

incidence of *Bact. coli* D 433 must include all positive results irrespective of the presence of symptoms. Sixty babies were examined and 17 of them were found to be excreting *Bact. coli* D 433 on one or more occasions in the course of a year. It appears that the frequency of isolation of *Bact. coli* D 433 is related to the number of times the infants were examined (Table II). However, the relatively high incidence among babies examined on twelve or more occasions may equally well be due to the length of their stay in the same semi-closed community resulting in an increased risk of exposure.

In many intestinal infections some susceptible children may excrete the causative organism for a short period without developing symptoms. Prolonged excretion without symptoms is, however, unusual. In the course of this investigation five infants were found to be excreting *Bact. coli* D 433 in large numbers for three weeks or more and yet did not develop symptoms. One further infant had very mild symptoms due to feeding difficulties during a long period of excretion. The ages of these six infants at the time were 4, 8, 8, 12, 16, and 20 weeks. Adequate past histories were obtained for all these children and only one had had infantile diarrhoea and vomiting. She was under observation in the home at the time and was not excreting *Bact. coli* D. 433. Breast-feeding is widely accepted as affording a degree of protection from infantile diarrhoea and vomiting, but none of these six infants was breast-fed at the time of excreting the organism and four of them had never been breast-fed. Eleven infants developed infantile diarrhoea and vomiting during the year, but only five of them were excreting *Bact. coli* D 433.

These findings, and the fact that 11 of the 17 children excreting the organism did not develop symptoms at the time, do not support the hypothesis that there is an aetiological connexion between *Bact. coli* D 433 and infantile diarrhoea and vomiting, though they are compatible with such a theory. However, the figures of previous workers summarized in Table VI strongly suggest some such connexion unless an alternative explanation of the very high incidence among ill children is found. It has already been suggested that the incidence among healthy babies may be higher than earlier results have shown. The present methods of isolating the organism cannot be considered satisfactory, and in the absence of selective media it is probable that scanty infections might be missed.

In this survey the organism was not isolated from any infant for more than four weeks at a time. The strain then died out or was present in the faeces in insufficient numbers to be detected. In the latter case it is possible that the appearance of the organism in the home in May was not due to a fresh introduction from outside, but to its persistence in small numbers in the stools of one or two children. In this event some unknown factor may have caused rapid proliferation of the organism. The fact that three of the four babies excreting the organism in May are known to have previously excreted it in February and March might be regarded as supporting this suggestion. No evidence of the possible nature of this factor was found. It is not necessary for the stools to be loose for the organism to flourish. Further work is necessary to determine whether such a factor exists.

The part played by *Bact. coli* D 433 in the aetiology of infantile diarrhoea and vomiting remains uncertain, but it has been shown that an outbreak of infantile diarrhoea and vomiting did not follow the spread of the organism among a group of infants, the majority of whom were presumed to have been susceptible to the disease.

### Summary

A clinical and bacteriological investigation of infants in a residential home was carried out for a period of one year. Sixty infants came under observation.

A specific serological type of *Bact. coli* identified as D 433 (Taylor *et al.*) was isolated from 17 infants on one or more occasions. Eleven of these infants had no symptoms, one had slight symptoms associated with feeding difficulties, and five had infantile diarrhoea and vomiting. Six infants developed infantile diarrhoea and vomiting in the absence of *Bact. coli* D 433.

At one time as many as 10 out of the 15 infants in the home were excreting *Bact. coli* D 433, but no outbreak of infantile diarrhoea and vomiting occurred.

The aetiological relationship between *Bact. coli* D 433 and infantile diarrhoea and vomiting is discussed.

We are indebted to Dr. Joan Taylor for identifying the first five strains of *Bact. coli* D 433 reported in this paper, for confirming the identity of strains isolated subsequently, and for the supply of agglutinating serum. Our thanks are due to the matron and staff of the home for their whole-hearted co-operation.

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## BACT. COLI D 433 IN CASES OF DIARRHOEA IN ADULTS

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Recent investigations concerning the causal factors of diarrhoea and vomiting in infants have indicated that the disease is very often associated with the presence in the intestine of a particular variety of *Bact. coli*. An organism of this nature (*Bact. coli* var. *neapolitanum*) was isolated by Bray (1945) from over 90% of cases of summer diarrhoea; Giles and Sangster (1948) isolated a similar organism from over 90% of cases occurring in an outbreak in 1947. Taylor *et al.* (1949) described the isolation of a non-motile variant of *Bact. coli* (D 433) from a large number of cases occurring in eight outbreaks of infantile diarrhoea and vomiting, and identified this organism with that previously isolated by Giles and Sangster.

In order to investigate strains of *Bact. coli* encountered in this laboratory from cases of infantile diarrhoea and vomiting, D 433 antiserum was kindly supplied by Dr. Joan Taylor. At the time the investigation was begun, however (April, 1949), there were few cases of infantile gastroenteritis, and it was decided in the first place to confine attention to adults and establish a routine method of procedure which could be used in the summer months if and when outbreaks developed.

### Procedure

Specimens of faeces arriving at the laboratory for routine investigation were inoculated on to blood agar, MacConkey, and Difco "bacto S.S." agar. The plates were inoculated

by the usual stroke method and incubated overnight. The following morning two colonies of coliform organisms from each plate were picked off into peptone water and incubated at 37° C. for six hours—that is, six colonies from each specimen of faeces were isolated. From the peptone waters the routine sugar media and an agar slope were inoculated and incubated for 18 hours; the agar slope growths were then tested by slide-agglutination against D 433 antiserum.

In this way coliform organisms from the faeces of 72 adults were examined over a period of several weeks, and it was with some surprise that positive slide-agglutination reactions were obtained with two cases on the first day of the investigation. Further positives were encountered within a few days, and over a period of three weeks a total of 14 was reached. Brief details of these cases are

in contact with young infants to a greater extent than men, and thus are more prone to infection from, or to infect, babies than are males.

