ESCHERICHIA COLI GASTRO-ENTERITIS IN A MILITARY HOSPITAL

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EPIDEMIC infantile gastro-enteritis due to the specific serological types of *Escherichia coli* is the most infectious disease that is regularly admitted to hospitals in England, and there are at present no successful methods of preventing cross-infection by these organisms (Rogers, 1956). Jameson, Mann & Rothfield (1954) describe a large outbreak in which control was only achieved by complete closure of an infected ward.

This paper describes a small outbreak which originated in a military hospital. *E. coli* serotype 0.26 (not previously found in the area) was isolated from three cases and two symptomless excreters. Control was achieved by closure of the infected ward, although the adjacent maternity unit having the same staff was kept open. The purpose of this paper is to draw attention to an infection unusual in military hospitals and to describe control measures thought to be successful.

THE OUTBREAK

Three infants, one aged 9 months and two aged 3 months, were taken suddenly and severely ill almost simultaneously on the evening of Monday, 21st January, 1957. The babies were seen by one of us (R.M.C.) in their own homes and were found to be collapsed and dehydrated as a result of profuse vomiting and diarrhoea. They were admitted immediately to the local civil hospital where *E. coli* serotype 0.26 was isolated from all three next day. Treatment by fluid and electrolyte replacement and neomycin effected eventual cure. A fourth infant, aged 12 days, also developed severe diarrhoea and vomiting in its own home and was admitted to the civil hospital on 23rd January, 1957. This baby also recovered, but as no pathogenic organism was isolated from the faeces it may not have been a case of the same infection.

INVESTIGATIONS

Cases

All four babies had at one time been patients in the military hospital prior to the outbreak. The first three infants had been together in the families' ward, the fourth child had been in a separate ward in the maternity unit. Table 1 summarises the relevant data.
Escherichia Coli Gastro-Enteritis in a Military Hospital

Table 1. Details of the cases

<table>
<thead>
<tr>
<th>Families' ward</th>
<th>Date admitted military hospital</th>
<th>Date discharged military hospital</th>
<th>Date of onset of symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case 1</td>
<td>5 Jan.</td>
<td>15 Jan.</td>
<td>20 Jan.</td>
</tr>
<tr>
<td>Maternity ward</td>
<td></td>
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</tbody>
</table>

Incubation Period

All four babies were on artificial feeding, three being bottle fed and the oldest one on ordinary food. From Table 1, and from later information which indicated that case 2 may have caused the outbreak, an incubation period of between five and nine days is suggested in cases 1 and 3. Rogers (1956) states that within three to five days of admission of one ill baby other babies in the ward start to excrete the specific types of E. coli and in a few more days some of them are suffering from gastro-enteritis due to these organisms.

The sudden onset of symptoms is apparent in that cases 2 and 3 were taken severely ill within a few hours of discharge from hospital. They were of course clinically well when discharged earlier that day. The almost simultaneous onset in cases 1, 2 and 3 is of interest and might suggest spread of infection from one particular feeding incident.

Faeces from all the medical, nursing and other staff were investigated by the laboratory and an adult female hospital cleaner was found to be excreting E. coli of the specific serotype. This cleaner's duties brought her in close contact with the babies in the infected ward. Two older children in the ward at the same time as the babies remained negative. The families of all three babies were investigated bacteriologically. An eight-year-old brother of case 2 was found to be excreting E. coli of 0.26 serotype also. This boy had no contact with his brother after the latter entered hospital. It was considered likely that the outbreak originated in this family, the symptomless excreter infecting his brother who brought the infection into the military hospital and passed it on to the other babies and to the adult excreter. That the adult excreter was probably secondarily infected was supported by her statement that both she and her husband suffered a mild attack of diarrhoea about 14th January. If this is so it would point to a three-day incubation period in her case, but this evidence is inconclusive as neither she nor her husband was certain about the actual date of onset. The latter had no contact with the hospital and was probably infected by his wife, although his stools were negative, as were those of the other two children in this family. Laboratory investigations in this family were carried out some days after the outbreak and it is possible that this family had overcome their infection, the two children having had a symptomless attack at an earlier date.

To summarise the laboratory investigations, out of 58 persons examined...
bacteriologically, \textit{E. coli} type 0.26 was recovered from three cases and from two symptomless excreters.

**PREVENTION AND CONTROL**

The infected ward was closed immediately and thorough disinfection was carried out. The adjoining maternity ward was not closed. The two remaining patients, both older children, were removed to another ward and were put on prophylactic sulphasuccidine. The doctors, nurses and other staff connected with the infected ward were also put on sulphasuccidine, as were the mothers and new-born babies in the adjoining maternity unit. It was considered that this was justified in that it might prevent the further spread of infection and also modify the severity of any subsequent infection in the infants. Fortunately no further cases occurred, probably largely due to the prompt closure of the infected ward. Neomycin (Rogers \textit{et al.}, 1956) would probably have been the prophylactic of choice, but it was not immediately available. This drug was used in treating the two symptomless excreters subsequently discovered. In the case of the adult excreter, sulphasuccidine was used for a week, a negative stool specimen was then obtained, but the specific serotype was isolated again a few days later. She was then put on neomycin and has remained negative. The boy excreter was successfully treated with neomycin from the start and has subsequently remained negative. The three babies were treated with neomycin in the civil hospital and remained free from infection on their return home.

