

SONNE DYSENTERY IN ABERDEEN.

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(With 2 Charts.)

In the *Journal of Hygiene*, vol. xxiii. No. 1, October 15th, 1924, one of us (J. Smith) recorded a small outbreak of enteritis involving four infants which occurred in December, 1923, in a ward in Aberdeen City Hospital, and which was shown to be due to dysentery bacilli of the Sonne type. In reviewing the literature of Sonne dysentery, Smith referred to the work of Thjøtta (1919) who, in investigating cases of dysentery in Norway, obtained 40 strains of Flexner dysentery bacilli and 25 strains of the Sonne type, and to Thjøtta's explanation that the less frequent finding of the Sonne type was due to the fact that this organism often causes a mild diarrhoea that was not sufficiently serious to necessitate the services of a physician, with the result that the cases were not subjected to bacteriological investigation.

DISTRIBUTION OF DYSENTERY IN ABERDEEN.

In the routine investigation of enteritis cases in Aberdeen since the outbreak of Sonne dysentery in December, 1923, a diagnosis of dysentery has been confirmed bacteriologically in the following cases:

I. Amoebic dysentery.

(1) June, 1924—one case—cysts of *Entamoeba histolytica* found; developed from infection contracted abroad; responded to treatment with bismuth emetine iodide and emetine hydrochloride.

(2) June, 1925—one case—cysts of *E. histolytica* found; relapse from infection contracted abroad; rapid response to emetine treatment.

(3) June, 1925—one case—cysts of *E. histolytica* found; infection contracted abroad; rapid response to emetine treatment.

(4) January, 1926—one case—*E. histolytica* and cysts found; history of three weeks' illness; patient had never been out of this country; no response to emetine treatment; patient died; at autopsy typical lesions of chronic amoebic dysentery.

(5) May, 1926—one case—cysts of *E. histolytica* found; relapse from infection contracted abroad; rapid response to emetine treatment.

(6) June, 1926—one case—cysts of *E. histolytica* found; relapse from infection contracted abroad; no response to emetine treatment; appendicostomy and colonic lavage with sodium bicarbonate resulted in subsidence of symptoms.

II. *Flexner dysentery.*

(1) February, 1925—one case—*B. dysenteriae* Flexner isolated from stools; contacts negative; source of infection not determined.

(2) April, 1925—one case—*B. dysenteriae* Flexner isolated from stools; contacts negative; source of infection not determined.

(3) August, 1925—one case—*B. dysenteriae* Flexner isolated from stools; contacts negative; source of infection not determined.

(4) November, 1925—one case—in a child in the Sick Children's Hospital; *B. dysenteriae* Flexner isolated from stools; contacts negative; source of infection not determined.

(5) November, 1925—one case—being a relapse of infection contracted abroad; *B. dysenteriae* Flexner isolated from stools; source of infection not determined.

(6) January, 1926—12 cases—in Burnside Home for Mothers and Babies; *B. dysenteriae* Flexner isolated from stools of three of the cases; 11 of the 12 cases had practically simultaneous onset, the remaining case being due to contact infection; 29 contacts negative; source of infection not determined.

III. *Sonne dysentery.*

(1) October, 1925—eight cases—in one of the scarlet-fever wards of the City Hospital; *B. dysenteriae* Sonne isolated from the stools of two of the cases, and serological confirmation in one case; all the cases had simultaneous onset and contacts negative; source of infection not determined.

(2) March, 1926—one case—in a boy, aged 4 years, in west-end of the city; *B. dysenteriae* Sonne isolated from stools; contacts negative; source of infection not determined.

(3) March, 1926—twelve cases—in the Marasmus Ward of the City Hospital; *B. dysenteriae* Sonne isolated from the stools of five of the cases, and serological confirmation of diagnosis in eight cases; all cases had simultaneous onset; contacts negative; source of infection not determined.

(4) April, 1926—one case—in a child in the Sick Children's Hospital; *B. dysenteriae* Sonne isolated from stools; source of infection not determined.

(5) May, 1926—five cases—in a household in the west-end of the city; *B. dysenteriae* Sonne isolated from the stools of one of the patients, and this patient's blood serum agglutinated *B. dysenteriae* Sonne in dilution 1 in 1600, while the blood serum of another of the five patients agglutinated *B. dysenteriae* Sonne in dilution 1 in 6400; onset practically simultaneous in all five cases; source of infection not determined.

(6) July, 1926—six cases—in the Marasmus Ward of the City Hospital; *B. dysenteriae* Sonne isolated from the stools of two of the patients, and serological confirmation of diagnosis in five cases; the first of the cases was a recent admission, and was the probable source of infection of the other five cases, which sickened within a week of the first case being recognised.

