discomfort. Should the bleeding restart it will at once be evident, as fresh blood will come through the tube.

Another way to stop bleeding is this: Cut off the finger of a rubber glove and, after passing the end into the rectum, plug gauze into the open end so as to well distend the closed end inside the rectum. To prevent the plug slipping in, a safety-pin and a roll of gauze are used outside the anus. The tube method is the more satisfactory as the glove finger is apt to tear. If a plug such as this fails to control the bleeding the patient should be given an anaesthetic, and when all the blood has been douched away the bleeding-point can be looked for with a speculum. It is generally very difficult, or impossible, to pick up the vessel satisfactorily, and it is better to plug the rectum properly with a gauze plug and tube of suitable size.

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OBSERVATIONS ON THE DYSENTERIC CONDITIONS AMONG EUROPEANS OF CALCUTTA

BY

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Acton and Knowles (1928) observed: "Chronic and relapsing dysentery we believe to be matters of very serious concern to the large European business firms in Calcutta. Although very few deaths from dysentery occur among them, the disease causes a tremendous amount of sickness in that community, and it is responsible for much invalidation and repeated and often prolonged absence from duty. We also believe that dysentery is a very important cause of sickness among the general European community in India." In consideration of the importance of the subject we here record some facts which we have come across during our routine diagnostic laboratory work from 1930 to July, 1937.

All the materials for study were obtained from Europeans who were either residents of Calcutta or worked in various commercial firms and Government departments. Most of the specimens were collected and sent to us, but some of the patients personally attended and passed their stool in the laboratory. As a rule the specimens were examined within a reasonably short time of being passed, except when this was not possible owing to unavoidable reasons.

The Careful Examination of Stools

Before giving the details of our observations we would like to make a few remarks about our experiences in the course of these examinations. The first thing is with regard to the occurrence of amoeba infection. This parasite is sometimes encountered in specimens where the physician has hardly any suspicion of it and in which the appearance of the stool is not in the least suggestive of such infection. Some symptoms of dyspepsia, vague

unaccountable pain in the abdomen, occasionally more severe before or during passage of a stool, liquid loose stools without obvious cause, pain in the liver with some degree of enlargement of the organ, a low-grade pyrexia of unknown origin, and even loss of flesh and strength, are some of the conditions for which an investigation of the stool had been suggested, and often we were amply rewarded by discovering the parasites in their active vegetative forms. Another point we would like to emphasize is the tenacity with which these parasites persist in the alimentary tracts of many persons. We had had occasion to follow up some cases in which *Entamoeba histolytica* could be found in the stools at any time during the course of seven years. The patients reported that whenever they took a course of treatment they felt better and remained well for some time, but any digestive upset or exposure to chill caused a return of some of the symptoms, and it was at this stage that the parasites always made their appearance. We may remark in this connexion that the character of the stool was often misleading. These parasites had on many occasions been seen in specimens which could easily have been passed as well formed, hard, and to all intents and purposes perfectly innocent-looking. A cursory examination of the material showed nothing, but when the specimen was very carefully inspected tiny shreds of mucus were found on the surface, and these contained a great number of the parasites. In the same way the examination of a specimen after the patient had taken a saline purgative was more often attended with positive results. It is no doubt well known that delay is frequently responsible for many negative findings, but we would lay particular

TABLE I.—Showing the Findings in All Cases and Both Sexes

	Number of Cases per Year								Total No.	Per-centage
	1930	1931	1932	1933	1934	1935	1936	1937		
Non-dysenteric	19	21	40	65	83	49	100	18	395	28.8
B. Faecalis	0	37	44	21	43	12	0	0	157	11.5
B. Carolinus	0	10	12	21	16	6	0	0	65	4.7
B. Shigae	2	4	6	2	1	1	2	0	18	1.3
B. Flexneri	10	28	37	34	45	16	18	10	198	14.4
B. Morgani	2	4	3	6	4	5	6	2	32	2.3
B. Sonnei	0	0	1	0	0	0	0	0	1	0.07
Ps. Pyocyanea	1	0	2	1	0	0	3	0	7	0.5
Shiga and Flexner Comb.	0	0	1	0	0	0	0	0	1	0.07
Entamoeba Histolytica, Vegetative	2	10	18	15	28	14	12	8	107	7.7
Entamoeba Histolytica, Cystic	0	2	3	6	11	0	2	0	24	1.7
Vegetative and Cystic Comb. Histolytica	0	0	1	0	3	0	2	2	8	0.6
Trichuris Trichiura ..	0	0	0	0	0	1	0	0	1	0.07
Ascaris	0	0	0	0	0	1	1	0	2	0.14
Ankylostoma	0	0	0	0	0	1	0	0	1	0.07
Tapeworm	0	0	0	0	0	1	1	0	2	0.14
Strongyloides	0	0	0	0	0	0	2	0	2	0.14
Trichomonas	0	0	0	0	1	0	0	0	1	0.07
Giardia	1	0	0	0	5	3	8	5	22	1.6
Other Protozoa	0	3	3	0	0	3	6	4	19	1.4
Charcot-Leyden Crystals	0	0	0	0	0	1	6	4	11	0.8
Non-specific	14	28	67	57	78	45	39	19	347	25.35
Amoebic and Bacillary Comb.	0	1	3	3	0	0	0	1	8	0.6
Totals	50	140	226	220	309	154	204	67	1,370	