Strict barrier nursing technique was introduced throughout the military hospital with particular attention to mask and gown drill, preparation of babies' feeds, laundry arrangements and disposal of soiled clothing and excreta. These measures were especially important in the maternity unit where it was not possible to maintain a separate nursing staff whose duties would be confined to that unit only. That no further cases occurred must be a tribute to the prompt action and the will with which preventive measures were carried out by all concerned.

**DISCUSSION**

Control measures put into effect immediately were:

1. No further patients admitted to the families' ward in which the cases had originated. This ward was then closed and disinfected.

2. Prophylactic treatment for infants in adjoining maternity ward.

3. Bacteriological investigation of patients, infants and all staff, with treatment and isolation of excreters.

4. Bacteriological investigation of family contacts of cases.

The detection of a symptomless excreter among the staff handling infants almost certainly prevented spread to the maternity ward, as also did closure and disinfection of the families' ward.
The use of chemoprophylactic drugs seemed justified, although neomycin, the drug of choice (Rogers, 1956), would have been used had it been available initially. The general finding that hospital cross-infection by these organisms is not preventable by present methods is a serious matter. Rogers (1956) suggests specially designed cell units for each child in the ward, each with its own equipment. In effect he is suggesting that each cell should be an isolated unit. In practice the staffing and administration required to achieve this optimum is probably beyond the resources of most military hospitals. A large nursing staff is an essential prerequisite to effective barrier-nursing. In this connection Rogers draws attention to the tendency of senior members of the medical profession to ignore barrier-nursing rules. It is, of course, essential that all doctors should observe the rules and set an example if the system is to be effective.

The risks of cross-infection in bottle-fed babies are well appreciated nowadays. McFarlan et al. (1949) found coliform organisms more frequently in the bacterial flora of the throats of artificially fed infants than of those entirely breast fed. In this outbreak it is thought that infected feeds may have started the outbreak. The prevention of cross-infection must depend very largely on an efficient milk kitchen. Ramsay (1955) defines the optimum requirements and these are well worth repeating:

(a) The nurse responsible for the feeds for 24 hours should not enter the ward until her duties in the milk room are complete for the day.

(b) Feeds when assembled should be autoclaved for 30 seconds at 10 lb. pressure.

(c) Feeds should be transferred then to a refrigerator and should remain there until just before use.

(d) Bottles should then be reheated to blood heat.

(e) The rubber cover over the teat should only be removed before the bottle is given to the baby.

Factors precipitating an outbreak, once infection is introduced, are not understood, but Rogers (1956) states that an attack of enteritis in a baby excreting one of the specific types of *E. coli* is often precipitated by a change of diet or by a super-added respiratory tract infection. In the present outbreak the latter factor was operative in all three cases.

In view of the difficulty of controlling spread of these infections in an infants' ward the exclusion of excreters from a clean ward merits consideration, although it is not usually practicable except in large hospitals.

In the Surrey area 22 of 1,044 (2.1 per cent) of children up to five years old admitted to day nurseries were found to be excreting *E. coli* specific serotypes (Cook, 1957). The incidence among well children in other areas may be higher.

The importance of immediate bacteriological examination of any patient with gastro-intestinal symptoms is emphasised.
SUMMARY
An outbreak of infantile gastro-enteritis due to *E. coli* serotype 0.26 in a military hospital is described.
Immediate preventive measures confined the outbreak to three cases and two excreters.
Some problems of cross-infection and methods of prevention are discussed in relation to children's wards in military hospitals.

We are indebted to Dr. G. H. Tee, of the Dorchester Public Health Laboratory, who carried out the bacteriological investigations.

REFERENCES


Book Reviews

**FLUID BALANCE IN SURGICAL PRACTICE.** By L. P. Le Quesne, D.M., F.R.S.C.

The second edition of this very useful and instructive book has appeared. Excellent as the first edition appeared to be, it is apparent that this new edition is even better. Fluid balance has become all important in the management of surgical cases and it should be understood by all who have in their hands the care of such patients. This book should be in the possession of every surgeon, surgical registrar and house surgeon, not only as a book of reference but for essential study.

A. G. D. W.


This is now the eleventh edition of this book and so speaks for itself. Moreover, it is the work of an elder surgical statesman who is very active and very much to the fore. It is full of the wisdom of experience on a subject important to all practitioners and not least to the surgeon himself, although the author only recommends it to students, house officers and general practitioners. The new additions to the illustrations and radiographs increase the value of this book which should be available to all who practise medicine with the patient.

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