It has been thought that blood transfusion may perpetuate or restart the bleeding, but the incidence of recurrent bleeding has actually fallen since the introduction of drip transfusions and it has not been the experience in this series that they do restart the bleeding. It has been argued that blood transfusion may raise the blood pressure. Drip blood transfusions do not increase the blood pressure more than would occur without transfusion (Avery Jones, 1939a). There does not appear to be any reliable evidence that subsequent haemopoiesis is depressed by transfusion, and the risk of transmitting infective hepatitis, syphilis, or malaria is very small.

Against these arguments are cogent reasons for giving drip blood transfusions. Death from bleeding does not occur quickly in most cases, but follows two, three, four, or more brisk recurrent bleedings in as many days. Therefore there is time to replace lost blood by drip transfusion even if given at the rate of 540 ml. in four hours. If the blood lost is replaced, and if the haemoglobin level is maintained above 40–50%, the patient is in a much better position to withstand further bleeding, should it occur.

If the blood loss is by slow oozing it is quite feasible to keep pace with the bleedings by drip transfusion. If surgery becomes necessary the patient can be maintained at a much safer level than if no transfusions were given. Once the haemoglobin is below 30% there is a risk of anoxaemic manifestations with disorientation, restlessness, particularly at night, and lack of co-operation. Such manifestations may well induce a vicious circle, as the patient becomes intolerant of further transfusion and nursing. Cerebral anoxaemia is particularly serious in elderly patients, and a short period may induce irreversible cellular changes which cause coma and death. Occasionally a severe initial collapse, with great reduction of the circulating blood, may lead directly to a state of profound and persistent oligoemic shock and death, which might have been averted if the restoration of the blood volume had been assisted.

Again, severe anaemia will cause a sharp increase in the output of the heart (Sharpey-Schafer, 1945), and the accompanying high venous pressure may induce cardiac failure and oedema, and in the presence of these phenomena the risk of transfusion will be considerably increased. If the patient becomes severely anaemic he may be considerably distressed from headache, and his intense pallor is an added anxiety for the medical staff and relatives. Lastly, there is the small risk of permanent amaurosis, which may follow recurrent bleeding in an anaemic patient.

The available evidence supports the use of blood transfusion, but a bias in favour of transfusion must be exerted with discretion and not enthusiasm. All possible measures must be taken to minimize the known risks. Women in the reproductive period of life should be Rh-tested; severely anaemic patients should be under constant supervision during the transfusion and a watch kept on the jugular veins (with the patient propped up) and on the pulse rate. Blood should be cross-grouped, and the bottle carefully inspected before use. The same blood group should be employed whenever possible. The experience of this series has shown that blood transfusion is a most valuable therapeutic aid in the management of gastro-duodenal haemorrhage. If it is given as a drip transfusion the patient can often be maintained at such a level of haemoglobin that he is able to withstand any further bleeding without developing anoxaemic manifestations. In view of the work of Sharpey-Schafer it is clearly desirable to maintain the haemoglobin above 40%, and secondary cardiac embarrassment may thereby be avoided. The patient is spared the headache of severe anaemia, and the risk of amaurosis is minimized. The risk of acute cardiac failure

from careful transfusion is considerably less than that of leaving the patient's haemoglobin below 40% when bleeding may recur.

Transfusions have been given with the M.R.C. blood transfusion set, and in very few cases has it been necessary to cut down on a vein. Usually 540–1,080 ml. has been transfused in four to eight hours, but on occasion 1,620–3,240 ml. has been given continuously at the same rate. Except in a few collapsed patients, the blood has never been given quickly. One patient died, possibly as the result of the transfusion, but necropsy revealed the presence of coronary infarction. On the other hand, in several patients insufficient transfusion undoubtedly contributed to their death. Minor reactions, slight jaundice, and urticaria have occurred in a very small minority of cases.

[The second lecture, with a list of references, will appear in our next issue.]

