relatively low, foodborne disease may eventuate because of poor hygiene during preparation of the carcass, and inadequate storage facilities for dressed and cooked birds.*

INTRODUCTION

Enormous and varied microbial populations are associated with the feathers, skin, feet, and intestine of live poultry. The faeces are the most important source of pathogenic microorganisms, containing organisms such as *Salmonella, Clostridium perfringens, Campylobacter jejuni, Chlamydia psittaci, Escherichia coli,* and *Yersinia enterocolitica* (I.C.M.S.F. 1980). These organisms may be transferred to feathers and feet when the birds walk or sit on contaminated surfaces. Contamination of the flesh by enteric pathogens during slaughtering, evisceration, and processing, then cross-contamination during culinary preparation of the carcass are considered to play an important role in the spread of foodborne disease, especially as the meat is an excellent medium for the growth of most food poisoning bacteria.

Poultry and poultry products are significant vehicles of foodborne illness accounting for as much as 31 percent of outbreaks in England and Wales, with Salmonellae and *Clostridium perfringens* most frequently implicated (Vernon 1977). These organisms are commonly found in the gastrointestinal tract of poultry, so risks exist if poultry or poultry products are handled incorrectly, improperly cooked, or if other foods are cross-contaminated. Domestic poultry constitute the largest single reservoir of Salmonellae and represent a major source of human disease (Williams 1972; Silliker 1982), but there is growing concern over the increasing incidence of campylobacteriosis. *Campylobacter jejuni* is now recognised as a significant bacterial enteric pathogen of man (Blaser 1982; Kotula and Stern 1984) and has been isolated from the intestinal flora and carcasses of numerous farm animals (Bolton *et al.* 1982) including poultry (Shanker *et al.* 1982; Wempe *et al.* 1983).

A significant number of live birds are sold at markets around Papua New Guinea, and they represent a relatively cheap source of animal protein for low income earners. This paper reports the results of a survey on the incidence of Salmonellae, *Cl. perfringens* type A, and *Campylobacter jejuni/Campylobacter coli* in live poultry sold by private vendors at the Lae market.

* Senior Lecturer, † Technical Officer, Department of Chemical Technology, Papua New Guinea University of Technology, Private Mail Bag, Lae.

MATERIALS AND METHODS

Random duplicate cloacal swabs were obtained from 103 live birds (fowls and roosters) held in makeshift cages at the Lae market. Swabs were placed in Stuart transport medium (Unless otherwise stated, all laboratory media were manufactured by Oxoid Ltd, Basingstoke, England), stored at 4–7°C, and subcultured in the laboratory within 2 hours.

Salmonella

One cloacal swab was enriched in nutrient broth at 37°C for 24 hours. The broth was subcultured into both tetrathionate broth and mannitol selenite cystine broth and incubated at 37°C and 43°C respectively. After 24 hours the broths were each streaked onto brilliant green agar and bismuth sulphite agar and incubated at 37°C for 24–48 hours.

Typical colonies were Gram stained then inoculated into triple sugar iron agar and urea agar. Presumptive *Salmonella* were tested biochemically using the API 20E system (Analytab Products Inc., Montalieu-Vercieu, France).

Clostridium perfringens type A

Swabs were streaked onto tryptone sulphite cycloserine (TSC) agar (Perfringens agar base, 400 mg cycloserine per litre, and 80 ml of a 50% aqueous solution of egg yolk emulsion per litre) and incubated for 48 hours at 37°C under anaerobic conditions.

Typical colonies were Gram stained, purified by streaking onto TSC agar and tested against *Cl. perfringens* type A antitoxin (Wellcome Diagnostics, Dartford, England).

Campylobacter jejuni/ Campylobacter coli

One swab was streaked onto Skirrow selective media (Columbia blood agar base, 7% defibrinated horse blood (Commonwealth Serum Laboratories, Melbourne, Australia), and Skirrow selective supplement). All plates were incubated at 42°C for 48 hours under microaerophilic conditions (5% oxygen, 10% carbon dioxide, and 85% nitrogen).

Typical colonies were Gram stained and subject to further biochemical tests. Gram negative, oxidase and catalase positive, motile bacteria growing at 42°C and inhibited by nalidixic acid (inhibition zone > 20 mm) were reported as *C. jejuni/C. coli*. This method cannot distinguish *C. jejuni* from *C. coli*, nevertheless both these organisms are pathogenic.

RESULTS AND DISCUSSION

The results obtained from screening the cloacal swabs are shown in *Table 1*. *Salmonella* was isolated only once, with the isolate identified serologically as *S. virchow* (Institute of Medical and Veterinary Science, Adelaide). This was a most unexpected result as the presence of salmonellae in poultry flocks is well documented (Green *et al.* 1982).

Table 1. **Cloacal isolation of enteric pathogens from poultry sold at the Lae market**

Organism	Incidence	Percentage
Salmonella	1/103	1.0
Clostridium perfringens type A	16/103	15.5
Campylobacter jejuni/coli	37/103	35.9

Contaminated feeds have been identified as a primary source of Salmonella infection in animals. Cox *et al.* (1983) found salmonellae in 58% of mash samples, and in 92% of meat and bone meal used as ingredients in commercial feeds. Local poultry producers provide their flocks with commercial feeds, so any contaminated batches could result in widespread dissemination of the pathogen. Survey work suggests that contamination by Salmonellae of locally manufactured feeds occurs only sporadically (D. L'Huillier, personal communication).