3. Of three patients with jaundice, two had definite liver damage.

4. So far as could be ascertained, none of the patients had direct contact with young infants, and no cases of "gastro-enteritis" could be traced to their homes. In the series described by Taylor *et al.* (1949), D 433 was recovered from the faeces of 4 out of 84 adult contacts of infantile diarrhoea and vomiting. None of these four cases had suffered any intestinal upset.

While it cannot be stated that D 433 is a likely cause of the diarrhoea in even some of these 14 cases, it may be that the reverse is true—that is, that the washing-down

#### Details of Cases

Case No.	Sex	Age	Clinical Notes	Diagnosis	D 433 Isolated	Contact with Children
1	F	25	Admitted 12/3/49. Diarrhoea 7 weeks' duration. Jaundice developed 6/4/49. Died 26/5/49	P.M. "Intestinal polyposis. Carcinoma of duodenum with secondary spread" Gastric ulcer	2/4/49	Not known
2	M	69	Admitted 15/3/49. Cough, haemoptysis, diarrhoea 3 weeks. X-ray showed gastric ulcer. Partial gastrectomy. Discharged 19/8/49		2/4/49	None
3	F	72	Admitted 21/2/49. Jaundice. Diarrhoea developed in hospital. Discharged 1/6/49	Infective hepatitis	4/4/49	None (nor with other cases of this series)
4	F	53	Admitted 11/2/49. Diabetes and diarrhoea. Discharged 30/4/49. Readmitted 16/6/49. No diarrhoea. Discharged 12/7/49	Diabetes mellitus	4/4/49	Not known
5	F	30	Admitted 3/4/49. Pregnant. Diarrhoea. Slight bronchitis. Discharged at own request 9/4/49	Bronchitis	5/4/49	One child aged 4 years. Well
6	M	50	Indian seaman. Admitted 29/3/49. Pneumonia; jaundiced; slight diarrhoea. Discharged 11/5/49	Lobar pneumonia	5/4/49	None
7	F	12	Vomiting and diarrhoea for 24 hours. Temperature 104° F. (40° C.). Speedy recovery	Enteritis. ? food-poisoning	12/4/49	Not known
8	F	72	Admitted 23/3/49. Diabetes and diarrhoea, with severe colic. Discharged 1/7/49	Diabetes mellitus	13/4/49	None
9	M	42	Admitted 24/3/49. Diarrhoea for several weeks; blood and mucus for 6 days. Died 17/4/49	Ulcerative colitis (no necropsy)	13/4/49	2 children—6 and 8 years. Well
10	F	5	Admitted 10/4/49. Abdominal pain, diarrhoea, and vomiting. Discharged 7/5/49	Mild appendicitis	14/4/49	Not known
11	F	12	Admitted 4/4/49. Acute rheumatism with diarrhoea	Acute rheumatism	14/4/49	" "
12	F	59	Admitted 5/1/49. Diarrhoea with blood and mucus; rheumatoid arthritis. Discharged 7/6/49	Non-specific "dysentery"	18/4/49	None
13	F	43	Admitted 11/3/49. Asthma and severe diarrhoea for several days. Discharged 22/6/49	Asthma; colitis	18/4/49	Not known
14	F	23	Admitted 20/4/49. 28 weeks pregnant—vaginal bleeding. Diarrhoea 2 days. Slough of bowel passed 25/4/49	Pregnancy; colitis	21/4/49	2 children—3 and 2 years. Well

set out in the Table. The 14 strains isolated were sent to Dr. Taylor for confirmation; all 14 were identified as *Bact. coli* D 433. No members of the *Salmonella* or *Shigella* groups were isolated from any of these patients.

Further investigations were carried out during May, 1949, but no more instances of D 433 in adults were encountered. Pressure of work unfortunately made it impossible to continue the work during the summer months. During September and October over 60 more cases of adult diarrhoea were investigated, with negative results so far as the isolation of D 433 was concerned.

#### Discussion

These brief notes are not intended to be in any way the results of exhaustive research, but are presented merely to draw attention to a possible reservoir of *Bact. coli* D 433. It is difficult to assess the importance, if any, of the present findings, but it is thought that the following points may be of interest.

1. All the patients had diarrhoea. In some it was of trifling severity, but was marked in others. Several of the latter, notably Cases 1 and 9, were the seat of pathological processes which could explain the diarrhoea without the intervention of an infective agent.

2. Eleven of the patients were females. In such a small series it is to be doubted if much significance can be placed on this finding, but there remains the fact that women are

effect of the diarrhoea caused the organism to be present in the faeces. This suggests the possibility that D 433 is a normal inhabitant of the adult duodenum or jejunum, and would to some extent explain the presence of the organism in cases of such diverse diagnoses.

I wish to thank Dr. Joan Taylor for her interest and help during this investigation; my thanks are also due to the medical superintendents of Stobhill and Southern General Hospitals, Glasgow, for permission to make use of the clinical details of the patients concerned.

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In recent years evidence has accumulated of the rapid external corrosion of cast-iron and spun-iron pipes used for water supply, especially those laid in clay subsoils containing sulphates. In view of the large number of bursts and premature replacement of mains which had resulted, the Minister of Health set up a Departmental Committee in December, 1948, to investigate the matter. This committee has now issued its *Interim Report of the Departmental Committee on the Deterioration of Cast Iron and Spun Iron Pipes* (H.M.S.O., 3s. 6d.). It covers the scientific and technical aspects of corrosion, deals with the extent of the problem and its implications, and suggests measures for protecting pipes in areas where the soil formation is known to be corrosive.