GASTRO-ENTERITIS OF UNKNOWN AETIOLOGY

AN OUTBREAK IN A MATERNITY UNIT

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In recent years increasing attention has been paid to a form of gastro-enteritis for which, despite improved methods of laboratory diagnosis, no known cause has been discovered. A number of such outbreaks have been described in this country,^{1–10 18 19} the U.S.A.,^{11–16 20} and on the Continent.^{17 21} The diagnosis depends on the recognition of a distinctive clinical picture differing from bacterial gastro-enteritis, on the presence of an epidemic, and on negative laboratory findings.

These outbreaks, excluding "epidemic diarrhoea of the newborn,"^{23 24} can be divided into two categories with rather different symptoms. On the one hand there is the epidemic nausea and vomiting described by Rischel,¹⁷ Miller and Raven,¹⁸ and Bradley,¹⁹ in which diarrhoea is not a predominant symptom; into this group falls, possibly, the less well defined "winter vomiting disease" of American observers.^{15 16 20} On the other hand there is a variety in which diarrhoea is the most striking and constant symptom, as exemplified in outbreaks described by Smith and Davies,¹ Brown, Crawford, and Stent² in this country, and by Reimann *et al.*¹³ and other observers^{11 12 14} in the United States.

This paper is concerned with the second type of illness, characterized by diarrhoea of abrupt onset, with frequent watery stools of a yellowish-grey colour without macroscopic blood or pus. Fatal cases have not been reported among adults, but the fatality rate among infants is variable.

Epidemiologically, though most of the outbreaks reported have occurred in selected groups in institutions, both sexes and all age groups are susceptible, the incubation period is short, and the outbreak tends to be of the protracted rather than of the explosive "food-borne" type. The attack rate is often high in semi-closed communities and the disease is particularly troublesome in maternity wards. The outbreaks have a variable seasonal incidence. That described by Smith and Davies¹ was in the autumn

and winter months, but during 1944-6 outbreaks starting during the summer months seem, from a limited number of published reports¹⁻⁶ and other sources,⁷⁻⁹ to have been more common (see Fig. 1).

FIG. 1.—Seasonal incidence of outbreaks of gastro-enteritis. — = Period of outbreak. HHH = Exact date not stated.

In the absence of an outbreak the mildness of the disease makes its detection in the general population difficult, for probably many patients do not require medical aid. The replies of general practitioners in the Salford area to the circular of Brown *et al.*² suggest that an outbreak of the disease in an institution is a reflection of its increased incidence in the surrounding population. The correspondence,³⁻⁶ following the report of Brown *et al.*² from general practitioners and other doctors living in various, sometimes widely separated, localities indicates that the disease was widespread throughout the country during 1945, and it is probable that it was also prevalent during 1946. The present account deals with an outbreak in an Oxford maternity unit.

The Outbreak

On Aug. 26, 1946, the medical officer of health and the Public Health Laboratory, Oxford, were asked to investigate an outbreak of diarrhoea and vomiting in the maternity section of an Oxford hospital. The hospital is mainly for the care and treatment of the aged and chronic sick, but part of it is used as temporary accommodation for a maternity unit run by the Oxford City health services.

The unit is housed on the first and second floors of one of the buildings and consists of seven rooms containing one to six beds, an admission ward, a nursery, labour ward, kitchen, and lavatory accommodation. The number of beds available in the unit is 26, and the staff consists of five midwives, six assistant nurses, and three domestic workers. The outbreak, which has involved patients, babies, and staff, and on occasion home contacts of these persons, started on July 7 and continued at the time of writing (June 25, 1947).

Clinical Aspects of the Disease in Adults.—The relative frequency of symptoms and signs and the mean duration of diarrhoea observed in a number of patients are summarized in Table I. The first indication of illness was usually diarrhoea of acute onset, with the passage of eight to ten stools in 24 hours in cases of moderate severity. The stools were unformed, very watery, free from blood and pus, resembled "milky tea"

TABLE I.—Symptoms and Signs in Adult Gastro-enteritis Patients

	Group A	Group B
Total No. of ill persons ..	23	35
Headache ..	No record	14 (40%)
Epistaxis ..	"	2 (5%)
Nasopharyngeal congestion ..	"	4 (11·3%)
Nausea ..	12 (52%)	17 (48·6%)
Giddiness ..	No record	6 (17·1%)
Vomiting ..	9 (39%)	14 (40%)
Diarrhoea ..	23 (100%)	35 (100%)
Abdominal colic ..	4 (17·3%)	23 (65·7%)
Temperature above 99° F. (37·2° C.) ..	10 (43·5%)	12† (41·4%)
Mean duration of diarrhoea ..	3·7 days (2-5 days)	3·9 days (1-7 days)

Group A = data from case records (July and August, 1946).

