Postoperative urinary infections caused by *Escherichia coli*

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SYNOPSIS Serological and biochemical classification of *Esch. coli* from the rectum and vagina of patients who developed a urinary infection after operation and the insertion of a self-retaining catheter showed that 13/20 urinary infections were caused by a type which had been present before operation in the rectum, vagina, or both.

In a study of the effects of the indwelling urinary catheter after gynaecological operations, Chamberlain, Dulake, and Kidd (1968) showed that 39% of patients who had previously been free of infection developed infections of the urinary tract within 12 days of operation. The three groups of organisms most commonly implicated were *Escherichia coli*, *Proteus spp.*, and enterococci. The origin of these infections is a matter of some interest and with this end in view we studied in detail 20 strains of *Esch. coli* derived from the urine of patients who had had indwelling catheters and compared them with the strains which had been present in the rectum and vagina before operation.

Methods and Materials

The operations were performed at King's College Hospital, London (Chamberlain *et al.*, 1968). The organisms present before operation were isolated from rectal and high vaginal swabs and the post-operative ones from the urine. When a short set of routine tests had confirmed that the organisms belonged to the *Esch. coli* group they were cultured and stored on nutrient agar slopes. Most of them were examined by us within four weeks of isolation.

The strains were examined by biochemical and serological methods which have been described (Bettelheim and Taylor, 1969). We recorded their ability to metabolize the following 16 substrates: lactose, sucrose, salicin, dulcitol, inositol, adonitol, raffinose, sorbitol, arabinose, rhamnose, xylose, trehalose, glycerol, cellobiose, maltose, and sorbose.

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Received for publication 30 September 1970.

The results were observed up to seven days. The somatic O, surface K, and flagellar H antigens were identified using 147 OK and 49 H antisera which are in constant use. Most strains could be identified in

Serotype	Rectum	Vagina	Urine
01K ?H7	1		
01K ?H34			1
01K ?H-	1		
02K ?H1			1
02K ?H4	3		
02K ?H-	1		1
04K3H5			1
05K ?H4	1		
06K13H1		1	2
06K ?H1		1	1
07K ?H-	1		
011K ?H-	1		
017K16H18	1		
018ac.K ?H12	1		
023K ?H15	1		
029K ?H-	1		
031K ?H4	1		1
031K ?H7			1
036K ?H5	1		
075K ?H5	1	3	3
076K ?H17		1	
083K ?H4			1
036K ?H5	1		
075K ?H5	1	3	3
076K ?H17		1	
083K ?H4			1
0100K ?H-	1	1	1
0103K ?H19	1	1	1
0125K70H30	1		
OK ?H- ¹		1	
0141K85H32		1	1
0 ?K ?H4			1
0 ?K ?H10		1	2
0 rough H-		1	1
Totals	19	12	20

Table I Number of serotypes of *Esch. coli* isolated from rectum and vagina preoperatively and from urine postoperatively in 20 patients

¹O antigen related to 0129

accordance with the international scheme proposed by Kauffmann (1944 and 1966).

Results

Twenty patients suffered from postoperative urinary infection due to *E. coli*. Table I lists the numbers of each serotype which were isolated from pre- and postoperative specimens.

Three patients yielded the same serotype from all three sites (Table II). In one other the same serotype 031K ?H4 was found in the rectal swab and the urine but not in the vagina. In two further patients the strains isolated from the urine and the rectum in each case gave the same biochemical reactions and had the same O and K structures; the H antigens were different (Table III).

Patient	Rectum, Vagina, Urine
A	0100K ?H-
B	0103K ?H19
C	075K ?H5

Table II Isolation of same serotype of *Esch. coli* from vagina and rectum preoperatively and urine postoperatively in three patients

Patient	Rectum	Vagina	Urine
D	02K ?H4	— ¹	02K ?H1
E	02K ?H4	—	02K ?H-

Table III Isolations of *E. coli* giving identical biochemical reactions and closely related serological reactions from preoperative rectal swabs and urine

¹— = No *E. coli* isolated

We have already met this kind of antigenic variation (Bettelheim and Taylor, 1969).

The seven patients in Table IV yielded identical types in the vagina and urine but a different one in

Patient	Rectum	Vagina	Urine
F	— ¹	0?K ?H10	0?K ?H10
G	—	0 rough H-	0 rough H-
H	017K16H18	0141K85H32	0141K85H32
J	023K ?H15	075K ?H5	075K ?H5
K	—	075K ?H5	075K ?H5
L	07K ?H-	06K ?H1	06K ?H1
M	01K ?H-	06K13H1	06K13H1

Table IV Isolations of same serotype of *Esch. coli* from vagina preoperatively and from urine postoperatively

¹— = specimen not taken

the rectum. In the remainder the types isolated from the three sites were apparently distinct (Table V).

The results are summarized in Table VI.

Patient	Rectum	Vagina	Urine
N	018acK ?H12	— ¹	083K ?H4
P	{ 02K ?H- 0125K70H30	—	06K13H1
Q	05K ?H4	—	01K ?H34
R	{ 02K ?H4 036K ?H5	076K ?H17	0?K ?H10
S	01K ?H7	—	04K3H5
T	029K ?H-	—	0?K ?H4
U	011K ?H-	—	031K ?H7

Table V Isolations of different strains of *Esch. coli* from vagina and rectum preoperatively and from urine postoperatively

¹— = no *E. coli* isolated

	No. of Patients
The same serotype in the urine and in both rectum and vagina	3
The same serotype in the urine and in the rectum	1
The same serotype in the urine and the vagina	7
The same biotype and related serotype in urine and rectum	2
The serotype in the urine different from that in rectum or vagina	7
	20

Table VI Association of serotypes causing urinary infection after operation with the presence of the same serotypes in rectum and vagina before operation

Discussion

While 13/20 patients in this series were shown to harbour the same or similar serotypes of *Esch. coli* in a site adjoining the urinary tract as that which caused a urinary infection, the mechanism of infection and the route by which it spread is still open to argument.

Testing these strains by biochemical methods added little information which was not provided by the serological classification.

No evidence of cross infection between patients was detected.

We thank Dr Chamberlain for clinical data.

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