

## A one-year survey of campylobacter enteritis and other forms of bacterial diarrhoea in Hong Kong

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### SUMMARY

The following enteropathogens were isolated from the faeces of 769 (10.2%) of 7,545 patients of whom 5,704 had diarrhoea or abdominal pain, attending a teaching hospital in Hong Kong during one year: salmonellae 458 (6.1%); *Vibrio parahaemolyticus* 125 (1.7%); campylobacters 108 (1.4%); shigellae 83 (1.1%); others 19 (0.3%). Further identification of the campylobacter isolates showed that 63 (58%) were *Campylobacter jejuni* biotype 1, 44 (41%) were *C. coli* and only one was *C. jejuni* biotype 2. Seventy-five (69%) of the 108 campylobacters were isolated from children under two years of age, mostly during the second year of life. Faecal specimens from 1,841 children under the age of two years without gastrointestinal symptoms yielded almost the same percentages of salmonellae, campylobacters and shigellae as children with diarrhoea.

Salmonellae, shigellae and vibrios were isolated most often in the hot late summer months (August to October), but, contrary to the pattern in Europe and North America, both *C. jejuni* and *C. coli* were most prevalent in the coolest months of the year (January to March). The reasons for this 'reversed' trend are unknown.

### INTRODUCTION

Studies carried out in Hong Kong in 1978 and 1980 showed that campylobacter enteritis was a common infection with a peak incidence in the cooler months of the year (McGeachie, Teoh & Bamford, 1982). This seasonal trend was the opposite of that found in Europe and North America (Skirrow, 1982; Blaser, Taylor & Feldman, 1983). Yet salmonella enteritis, a particularly common infection in Hong Kong, remained 'true to type' in that it had a higher prevalence in the hot summer months. Since these results were derived from just one year's observations, we decided to conduct a further survey to see whether these trends were maintained.

### MATERIALS AND METHODS

#### *Selection of patients*

This study was conducted in the clinical bacteriology laboratory of the Queen Mary Hospital, which is the teaching hospital of the University of Hong Kong. During one year (June 1982 to May 1983), specimens of faeces or rectal swabs from

Table 1. Bacterial enteropathogens isolated from patients with diarrhoea or abdominal pain in Hong Kong during one year

Age group of patients (years)	Number tested	No. of patients infected (% of samples submitted)					Total
		Salmonella	<i>Vibrio parahaemolyticus</i>	Campylobacter	Shigella	Others*	
< 1	1,853	129 (7.0)	1 (0.1)	38 (2.1)	4 (0.2)	10 (0.5)	182 (9.8)
1-2	104	11 (10.6)	1 (0.1)	8 (7.7)	1 (1.0)	0 (0)	21 (20.2)
3-5	304	23 (7.6)	0 (0)	9 (3.0)	1 (2.3)	0 (0)	39 (12.8)
6-10	219	13 (5.9)	1 (0.5)	4 (1.8)	7 (3.2)	2 (0.9)	27 (12.3)
> 10	3,224	217 (6.7)	122 (3.8)	20 (0.6)	60 (1.9)	4 (0.1)	423 (13.1)
Total	5,704†	393 (6.9)	125 (2.2)	79 (1.4)	79 (1.4)	16 (0.3)	692 (12.1)

\* Including *Staphylococcus aureus*, *Aeromonas hydrophila*, enteropathogenic *Escherichia coli* and *Clostridium perfringens*.

† Two pathogens were isolated from 24 of these patients.