Group B = patients and six members of the staff interviewed by investigators (August to October, 1946).

* One patient had both symptoms.

† Of 29 cases in which temperature was recorded.

in colour, sometimes contained mucus, and were very offensive in smell. The vomiting was usually of short duration and the temperature rarely exceeded 100° F. (37·8° C.). Direct questioning revealed respiratory symptoms in five out of the 35 patients, one having epistaxis, three nasopharyngitis, and one both symptoms (Table I); the true relation between respiratory and intestinal symptoms was indefinite.

Diarrhoea and Vomiting Among the Newborn.—The clinical condition of the infants was particularly difficult to assess because of the mildness of the symptoms. Study of the ward records revealed three varieties of bowel action: (a) passage of a formed or semiformed yellowish stool after each feed (well); (b) increased frequency of defaecation associated with the passage of looser yellow stools necessitating more frequent changes of napkin (Class I); and (c) passage of a loose, green, slimy, offensive stool, associated with increased frequency of defaecation and sometimes excoriated buttocks (Class II). The incidence of these grades of bowel activity in the infants of well and ill mothers is recorded in Table II

TABLE II.—Incidence of Disease among Infants of Ill and Well Mothers

Infants	No. of Infants associated with		Total
	Ill Mothers	Well Mothers	
Class I ..	19 (21·6%)	29* (23·9%)	48
Class II ..	42 (47·7%)	24† (19·8%)	66
Well ..	27 (30·7%)	68‡ (56·2%)	95
Total ..	88	121	209

NOTE.—One pair of twins equals one child for purpose of table, as each twin in the two pairs reacted in the same way as its sibling.

* Includes the infants of eight mothers who had diarrhoea after discharge from hospital and of two mothers with "doubtful" symptoms.

† Includes the infants of seven mothers who had diarrhoea after discharge from hospital and of two mothers with "doubtful" symptoms.

‡ Includes the infants of 10 mothers who had diarrhoea after discharge and of 12 mothers who had "doubtful" symptoms.

and their significance is assessed in the discussion. For convenience and brevity infants with Class II bowel signs are described below as suffering from gastro-enteritis. Such infants never became severely dehydrated, nor was their eventual progress affected.

Epidemiology.—The majority of patients were delivered soon after admission, but there was some contact at meal-times between cases awaiting delivery for any length of time and those about to be discharged. Infants spent most of the day in cots by their mothers' beds, and at night were transferred to a common nursery on the second floor. Washing, changing, and supplementary feeding were carried out in the nursery, and there was necessarily some contact between infants from different wards. An analysis is made below of the epidemiological data for all patients admitted during the period July 4 to Nov. 29, 1946, inclusive. During this period 216 women were admitted, of whom 209 gave birth to viable infants (207 single births and two pairs of twins).

The outbreak, which continued until the unit was closed on Nov. 29, was apparently started by the admission to the unit on July 4 of a patient suffering from slightly relaxed and offensive stools, which became more frequent and watery during the next three days. Fig. 2 shows the daily incidence

FIG. 2.—Daily incidence of new cases of gastro-enteritis among adult patients and staff, and daily number of admissions to the unit. A=Overt cases among maternity patients. B="Doubtful" cases among maternity patients. C=Cases among staff. D=Admissions of maternity patients.

of new cases among adult patients and staff and also the daily number of admissions to the unit during the period. In this figure the adult patients have been divided into overt and "doubtful" cases: the symptoms of the latter were so slight—consisting merely of a few loose stools on one day only—that it was difficult to know whether they were suffering from a bowel disturbance of a non-infective nature or were cases of true but mild gastro-enteritis. The staff in the unit at the start of the outbreak succumbed in the first weeks, the cases during the last months being new recruits who generally became ill within ten days of joining. Fig. 2 does not include "illness" among the babies, the first of whom became ill on July 11. The subsequent daily incidence of new cases among the babies resembled that of the mothers.