TABLE II.—Positive Cases according to Age and Sex Groups

YEAR	JANUARY			FEBRUARY			MARCH			APRIL			MAY			JUNE			JULY			AUGUST			SEPTEMBER			OCTOBER			NOVEMBER			DECEMBER																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
	Amoe-bic		Bacil-lary	Amoe-bic		Bacil-lary	Amoe-bic		Bacil-lary	Amoe-bic		Bacil-lary	Amoe-bic		Bacil-lary	Amoe-bic		Bacil-lary	Amoe-bic		Bacil-lary	Amoe-bic		Bacil-lary	Amoe-bic		Bacil-lary	Amoe-bic		Bacil-lary	Amoe-bic		Bacil-lary																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
	Child	Adult Male	Adult Female	Child	Adult Male	Adult Female	Child	Adult Male	Adult Female	Child	Adult Male	Adult Female	Child	Adult Male	Adult Female	Child	Adult Male	Adult Female	Child	Adult Male	Adult Female	Child	Adult Male	Adult Female	Child	Adult Male	Adult Female	Child	Adult Male	Adult Female	Child	Adult Male	Adult Female																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
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emphasis on the injurious influence a low temperature has on the vitality of the amoebic organisms. Perhaps it is not exactly realized how rapidly the parasites lose their mobility and disintegrate when the specimen of stool is kept exposed to a cold atmosphere. By asking the patient to pass the stool in the laboratory whenever it was feasible and by the use of a hot stage during examination we obtained many a successful result.

The epidemiological considerations are interesting. The Europeans in Calcutta are a semi-isolated community and remain apart from the general mass of the population. They enjoy the best hygienic conditions available in that city, their residential quarters being provided with all the modern equipments of sanitation. Under such circumstances it is curious that there should be such a high incidence of dysenteric condition among them.

Chart showing the seasonal incidence from July, 1929, to July, 1937 (all ages and both sexes).

The findings are given in Table I. In this series we have included all the cases that were sent to us under suspicion of dysenteric infection. Stools received for other investigations were not included.

Table I shows the findings in all ages and both sexes; Table II shows the incidence of positive cases according to age and sex groups. Although we had no means of determining the exact age the records informed us whether the cases were from adults or children. Hence we have classified them as such. The chart gives the incidence according to season during the seven years of the investigation.

The Origin of the Infection

The question now arises as to how the infection is acquired. Topley and Wilson (1936) stated that imperfect sanitary conditions are the main cause of dysentery in the Tropics, and noted the rarity of this disease in the West. Rogers (1913) points out the coincidence of dysentery with rainfall and the prevalence of flies following it. Manson-Bahr (1912), working in Fiji, discovered the part played by flies in the dissemination of dysentery. Taylor (1919) has corroborated these findings. Fletcher and Jepps (1924), according to their statistics in the wards of the Kuala Lumpur Hospital, stated that dysentery was a disease of poverty. In our series none of these possibilities are applicable.

The Europeans in Calcutta, as mentioned above, live under practically the same hygienic conditions as their people in the West. Gettings (1913), in his studies on asylum dysentery, reported on the scarcity of dysentery in England, and Carter (1937), while reviewing the incidence of bacillary dysentery in the Glasgow area, stated that at the beginning of the twentieth century dysentery was regarded as a rare disease in Britain and other

Western countries. He further notes, however, that in industrial centres, with their associated overcrowding, there are always a certain number of cases. In Calcutta the Europeans live as a group by themselves, isolated from the general population. The latter are confined to the northern portion of the city, from which the European residential quarters are separated by the office quarters, where people collect only during working hours. In the European quarters the municipal authorities have provided underground dustbins and refuse pits, which are kept covered. With regard to the possible dissemination by flies and to the dysenteric infections coinciding with rainfall, our curves of incidence for the dry and the monsoon months tell a different story.

