

## Serotypes of *Escherichia coli* isolated from patients with recurrent pyogenic cholangitis

BY W. T. WONG

*Department of Microbiology, University of Hong Kong, Queen Mary Hospital,  
Hong Kong*

K. A. BETTELHEIM

*National Health Institute, New Zealand*

F. C. Y. CHENG AND G. B. ONG

*Department of Surgery, University of Hong Kong, Queen Mary Hospital,  
Hong Kong*

(Received 29 September 1981; accepted 16 November 1981)

### SUMMARY

Strains of *Escherichia coli* were isolated from laparotomy specimens from Chinese patients with recurrent pyogenic cholangitis in Hong Kong. A large variety of serotypes were found. Several sites were sampled in each patient. While only one serotype was normally isolated from one site, different sites often yielded different serotypes in the same patient. Generally the 'O' types found did not correspond to those found in the faeces of the Hong Kong Chinese population.

### INTRODUCTION

Recurrent pyogenic cholangitis (RPC) is a common disease in Hong Kong (Ong, 1968). The most frequent organism isolated from such cases is *Escherichia coli* which may be transmitted by concomitant bacterial infection following clonorchiasis (Teoh, 1963; Wong *et al.* 1981). However the precise mode of transmission is not clear. In this study strains of *E. coli* were isolated from various internal sites following laparotomy and serotyped in order to assess the possible line of transmission of these organisms. This study thus explores the relation of the different serotypes to their sites of isolation, in the same way that urinary tract infections have been studied (Grüneberg, Leigh & Brumfitt, 1968; Bettelheim & Taylor, 1969). *E. coli* isolated from bile and blood of other patients were also serotyped as well as strains from the faeces of healthy Chinese as control strains to establish a baseline of the normal flora in this population.

Table 1. *O and H serotypes of E. coli isolated from laparotomy specimens of patients with RPC in 1975*

Cases	Nature of Specimens							
	A Portal blood	B Lymph node	C Liver biopsy	D Duodenal juice	E GB bile	F CBD bile	G Peripheral blood	H Rectal swab
1	Ont. Hnt	—	Ont. Hnt	Ont. Hnt	Ont. Hnt	Ont. Hnt	—	O132. Hnt
2	—	O54. Hnt	O132. Hnt	O54. Hnt	Ont. Hnt	O54. Hnt	—	O13. Hnt
3	—	—	—	—	O161. H4	O1. H34	—	O54. Hnt
4	—	OR. H10	—	OR. H10	—	OR. H10	—	O7. Hnt
5	—	—	—	O9. Hnt	O9. Hnt	—	—	OR. H10
6	—	—	O2. H42	—	OR. H16	O6. H16	—	O1. H42
7	—	—	O2. Hnt	—	O2. Hnt	O2. H7	—	O2. H42
8	—	—	—	—	OR. Hnt	OR. Hnt	—	OR. H2
9	O(9CB). H21	—	—	—	—	—	—	OR. Hnt
10	—	Ont. Hnt	OR. H19	O129. Hnt	—	O126. H21	—	O68. Hnt
11	—	—	O33. H7	O33. Hnt	—	O33. H7	—	O132. H21
12	—	—	O113. H21	OR. H21	—	OX8. H7	—	O126. H21
13	Ont. H37	—	O5. H10	—	—	O113. H21 OX8. H15	—	O21. Hnt
							Ont. Hnt	O4. H5
							Ont. Hnt	Ont. Hnt

## MATERIALS AND METHODS

*The patients and the strains*

In 1975, 25 patients in Hong Kong with clinical symptoms of RPC were subject to laparotomies. Portal blood, lymph node, liver biopsy, duodenal juice, gall bladder bile and CBD bile were taken from each patient for bacterial culture. Thirteen of these patients yielded 40 strains of *E. coli* between them from their laparotomy specimens. Another 16 strains of *E. coli* from culture of peripheral blood and faeces were also collected from the same 13 patients (Table 1).

Ninety-three strains of *E. coli* isolated from the blood of similar patients between 1968 and 1975 and 76 strains collected from bile over the same period were also examined (Table 2).

*Faecal control strains*

Two hundred and seventy strains of *E. coli* were isolated from members of the local Chinese population, selected as not having any symptoms of gastroenteritis or diarrhoea and, as far as could be assessed, to have a normal intestinal flora.

*Bacteriology*

The specimens were usually cultured immediately but if they had to be stored it was only overnight and they were kept at +4 °C. They were cultivated on blood agar and MacConkey's agar and *E. coli*-like colonies were selected. The strains were identified as being *E. coli* on the basis of their reaction in the following tests: indole, methyl red, Voges-Proskauer, Simmon's citrate, glucose fermentation, lactose fermentation and failure to decompose urea. All strains were serotyped for their 'O' and 'H' antigens by the method described by Wong (1978).

## RESULTS

Strains of *E. coli* were isolated from 13 of the 25 patients with RPC, comprising in all 56 different strains (Table 1). Twenty-one different 'O' types and 12 different 'H' types were found. The serotypes and the sites from which they were isolated are presented in Table 1.