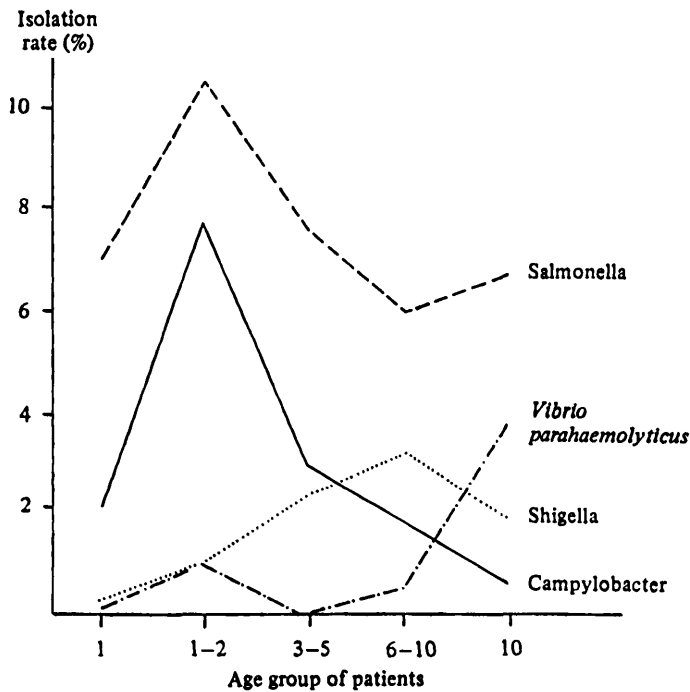


Fig. 1. Isolation rates of enteropathogenic bacteria in Hong Kong by age.

5,704 patients attending the hospital with diarrhoea or abdominal pain were examined for campylobacters, salmonellae, shigellae, vibrios, *Aeromonas hydrophila* and *Yersinia enterocolitica*. Enteropathogenic *Escherichia coli* were only examined and serotyped in cases of outbreaks or when they were isolated in heavy and pure growth from newborn babies. In addition, faecal samples from 1,841 children under the age of two years without gastrointestinal symptoms were similarly examined. These children were attending the hospital with other complaints.

#### Bacteriological methods

About one-quarter of the faecal specimens received were rectal swabs. They were collected with culturettes, each of which included a transport medium (modified Stuart's transport medium). For the isolation of campylobacters, faecal specimens were inoculated on Skirrow's medium (Oxoid no. SR 69) and incubated at 42 °C for 48 h under microaerobic conditions (BTL or Whitley jar evacuated to a pressure of 40–50 cmHg, then filled with a gas mixture of 10% H<sub>2</sub>, 10% CO<sub>2</sub>, 80% N<sub>2</sub>). Organisms which showed typical comma, S or spiral forms in Gram-stained smears and which were oxidase-positive, sensitive to nalidixic acid and resistant to cephalothin were identified as *Campylobacter jejuni* or *C. coli*. Tests for hippurate hydrolysis and the production of H<sub>2</sub>S in a medium containing iron and metabisulphite served to distinguish *C. jejuni* from *C. coli* and divide *C. jejuni* into two biotypes according to the scheme of Skirrow & Benjamin (1980). Designated control strains were included in each batch of tests (*C. coli*, NCTC 11353; *C. jejuni* biotype 1, NCTC 11168; *C. jejuni* biotype 2, NCTC 11392).

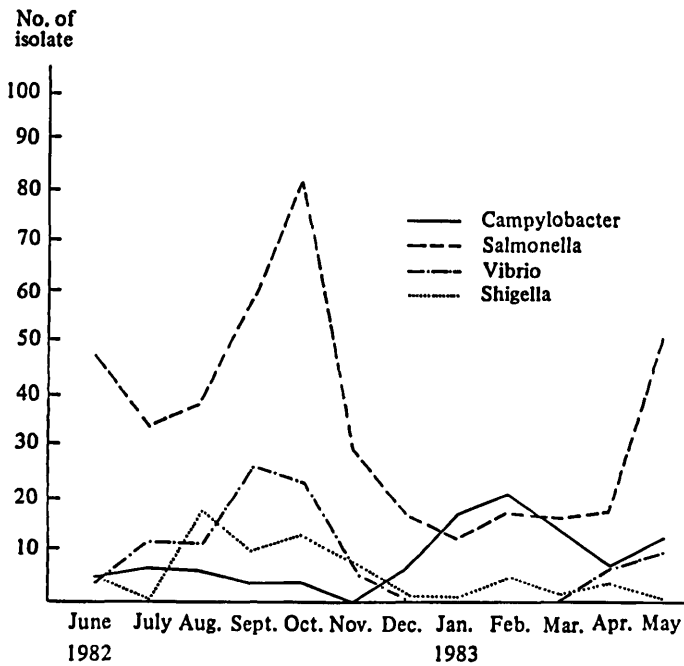


Fig. 2. Seasonal distribution of enteropathogenic bacteria isolated in Hong Kong.