Attack Rates among Adult Patients and Staff.—The attack rate of all adult admissions during the period July 4 to Nov. 29 was 52.3%, including those patients whose illness began after discharge. The number of attacks per 1,000 patient-days of exposure for each of the five months was: July, 41.6; August, 46.4; September, 60.8; October, 93.3; November, 83.3. Of 211 infants born between July 4 and Nov. 29, 68 (32.2%) had gastro-enteritis. The nursing and domestic staff also experienced a high attack rate: of 32 persons employed during the period July to November, 21 (65.6%) had gastro-enteritis. Second attacks, one and two months after the first, were experienced by two members of the staff.

Relation of Onset of Diarrhoea to Day of Admission.—The majority of cases of gastro-enteritis among the mothers began between the fifth and ninth days after admission, the shortest and longest periods observed being three and 18 days. The usual length of stay in the unit was nine to 14 days for healthy women, and it was evident that some patients must have been discharged before the beginning of their illness. A "follow-up" in co-operation with the Oxford Health Visitor Service of 94 patients discharged during the period July 4 to Nov. 29 revealed that in 25 (26%) gastro-enteritis had started not later than three days after discharge.

Incubation Period.—Patients did not develop gastro-enteritis in less than three days after admission, and those discharged in the incubating stage of the malady were sometimes at home for a period of two days before having symptoms. In a sample of 216 persons some must have been infected very shortly after admission and on the day of their discharge. Hence the shortest period between admission and onset and the longest period between discharge and onset should approximate to the incubation period. These considerations suggest that the incubation period was two to three days. This estimate agrees in general with that deduced from "single contact" episodes involving the families of sick maternity patients and staff.

Time Relation of Illness in Mothers and Infants.—Fig. 3 has two curves: one (A) showing the number among 66 infants

FIG. 3.—Time relation of gastro-enteritis in mothers and infants. A=Number among 66 infants. B=Number among 87 mothers starting gastro-enteritis on each day after delivery.

and the other (B) the number among 87 mothers starting gastro-enteritis on each day after delivery. It will be seen that the onset of gastro-enteritis in the infants was, in general, earlier than that in the mothers, for curve A reaches a peak some three days before curve B. In the group of 42 mothers and infants with gastro-enteritis the onset in the infant was either before (22), simultaneous with (5), or after (15) that in the mother.

Gastro-enteritis Among Families of Maternity Patients.—Table III shows the number of patients in various categories whose discharge from the maternity unit was followed within a month by one or more familial cases of gastro-enteritis. There is a marked difference between the number of families having gastro-enteritis cases when the returning patient had

TABLE III.—Gastro-enteritis (G.E.) Among Families of Maternity Patients

Patient's Status Inside Hospital	Total	Followed Up	Families with One or More Cases of G.E. Within a Month of Return of Patient
Overt G.E.	88	83	13 (15.6%)
Doubtful G.E.	19	15	2 (13.3%)
Well	109	69* 25†	1 (1.4%) 6 (24%)
Total	216	192	22

* Remained well after discharge. † Developed gastro-enteritis after discharge.

had diarrhoea in the hospital (15.6%) or shortly after discharge (24%), and the number of families in which the returning member had never had symptoms (1.4%). A difference of the size of that existing between the families of the healthy patients and of patients who had gastro-enteritis in the maternity unit is unlikely to have arisen by chance alone ($\chi^2_{ Yates} = 7.48$, $N = 1$, $P = < 0.01$).

Several conclusions can be drawn from the occurrence of secondary familial cases. First, the number of patients who "caused" secondary familial cases was a small proportion of the total sick patients discharged from the unit (Table III). Secondly, familial contact cases were more frequent when the time between onset and discharge in the primary case was short, but periods up to 10 days were occasionally observed. Thirdly, the period between onset in the primary and in the first secondary case was variable and lay between four and 29 days, figures which include the incubation period of the secondary case. These data indicate that the period of infectivity in some patients is certainly as long as 10 days and possibly as long as 26 days.