Conditions during farming and marketing of poultry were found to be conducive to infection by *Salmonella*. Insects and rodents form an important part of the infection cycle for salmonellae, and since local producers house their birds in sheds constructed of bush materials, these pests may gain easy access to feedstuffs, water, and birds. Birds were transported to market in makeshift wooden cages (see *Plate 1*), and kept under overcrowded conditions for periods of up to eight hours. As a result there were frequent opportunities for cross-contamination by feed, faeces, and water between individual birds and separate flocks.

The cloacal swab technique only detects birds shedding *Salmonella*, while the caeca must be examined to establish carrier status. Shedding by market age poultry is common under the stress of transport and excessive handling, so the results demonstrate the incidence of *Salmonella* was exceedingly low. This is probably related to the way day old chickens are handled. Pivnick and Nurmi (1982) found that the exposure of newly hatched chickens to the intestinal microflora of adult birds increased their resistence to infection by *Salmonella*, as an established gut microflora helps to inhibit pathogenic microorganisms. The rearing environment of locally produced poultry is not sanitised, and in most cases consists of an earth floor covered with sawdust. As a result, day old chickens are soon exposed to the autochthonous microflora of older birds.

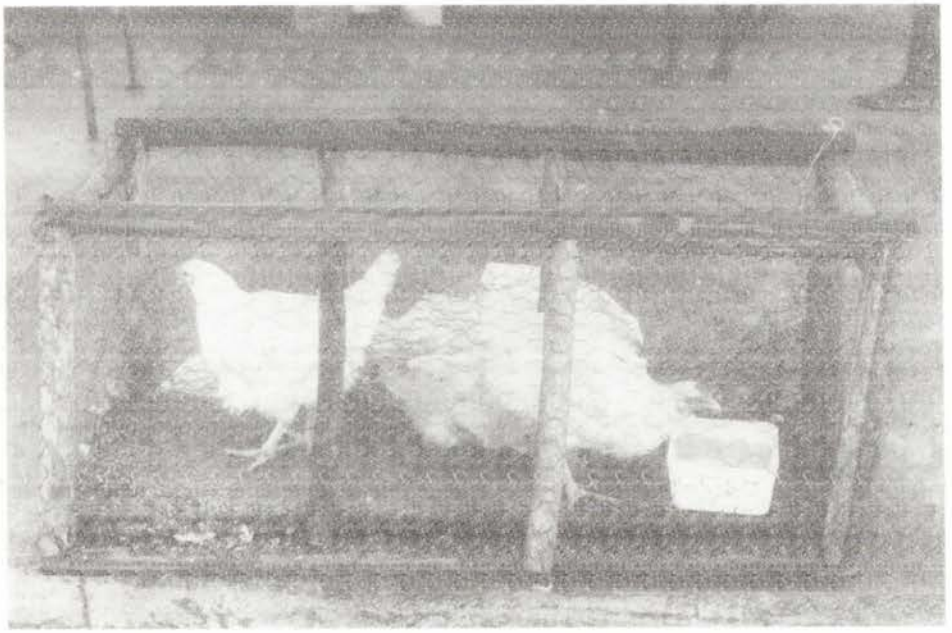

Plate 1—**Typical cage used to transport and market poultry**

Cl. perfringens type A was found in only 15.5% of the poultry surveyed. Poultry and poultry products are important vectors of foodborne illness by *Cl. perfringens*, as this organism is often present in large numbers in the intestinal tract. Contamination is expected to increase during preparation of the carcass because of the ubiquitousness of the organism, and poor hygiene during evisceration and handling. Prevention of this form of food poisoning is achieved by rapid cooling of the carcass, particularly after cooking as heat resistant spores of *Cl. perfringens* may quickly multiply to produce an infective dose.

C. jejuni/C. coli were isolated from 36% of birds swabbed. This level was not considered excessive as *C. jejuni* has frequently been associated with live, freshly slaughtered, and retail-ready poultry. Shanker *et al.* (1982) reported the isolation of *Campylobacter* from 41% of cloacal swabs from broilers at processing plants in Sydney. Wempe *et al.* (1983) isolated *C. jejuni* from the caeca of 71% of birds, while the breast feathers were contaminated in 18% of the birds examined. As with other enteric pathogens, the carrier status varied considerably between different lots.

Carcasses frequently become contaminated with *Campylobacter* during the process of slaughtering, and this has resulted in outbreaks of campylobacter enteritis as a consequence of cross-contamination or improper cooking (Doyle 1984). The handling or preparation of raw chicken has also been found to be a strong risk factor in *C. jejuni* enteritis (Hopkins and Scott 1983; Norkrans and Svedhem 1982). The presence of *C. jejuni* in the gastrointestinal tract of chickens marketed in Lae could, therefore, represent a potential source of human infection, as these chickens are often slaughtered under conditions of poor hygiene. There is little evidence that campylobacters can multiply to large numbers under normal conditions of food storage, nevertheless, infection may be induced by ingestion of only 500 organisms (Robinson 1981).

Most poultry sold at the Lae market were found to be in good condition, with a very low rate of shedding *Salmonella*. Nevertheless, appreciable numbers of birds were contaminated with *Cl. perfringens* and *C. jejuni/C. coli*, and the risk of foodborne disease exists if these birds are not prepared and stored under hygienic conditions.

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