Table 2. Isolation of enteropathogenic bacteria from children below the age of two years with and without gastrointestinal symptoms

	No. tested	Number of isolates (% of samples submitted)				
		Salmonella	Campylobacter	Shigella	Vibrio	Others
Children with symptoms	1,957	140 (7.2)	46 (2.4)	5 (0.3)	2 (0.1)	10 (0.5)
Children without symptoms	1,841	65 (3.5)	20 (1.0)	4 (0.2)	0 (0)	3 (0.2)

## RESULTS

Bacterial pathogens were found in 668 (11.7%) of the 5,704 patients with diarrhoea or abdominal pain. These results are shown in Table 1 and Fig. 1. Most (69%) of the campylobacter isolations were from children under two years of age. Mixed infection by two pathogens was found in 24 (3.1%) of the 769 positive patients, and in four of these campylobacter was found. Fig. 2 shows the monthly isolations of each pathogen during the year of study. Half of the campylobacter isolations were made in the period January to March, the three cooler months of the year (outdoor temperature range 10–25 °C), whereas salmonellae, shigellae and *Vibrio parahaemolyticus* were all more prevalent during the late summer months. Table 2 shows the results of testing the 1,841 children without gastrointestinal symptoms.

Identification of the 108 campylobacter isolates showed that 63 (58%) were *C. jejuni* biotype 1, 44 (41%) were *C. coli* and only 1 was *C. jejuni* biotype 2. There were no outstanding differences in the distribution of *C. jejuni* and *C. coli* either among patient age groups or months of the year.

## DISCUSSION

This study shows that campylobacter enteritis in Hong Kong is a common infection, with a preponderance of infection in children below the age of two years and a decreasing incidence thereafter. This is the sort of pattern seen in developing countries (e.g. Billingham, 1981; Glass *et al.* 1983; Richardson *et al.* 1983). The incidence of salmonella infections was unusually high for such a setting and they were common in all age groups studied. Most (54 %) of the salmonella isolates belonged to serogroup B. Shigellae were isolated mainly from older children rather than infants, which is the usual pattern for this group of organisms. *V. parahaemolyticus* infection was virtually limited to adults; this is what one would expect, as children seldom eat shellfish in Hong Kong.

The seasonal trends noted by McGeachie, Teoh & Bamford (1982) were confirmed in this study. Campylobacter infections were most prevalent in the cooler months of the year, whereas the other bacterial pathogens were more prevalent in the hot summer months. Although four times as many salmonellae as campylobacters were isolated during the whole year, campylobacter isolations outnumbered salmonella isolations in January and February. This seasonal trend is the opposite to that seen in Europe and North America, but similar to the trends reported from Israel (Shmilovitz, Kretzer & Rotman, 1982) and South Australia (Cameron, Roder & White, 1982). The reasons for these seasonal trends are unknown, but two factors may operate in Hong Kong. First, the warm winter climate in Hong Kong with humidity range 70–80 % resembles the summer climate in much of Europe and parts of North America, and these conditions may be the most favourable for the transmission of campylobacters. Secondly, the Chinese eat more offal (stomach, intestine, bladder, kidney, spleen and liver) of animals such as poultry, cattle and especially swine in winter in a type of Chinese cooking called the 'hotpot'. With this type of self-cooking at the table, campylobacters may be transmitted if the offals are insufficiently cooked. Although the adequate cooking of such animal products would kill campylobacters, their increased presence in the home would also carry an increased risk of cross-contamination to other foods.

The identification and typing of campylobacter isolates showed that there was a scarcity of *C. jejuni* biotype 2 and an excess of *C. coli* relative to the distribution of these types in most other parts of the world. Since *C. coli* is particularly associated with pigs, it is possible that pigs are a more important source of campylobacter enteritis in Hong Kong than elsewhere. No obvious difference in the seasonal or age distribution between the three types of campylobacter was found.

The reasons for the epidemiological peculiarities of campylobacter enteritis in Hong Kong have yet to be elucidated. They serve to emphasize that what is true in one place may not be true in another.

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