Examination of the chart shows that, with regard to the amoebic infections, the highest peak of course is in August, but the incidence in the drier seasons is quite high too, and it will be noted that the other high peaks, excepting those of August and July, occur in the months of February, March, May, and October, all of which are dry periods, with the lowest rainfall. On the other hand we find a very low incidence in September, a month which would be expected to provide the highest figures, as it corresponds to the end of the monsoons in Bengal.

With respect to the incidence of bacillary infection the curve in the chart tells the same story—namely, that the highest incidence does not always follow the periods with the highest rainfall. The highest peak is in April and the next highest is in January. So, taking all these factors into consideration, we might reasonably conclude that the incidence of dysenteric conditions among Europeans in Calcutta does not strictly follow any seasonal variations. Rogers's (1921) figures were from the jail population in India, mainly composed of Indians, with a negligible European element in it; so that the conditions which are responsible for dysentery in the Indian community need not necessarily be the same as with the material we are reviewing.

The people now under consideration were Europeans employed in various commercial and business houses in Calcutta and their families, and resident in that city for fairly long periods. Some of them, of course, go out of the city in their various business pursuits, but we understand that these out-of-station journeys are very few and far between, and for practical purposes they do not alter the conditions.

TABLE III.—Showing Sex Incidence and Age Groups

	Amoebic	Bacillary
Children	6	30
Adult Male	96	100
Adult Female	42	102

It is evident from Table III that the number of cases of dysentery in males is not so much in excess as to suggest infection from outside-station areas. It is to be noted, however, that the male population is double that of the female.

It appears from Table II and the chart that the prevalence of the infection is more or less constant, with very slight periodic rise and fall, but quite unlike an epidemic curve; so it may be supposed that the factors responsible for this disease are constantly present somewhere. It is, however, needless to point out that if the source could be traced it would go a long way to solve the problem.

From the curative point of view amoebic infection is extremely hard to deal with. The cure of cases of chronic bacillary dysentery is also far from satisfactory. If any light, therefore, could be thrown on the method by which dysenteries spread among the Europeans in Calcutta we might cut the chain of events and thereby arrive at a solution of the problem; moreover, the data thus obtained might be of use in solving the dysentery problem of the country as a whole. *Br. melitensis* infection in Malta is a familiar example. When the mode of spread was discovered that disease was stamped out in very little time. Similarly with tuberculosis infection in Western countries: by severing the chain of events in the dissemination of the disease this has been brought well under control.

With the same object in view it appeared to us that, taking into consideration the constant prevalence of the infection, the comparatively isolated position of the community, and their standard of life, the personal element—namely, carriers—came uppermost, and that the most likely human factor might be found among the Indian servants and cooks. Another possibility was the green unboiled foodstuff. This latter point required investigation, and we began by periodically collecting green foodstuffs from the markets which supply the Europeans. It is supposed to be the custom with the Europeans here to keep all the greenstuffs dipped in potassium permanganate solution before they are put on the table, but this is never strictly adhered to. That there are carriers among the servants is a very strong possibility, and the scanty evidence that we have been able to collect points towards this conclusion. It appears, from the report of the medical officers attached to the business houses, that cases of dysentery do occur in certain families, and several of them suffer, one after another. Moreover, the worst instances are found in office messes and chummeries, where those who are ill invariably contract the same type of infection. Our own endeavour was to investigate the possibility of carriers being present in such isolated foci of infected places, and the few cases we have been able to examine from this angle lend support to this hypothesis.

Before concluding we would like to make a few observations. Acton and Knowles (1928) found the same preponderance of the bacillary infection, and especially the Flexner type, as we encountered. We have included *Ps. pyocyanea*, *Bact. morgani*, *B. carolinus*, and *B. faecalis alcaligenes* in our observations because there are good reasons for believing that they might cause intestinal disorder. In Table I, under the heading "non-dysenteric," we have included those cases in which there was no evidence to indicate any abnormal condition of the intestinal tract. Under the heading "non-specific" will be found those cases which gave a definite indication of abnormalities of the bowels—namely, mucus, cellular exudate, etc.—but we failed to isolate any of the bacteria included in the chart or any of the amoebae. The association of Charcot-Leyden crystals with amoebiasis seems to be slight: the positive cases of amoebiasis in our series total 9.6 per cent., whereas Charcot-Leyden crystals were found in 0.8 per cent. In certain cultural examinations of faeces we had the curious experience of seeing a sterile plate even on seventy-two hours' incubation with MacConkey's and bromcresol media; naturally the question of faulty technique arose, but on repeated cultural examinations of other samples from the same patients similar results were obtained. Whether it was due to the presence of a lytic enzyme or an abnormal alteration in the pH of the faeces, or was due to some other factor, we are as yet quite undecided.