The distribution of the most numerous 'O' types is shown in Table 2. The 'O' types present among the laparotomy specimens but not listed individually in Table 2 were only found once or twice and included O5, O9, O90, O113, O161, OX8 and O(29B3/2). The latter two are types which have not been given an international designation.

## DISCUSSION

This study again demonstrates the multiplicity of 'O' types which can be found associated with clinical material. However it is apparent that in a number of patients the same or related serotypes were isolated from a number of sites (Table 1). Thus patient 2 yielded O54. Hnt from four of six sites sampled, although a quite

Table 2. *Distribution of more common E. coli 'O' types from the clinical material studied*

'O' type	Normal faeces	Blood cultures	Bile cultures	Laparotomy specimens	Total
O1	4	12	2	1	19
O2	8	8	8	4	28
O4	3	12	1	0	16
O6	19	0	2	1	22
O12	4	0	1	0	5
O21	1	4	0	0	5
O25	2	5	1	0	8
O33	0	0	0	3	3
O39	6	3	0	0	9
O54	0	0	0	3	3
O75	7	0	1	0	8
O83	3	0	3	0	6
O86	14	8	3	0	25
O119	0	6	0	0	6
O126	11	0	0	1	12
O129	8	0	0	1	9
O132	15	1	0	1	17
O145	0	0	10	0	10
Other 'O' types	42	8	14	9	73
Ont	82	14	9	8	113
O rough	41	12	21	8	82
Total	270	93	76	40	479

different serotype was found in the liver biopsy. In patient 6 the liver biopsy and faeces yielded the same serotype (O2 . H42), which was not found in the bile. The serotypes isolated from patient 11 form an interesting group of related types. Both the liver biopsy specimen and the CBD bile specimens yielded O33 . H7. One of each of these antigens is represented in the isolates from duodenal juice (O33 . Hnt) and another bile specimen (OX8 . H7) suggesting some possible antigenic variation.

The results do not clearly suggest whether faecal *E. coli* are the source of infecting strains; however the findings in patients 2, 4, 6, 8 and 10 (Table 1) of the faecal serotype in at least some laparotomy specimens does indicate that this may be so.

The comparison of 'O' types listed in Table 2 indicates that laparotomy serotypes are not necessarily the ones most commonly found in faeces of healthy individuals or even in blood or bile. This may suggest that the *E. coli* in cases of RPC may originate in faeces from endogenous or exogenous sources but that only certain types cause infection. This situation may be analogous to urinary tract infection, where all studies suggest a faecal origin of the endogenous strains, which must have also some of a number of virulence factors (Brooks *et al.* 1981). Only further studies will elucidate whether similar factors are involved in *E. coli* from cases of RPC. Based on serological evidence these strains differ quite markedly from those found in urinary tract infections in Hong Kong at the same time (Wong & Bettelheim, 1976, 1981).

## REFERENCES

- BETTELHEIM, K. A. & TAYLOR, J. (1969). A study of *Escherichia coli* isolated from chronic urinary infection. *Journal of Medical Microbiology* **2**, 225-236.
- BROOKS, H. J. L., BENSEMAN, B. A., PECK, J. & BETTELHEIM, K. A. (1981). Correlation between uropathogenic properties of *Escherichia coli* from urinary tract infections and the antibody-coated bacteria test and comparison with faecal strains. *Journal of Hygiene* **87**, 53-61.
- GRÜNEBERG, R. N., LEIGH, D. A. & BRUMFITT, W. (1968). *Escherichia coli* serotypes in urinary tract infection: studies in domiciliary, antenatal and hospital practice. In *Urinary Tract Infection* (ed. F. W. O'Grady and W. Brumfitt), pp. 68-78. London.
- ONG, G. B. (1968). Recurrent Pyogenic Cholangitis. In *The Medical Annual* (ed. Sir R. Bodley Scott and R. Milnes Walker), pp. 21-29. Bristol.
- TEOH, T. B. (1963). A study of gall-stones and included worms in recurrent pyogenic cholangitis. *Journal of Pathology and Bacteriology* **86**, 123-133.
- WONG, W. T. (1978). *Escherichia coli* serotypes isolated from urinary tract infections and recurrent pyogenic cholangitis in Hong Kong. Ph.D. Thesis, University of Hong Kong.
- WONG, W. T. & BETTELHEIM, K. A. (1976). Serotypes of *Escherichia coli* from urinary tract infections in Hong Kong. *Zentralblatt für Bakteriologie, Parasitenkunde, Infektions Krankheiten und Hygiene (I Abteilung Originale A.)* **236**, 481-486.
- WONG, W. T. & BETTELHEIM, K. A. (1981). *Escherichia coli* isolated from urinary tract infections in Hong Kong 1969-76. *Zentralblatt für Bakteriologie, Parasitenkunde, Infektions Krankheiten und Hygiene*. (In the Press.)
- WONG, W. T., TEOH-CHAN, C. H., HUANG, C. T., CHENG, F. C. Y. & ONG, G. B. (1981). The bacteriology of recurrent pyogenic cholangitis and associated diseases. *Journal of Hygiene* **87**, 407-412.