Gastro-enteritis in the Rest of the Hospital.—A few sporadic cases of gastro-enteritis occurred in the chronic sick wards of the hospital, but the incidence of the disease was much greater in the maternity unit; for this reason spread of the disease by food from the central kitchen supplying the whole hospital seemed unlikely. Milk and water supplies to the maternity unit were sampled and did not show evidence of faecal pollution.

Control Measures.—Control measures, in the absence of exact knowledge of the mode of spread of the disease, were necessarily limited to ordinary hygienic precautions. Incoming patients were asked about outside contact with the disease and were kept separate from those about to be discharged. Recently delivered patients were admitted to wards on the so-called "Boston" system, and, when possible, gastro-enteritis patients were transferred to the local isolation hospital and ward contacts isolated. Babies with gastro-enteritis were removed from the nursery and kept by their mothers' beds. The administration of mepacrine prophylactically and also therapeutically did not affect the occurrence of new cases in the unit—an experience contrary to that of Freedman.¹⁰ The limited isolation accommodation available and the lack of staff specifically trained in barrier nursing made the application of control measures difficult, but even when such measures were rigidly enforced in a local isolation hospital four members of the nursing staff were cross-infected from a newly admitted maternity patient.

On Nov. 29 the medical officer of health, Dr. G. C. Williams, closed the home to new admissions, it being completely empty from Dec. 6 to 21. This decision had not been taken earlier because of the difficulty of arranging alternative accommodation for patients awaiting admission. During the period of closure fumigation and structural alterations were made, but in spite of these measures further cases of gastro-enteritis occurred 10 days after the home was reopened.

Laboratory Investigation.—The stools, usually obtained within one day of collection, were examined as follows:

Microscopical Examination.—A small piece of faecal material was suspended in a mixture consisting of equal parts of 1% eosin and iodine and examined for pus cells, red blood cells, ova, and cysts.

Culture.—All stools were plated direct on to desoxycholate-citrate agar and on to Wilson and Blair's medium. In addition a large loopful of a liquid stool or of a broth suspension made from a solid stool was inoculated into Kauffmann's tetrathionate broth and into selenite-F. After 18 to 24 hours' incubation a loopful from each of these enrichment media was plated out on both desoxycholate-citrate agar and Wilson and Blair's medium.

As some of the earlier specimens failed to produce growth on the selective media used, all stools were subsequently streaked on to MacConkey's medium. Many of the stools were also inoculated on to blood-agar plates and incubated aerobically and anaerobically.

Results of Stool Examinations.—Stools were examined on 77 occasions from 55 patients—namely, 40 mothers and four babies in the maternity unit, five affected members of the staff, and six contact cases. Microscopical examination of the faeces was carried out on specimens received from 52 patients. Pus cells, usually in small numbers, were found in nine cases, associated in one instance with red blood corpuscles. No protozoal cysts or ova were seen in any of the specimens. *Clostridium welchii* was present on only a few occasions on blood-agar plates, and Group D streptococci were never isolated. Organisms of the *Salmonella-Shigella* groups were not isolated from any case. The results of stool culture in 55 cases were as follows: sterile (4), lactose fermenters only (29), *Proteus* group (4), paracolon bacilli (18). The dissimilarity of the biochemical reactions of the paracolon bacilli and their failure to react significantly with patients' sera suggested that they were not responsible for the outbreak.

Other serological investigations included the testing of acute and convalescent phase sera for heterophil agglutinins (4° and 37° C.) to red cells of horse, rabbit, chick, rat, guinea-pig, and sheep, and for "cold" agglutinins to human Group O cells. Paired sera were also tested for a rise in the agglutinin titre to influenza viruses A and B. The influenza antibody titrations were kindly carried out for us by Dr. J. A. Dudgeon, of the National Institute for Medical Research. All of these serological tests were negative.

Leucocyte Counts.—We are much indebted to Mr. B. H. Ryalls, of the Radcliffe Haematology Department, for making the leucocyte counts. Leucocyte counts on 14 puerperal women with gastro-enteritis revealed that seven had a neutropenia below 3,600 cells per c.mm. within the first five days of the illness. The other seven patients had counts approaching the lower limit for normal non-puerperal cases. In a control series of 66 counts made on 28 normal women at exactly comparable stages of the puerperium no value below 3,600 neutrophil leucocytes per c.mm. was observed.