Summary and Conclusion

1. Analyses of 1,370 specimens of stools from Europeans resident in Calcutta are recorded.
2. The incidence of dysenteric condition—amoebic and bacillary—is noted.
3. Possible sources of infection are discussed; the probable disseminators seemed to be carriers among the Indian menial staff.
4. Although among the Indian population there is a definite seasonal correlation with the disease, this was not found to be so in the case of the Calcutta Europeans.
5. The association of Charcot-Leyden crystals with amoebiasis could not be found to extend far.

Finally we express our grateful thanks to Colonel Vere Hodge, professor of medicine, Calcutta Medical College, Dr. G. Brandon and his colleagues Drs. M. C. O'Connor and A. D. Pegg of 2/2, Harrington Street, and Lieutenant-Colonel A. Denham White, late civil surgeon of 24-Parganas, Bengal, for helping us in our work; our thanks are also due to the staff of the Pathology Department, Medical College, Calcutta, for giving us every help, and to the Director of the All-India Institute of Hygiene for supplying us with the numbers of the European population in Calcutta.

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PREVENTION OF MEASLES IN A CHILDREN'S HOSPITAL

BY

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Measles should no longer be considered a "minor" infection. It is a major illness causing a considerable mortality and a much greater morbidity among young children affected by it.

The occurrence of measles in a children's ward is a catastrophe, as children already ill are exposed to the risk of a second serious illness which they may not be able to overcome. Moreover, such an occurrence dislocates the work of the ward and impairs the utility of the hospital. Every effort should therefore be made to prevent the entry of measles into a children's hospital and to check its spread once it has appeared. These objects can best be attained by the system of nursing children in cubicles, as by this means it is possible to avoid one child infecting another. In the absence of cubicles the problem which all too often presents itself is how to prevent the disease from spreading among, or alternatively to modify its virulence in, the children already exposed. In the light of our present knowledge the only measures available are the passive immunization of contacts by one of the following substances: (a) serum from patients convalescing from measles; (b) serum from adults who have had measles; (c) an immune substance (immune

globulin) obtained from the placenta of women who have had measles. Another method sometimes used is to inject whole blood taken from the parents.

During the past winter a considerable number of cases of measles arose in the wards of Alder Hey and Olive Mount Hospitals, with the result that it was necessary to immunize many contacts. The substances used for the purpose were: (1) serum from adults who have had measles, and (2) immune globulin from placental extract in varying doses. All susceptible contacts were given an immunizing dose as soon as a case of measles was diagnosed in the ward. In practice this meant on the appearance of the rash and therefore possibly on the third or fourth day of exposure. The results are tabulated below.

Table showing Results of Immunization with Adult Human Serum and Immune Globulin

Substance used for Immunization	Number Developing Measles in :			Total Number Developing Measles	Total Number Immunized	Remarks
	11-14 Days	15-21 Days	Over 21 Days			
Adult human serum, 15 c.cm.	12	13	8 (a)	33	124	(a) 6 cases developed 21-26 days after immunization; 2 later than this
Placental extract, 10 c.cm.	8	10	2 (b)	20	84	(b) 1 case 26 days after immunization; 1 case 33 days ditto
Placental extract, 6 c.cm.	6	4	9 (c)	19	33	(c) 6 cases developed measles 21-25 days after immunization; 3 cases later than this
Placental extract, 4 c.cm.	12	10	6 (d)	28 (e)	48	(d) 3 cases 21-25 days; 3 cases later than this (e) 12 cases not modified

In assessing the results no attempt has been made to work out a percentage of immunity, as in my opinion this tends to convey an impression which may err on the optimistic side. For example, one may immunize 100 children and of these only twenty may contract the disease; it is impossible in hospital practice to say with certainty that any or all of the remaining eighty children were actually infected. It is, however, reasonable to assume that *on the average* the risk of infection is the same in any one hospital, and it is on this basis that comparison should be made.

It will be seen from the above table that the best results were obtained from the use of a 15 c.cm. dose of adult human serum or 10 c.cm. of immune globulin. Smaller doses of immune globulin did not give the same degree of protection, and of the forty-eight children receiving 4 c.cm. of that substance twelve did not obtain sufficient immunity to modify the course of the disease. It must be stated here, however, that no complications or sequelae occurred in these twelve children.

One effect of passive immunization against measles by this method is the prolongation of the incubation period. This is important when quarantining such immunized contacts, because one should wait for at least twenty-one days before admitting other susceptible children into the ward. In considering the cases which developed measles after a period of twenty-one days following the immunization it should be borne in mind that some of these were exposed a second time through contact with children developing a modified form of the disease. We therefore