

The origin of O serotypes of *Escherichia coli* in babies after normal delivery

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SUMMARY

A total of 2525 strains of *Escherichia coli* were isolated from the faeces of 33 mothers, the faeces of their babies and the mucus extracted from the babies' mouths after delivery. Of these strains 1832 could be O-serotyped with 150 O antisera. *E. coli* were isolated from 28 babies and the same serotypes as were found in their mothers were found in 22 of them. *E. coli* was isolated from only 14 of the mucus specimens but in 12 of these at least one of the serotypes present was subsequently found in the babies' stools.

INTRODUCTION

Babies have *Escherichia coli* in their stools within a few days of birth. Some of these organisms are thought to come from the mother's bowel at the time of delivery but their appearance in babies delivered by Caesarean section and the spread of entero-pathogenic strains of *E. coli* make it clear that intestinal organisms of this group can be acquired from other sources.

MATERIALS AND METHODS

Full clinical details of mothers and babies were recorded. An attempt was made to obtain stool specimens from mothers before delivery and from the baby on each day after delivery. Mucus was also sucked from each baby's mouth immediately after birth. Stools and mucus were sown directly on MacConkey's medium. A second culture on a MacConkey plate was made from the mucus after it had been incubated overnight with broth.

All plates were incubated overnight and from each at least ten colonies of *E. coli* were isolated and were O-serotyped using 150 antisera by the method described by Bettelheim & Taylor (1969).

RESULTS

Thirty-three babies and their mothers were studied. All the babies were delivered normally and Table 1 shows the origin of the 2525 strains of *E. coli* that were isolated from them and their mothers.

Table 1. *Distribution of strains of Escherichia coli*

Strains	Number of strains from			All three
	Mothers' stools	Babies' stools	Babies' mucus	
Typable with 150 O sera	622	987	223	1832
Not typable	154	151	2	307
Rough	145	215	26	386
Total	921	1353	251	2525

The babies were observed for an average of 7 days, and in this time 28 were found to have one or more strains of *E. coli* in the stool. In 22 the same serotype had been found in the mother's stool either before delivery (19 cases) or after delivery (21 cases). For the present study rough or non-typable strains were considered similar if they were found in specimens from one mother and her baby. Mucus was examined from 30 of the 33 babies and 14 of these samples contained *E. coli*. In 12 of these at least one of the serotypes present was found subsequently in the babies' stools, and in 11 of these 12 at least one of the serotypes was also found in the mother's stools (Table 2).

More serotypes were identified in mothers' stools than in babies' stools, 119 serotypes being identified from 32 mothers and 60 from the 28 babies whose stools were positive. The number of serotypes present in the babies appeared to be related to the presence or absence of *E. coli* in the baby's mucus. For the 14 babies with *E. coli* present in the mucus, 40 serotypes were identified in the stools compared with 19 serotypes for the 16 babies with no *E. coli* in the mucus. Only one of the five babies from whose stools no *E. coli* were isolated had the organism present in the mucus.

All the babies were given supplementary bottles and eight were breast fed, but this did not appear to be related. Of more interest was the finding that in the 11 babies from whom maternal serotypes were not isolated, the mean time from rupture of the membranes to birth was 157 min., as compared with 284 min. for the 22 babies from whom maternal serotypes were isolated.

DISCUSSION

Since Escherich (1885) first observed that, although sterile at birth, babies' stools soon contained bacteria, including *E. coli*, there have been many studies of the babies' faecal flora, and in recent years particular attention has been paid to the presence of entero-pathogenic strains.

The use of an almost complete set of *E. coli* O-sera has enabled us to identify almost certainly the same serotype in mother and baby in 22 of the 28 babies from whose stools we isolated *E. coli*. Our results therefore support and extend those of others (Nejedlá, Šrajbr & Lanc, 1967; Gareau *et al.* 1959; Rosner, 1966; Ironside, Brennan, Mandal & Heyworth, 1971) who have claimed that at least a proportion of the baby's strains come from the mother, probably at the time of delivery, and additional support for this view is given by the frequency with which we found

Table 2. *O*-serotypes in mothers and babies

Pt. no.	Mothers' stools	Babies'	
		Mucus	Stools
2	O 3, O 7, O 8, O 19, O 78, O 81, NT	O 3, O 78, O 81	O 3, O 81
17	O 18, O 71, O 81, R	O 81, O 147, R	O 71, O 81
21	O 10, O 18, O 58, R	O 10, O 18, O 58, R	O 18, O 58, R
27	O 27, O 40, O 108, R, NT	O 19, O 27, O 41, O 108, O 116, O 129, R	O 27, O 79, O 108, O 116, R, NT
35	O 11, R	O 11, R	O 1, O 11, R
1	O 1, O 8, O 102, NT	No specimen	O 1, R
7	O 42, O 96, R	No <i>E. coli</i>	O 20, O 42, R
15	O 4, O 12, R	No <i>E. coli</i>	R
19	O 1, R	No <i>E. coli</i>	R
26	O 1, O 46	No <i>E. coli</i>	O 1
31	O 9, O 16, O 129, NT	No <i>E. coli</i>	O 9
8	O 19, O 82, O 129, NT	No <i>E. coli</i>	No <i>E. coli</i>
20	O 6, R	O 6	No <i>E. coli</i>
28	O 22	No <i>E. coli</i>	No <i>E. coli</i>
12	O 145, R	No <i>E. coli</i>	NT
16	O 6, O 30	No <i>E. coli</i>	O 3
32	O 21, O 1	No <i>E. coli</i>	O 3
5	O 18, O 42, O 78, R	O 42, O 75, O 78,	O 19, O 42, O 75, O 78, O 117
18	O 1, O 25, O 48, O 71, NT	O 48, R	O 48, R
23	O 7, O 19, O 46, R, NT	O 19, O 75, R	R, NT
29	O 11, O 42, O 79, O 108, R, NT	O 86, O 108, R	O 42, O 79, O 86, O 34, O 41, R, NT
33	O 27, O 84, O 153, NT	O 2, O 27, NT	O 3, O 84, R, NT
37	O 25, R, NT	O 25	O 25, NT
6	O 7, O 8, O 38, O 184, R	No <i>E. coli</i>	O 38
10	NT	No specimen	NT
13	O 5, O 7, O 8, O 82, O 148, NT	No specimen	O 7, O 82
22	O 6, O 52, R	No <i>E. coli</i>	O 6
30	O 46, O 141, R, NT	O 15	O 141, NT
4	O 18, O 26, O 37, O 75, NT	No <i>E. coli</i>	No <i>E. coli</i>
14	O 4, O 50, O 52, O 147, R	No <i>E. coli</i>	No <i>E. coli</i>
3	O 3, O 9, O 16, O 18, O 79, O 106, NT	No <i>E. coli</i>	O 7, O 102
24	O 9, O 106, NT	No <i>E. coli</i>	O 3
25	No specimen	O 10	O 10

matching of the maternal faecal serotypes with those found in the mucus from the baby's mouth immediately after delivery.

Nine of our babies had serotypes in their stools that we did not find in the mucus in their mouths at birth or in their mothers' stools and on six occasions serotypes were found in the baby's mucus that we did not identify in the mother's stools. These may represent strains acquired in some other way but present methods do

not permit the identification of all serotypes in a stool (Bettelheim, Faiers & Shooter, 1972) and these strains may have been in the mother's bowel.

The study of babies delivered by Caesarean section appears to offer a chance to investigate some of the other sources from which newborn babies acquire their intestinal *E. coli*, and work on this is in progress.

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