Discussion

The clinical picture presented by the adults in this outbreak is similar in most respects to that described by other authors.^{1 2 11 12 13 14} The mildness of the signs in the babies and the absence of a specific laboratory test made it difficult to decide whether the observed changes in the infants' bowel action were due to infection or not. Infants having Class I bowel activity were equally distributed among sick and healthy mothers (Table II), and it is likely that this change was of no significance.

Class II bowel activity, however, was more frequent (Table II) in the children of sick mothers than would be expected by chance alone ($\chi^2_{Yates} = 17.07$, $N = 1$, $P = < 0.001$). The number of infants starting such signs rises to a maximum earlier after delivery than does the number of mothers commencing diarrhoea (Fig. 3); in a group of sick mothers and infants the onset in the infants may be before, simultaneous with, or after that of the mother. These facts are compatible with the view that Class II bowel activity is

due to infection of the infant and that the varying time relation of the onset of diarrhoea in mother and child represents a reciprocal spread of infection.

It is evident that the clinical aspects of infants in this outbreak are quite different from the severe diarrhoea, toxicity, and high case fatality rate characterizing "epidemic diarrhoea of the newborn,"^{23 24} and also from the combination of stomatitis and diarrhoea in infants described by Buddingh and Dodd.²⁵ In the present series of 66 infants with gastro-enteritis only three had stomatitis.

The disease presents two main problems: aetiology and its mode of spread.

Salmonellae, *Shigellae*, paracolon organisms, or protozoa were not incriminated in this outbreak, and the possibilities remaining are infection with a bacterium of exacting growth requirements or with a virus. Reimann *et al.*,²² using material from a clinically similar outbreak in Philadelphia, found that student volunteers could be infected by inhaling medium Mandler filtrates of stool or garglings. No significant result was obtained by feeding the filtrates or serum enclosed in gelatin capsules. The incubation period in the successful experimental inoculations was very variable: about half (58%) the volunteers became ill in two to five days, while the remainder did not succumb until nine to 21 days after inoculation. Reimann interpreted the results of these experiments to mean that the causative agent was filtrable, entered the body through the respiratory tract, and therefore was transmitted as an air-borne infection. This concept of air-borne infection was supported by the seasonal incidence of the outbreaks in Philadelphia (both the 1943 and the 1944 outbreaks took place in October and November) and by the occurrence of prodromal respiratory disease in a proportion of patients, although Reimann was uncertain whether the respiratory symptoms (38% in the 1944 outbreak) were due to the disease or concurrent "colds."

In our experience of this and seven other outbreaks prodromal respiratory disease has been a rare and unconvincing finding, and it would be remarkable, in a disease with such a short incubation period, if the site both of the invasion of the "virus" and that from which it was expelled as droplets should show no overt disease. The number of reported outbreaks in this country is not yet large enough to judge the seasonal incidence, and more data on this point are needed.

Sources of Infection and Pattern of Spread

Leaving aside the unsettled question as to whether the disease is air-borne or transmitted by the intestinal-oral route, it was noted in the present outbreak that there were certain patterns of spread determined by the organization of the maternity unit.

A maternity unit is more complex epidemiologically than the ordinary hospital ward or institution, partly because its population is changing rapidly and partly because of the presence of the babies, who are susceptible to infection and whose discharges are difficult to control without an efficient aseptic technique. It is of interest to contrast the high infectivity of the disease in the maternity unit with its low infectivity in the chronic sick wards of the rest of the hospital. Deductions about the method of spread of infection from such high attack rates in the special circumstances of a maternity unit may therefore be misleading.

The admission of the first patient with diarrhoea was followed by a straggling series of cases among patients and staff with a steadily mounting number of attacks per 1,000 patient-days of exposure—a fact which, taken in

conjunction with the low number of admissions during the last two months, suggests that the rate of spread of the disease was not closely correlated with the rate of change of the maternity unit population. Some patients were probably infected from convalescent cases about to be discharged, and others from previous overt or possibly mild atypical cases in the same ward. Carriers among the staff must be regarded as a possibility because most of the staff had the disease, and in view of the data given on the duration of infectivity a few probably remained infectious for some time. This possibility is supported by the fact that cases occurred in the families of staff who were convalescent from the disease.

Lastly, though the significance of the sick infants is undecided and needs further investigation, the possibility of spread between mothers in different wards via their infants infected in a common nursery must be considered.

In this outbreak the association of sick mothers and infants and the time relation of their signs suggests that a reciprocal spread of infection may have occurred. On the other hand, if such a route of infection was important it might be expected that the sick mothers would more often be associated with a sick infant whose onset of illness preceded theirs than would be expected from the ratio of sick infants to healthy mothers; thus of the 88 sick mothers, 22 (25%) had an infant with signs starting before theirs, while of 66 entirely healthy mothers 10 (15%) had sick infants. Differences of this order would be frequently observed by chance alone. We feel that, although conclusive proof of the nursery spread is lacking, owing possibly to the difficulty of detecting "infective" infants on clinical grounds alone, it is a route that cannot be ignored. It is of interest that the data in Brown, Crawford, and Stent's paper,² not commented on by these authors, show that the babies were the first to become ill in the maternity wards, that illness in mother and infant was often associated, and, further, that in this group the babies, with one exception, became ill before their mothers, the average interval between them being 4.4 days.

Summary

An outbreak of gastro-enteritis among mothers, staff, and babies in a maternity unit is described.

The disease was characterized in adults by diarrhoea, slight fever, a watery stool of light yellow colour, and, in some patients, by neutropenia.

The babies had milder symptoms consisting of loose green stools sometimes accompanied by excoriated buttocks.

Salmonellae, Shigellae, paracolon bacilli, and protozoa were not found to be responsible for the disease.

The incubation period in adults was one to three days. The period of infectivity appeared in a few adult patients to be as long as 26 days from the onset of diarrhoea.

A "follow-up" of the discharged maternity patients revealed that 26% developed gastro-enteritis after discharge and that 15 to 24% of the families of returning sick maternity patients became infected.

Epidemiological investigations indicate that new admissions could have been infected from overt, atypical, or convalescent cases of gastro-enteritis or from carriers of the disease in the staff. It is also suggested that infection of infants in a common nursery might account for the occurrence of sporadic cases among mothers in different wards in the unit.

The outbreak appears to be an example of a common and widespread disease in the special circumstances of a maternity unit which had apparently facilitated its spread.

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SUPPURATIVE ARTHRITIS OF HIP-JOINT TREATED WITH PENICILLIN

REPORT OF FOUR CASES

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Acute staphylococcal suppurative arthritis of the hip-joint is luckily of comparative rarity. Four cases in close succession have recently been under treatment with penicillin in Suva, Fiji, and the good final results obtained may be worthy of record.

Case 1

A male Fijian aged 6 was admitted to hospital with four days' history of pain in the right hip. Acute suppurative arthritis of the hip-joint was suggested by clinical examination, pyrexia, high leucocytosis, and absence of radiographic abnormality. Several septic skin spots were present. Exploratory aspiration of the joint yielded a very small amount of thick pus, which showed pure *Staphylococcus aureus* on culture.

Penicillin, 10,000 units in 5 ml., was injected into the joint, aspiration and a similar injection being repeated twice on alternate days. Systemic penicillin, 20,000 units three-hourly, was administered for seven days. Extension was applied on Thomas's splint for ten days, followed by a hip spica plaster which was maintained for six weeks, the patient being allowed up during the last two weeks. He remained in hospital for a further five weeks, and on discharge (three months from onset of the disease) had a full range of movements to the hip-joint with complete absence of symptoms. Skiagrams after removal of the plaster showed definite evidence of localized bony infection of the upper acetabular rim: probably this primarily was osteomyelitis of the area with early infection of the joint. When seen five months later he was quite fit, with full movements of the joint.

Case 2

A European girl aged 10 came with two days' history of pain in the right hip. Acute suppurative arthritis of the hip-joint was diagnosed. A septic spot was present on the right knee.