From the above summary it will be seen that in the routine investigation of enteritis cases in Aberdeen, during a period of 30 months, bacteriological confirmation has been obtained of:

I. Six unassociated cases of amoebic dysentery, one of which contracted the infection in this country; two of the six cases failed to respond to treatment with emetine preparations, and one of these died, the other recovering following on appendicostomy and colonic lavage.

II. Four sporadic cases of Flexner dysentery in which the sources of infection were undetermined; one relapsing case of Flexner dysentery in a patient who had contracted

the infection abroad; an outbreak of 12 cases of Flexner dysentery occurring in Burnside Home for Mothers and Babies. All the 17 cases responded rapidly to the exhibition of polyvalent anti-dysenteric serum and sodium sulphate.

III. Two sporadic cases of Sonne dysentery in which the sources of infection were undetermined; four outbreaks of Sonne dysentery, one of the outbreaks occurring in a private household, involving five persons, the second outbreak occurring in a scarlet-fever ward of the City Hospital, involving eight persons, and the remaining two outbreaks occurring in the Marasmus Ward of the City Hospital, involving twelve infants and six infants respectively. All the 33 cases recovered following aperient treatment and water diet.

VARYING FREQUENCY OF DIFFERENT TYPES OF DYSENTERY IN ABERDEEN.

It is found from the foregoing figures that in a period of 30 months the incidence of the various forms of dysentery as occurring in Aberdeen was of the following magnitude:

I. Amoebic dysentery	6 cases
II. Flexner dysentery	17 „
III. Sonne dysentery	33 „

It is not contended that this proportion of 1 amoebic to 3 Flexner to 6 Sonne dysenteries is a reliable index of the relative proportions of the various dysenteries in their incidence in the city. As Thjøtta has pointed out, the Sonne organism often causes so mild a diarrhoea that the cases are not investigated, and it is reasonable to conclude that a considerable number of mild diarrhoeal outbreaks of Sonne dysentery occurring in the city are never brought to the attention of the Health Department or to the notice of any medical practitioner.

It has to be pointed out, however, that 26 out of the 33 cases of Sonne dysentery here recorded were recognised as occurring within medical institutions in the city, wherein the patients are undergoing intensive observation. On the other hand, 13 out of the 17 cases of Flexner dysentery here recorded were recognised as occurring within medical institutions. In other words, 79 per cent. of the cases of Sonne dysentery and 76 per cent. of the cases of Flexner dysentery occurred in medical institutions where observation of patients may be regarded as being intensive. *So far as the evidence goes, therefore, it may be concluded that the Sonne bacillus is the most frequent cause of dysenteric outbreaks in Aberdeen.*

Finally, it is not suggested that all dysenteric outbreaks in Aberdeen are due either to *B. dysenteriae* Sonne or to *B. dysenteriae* Flexner. On the contrary, we have previously put on record (31. x. 1923, *Journal of Hygiene*, xxii. p. 89) an epidemic of milk-borne enteritis in Aberdeen, in which the evidence pointed to the enteritis being due to a living bacillus of *unrecognised* type, and subsequent experience in the investigation of diarrhoeal outbreaks has strengthened our former conclusion that viruses hitherto undetected can originate diarrhoeal outbreaks simulating dysenteric infections.

FEATURES OF SONNE DYSENTERY.

Clinical appearances.

There is a notable variation in the degree of severity of the dysenteric symptoms in different cases of Sonne dysentery. In exceptional cases the symptoms are of an urgent description, and two varieties of these urgent forms of Sonne dysentery can be recognised. In one variety the symptoms simulate those of acute Flexner dysentery with sudden onset of illness, diarrhoea and colic, and the rapid appearance of blood and mucus in the stools. In the second variety of the urgent form of the disease, the symptoms simulate those of Salmonella infections, or of the choleraic form of dysentery, with sudden onset, epigastric pain, vomiting, diarrhoea with green stools containing mucus but no blood, and rapid prostration.

In the great majority of cases of Sonne dysentery, however, the symptoms are of a much milder description, and are those of an irregular sub-acute diarrhoea with green stools containing mucus. In all forms of Sonne dysentery there is probably some elevation of temperature associated with the abrupt onset, but in the milder forms of the disease the rise of temperature is commonly slight and transient. Temperature Charts I and II, one relating to the severe form of the disease, and the other to the milder form, are submitted for comparison (see p. 457).

In the common and mild form of Sonne dysentery the onset is abrupt and with slight rise of temperature, frequently associated with symptoms of a catarrh of the respiratory system. This catarrhal condition not infrequently precedes the development of abdominal symptoms or is coincident with them. The degree of catarrh varies from a simple catarrh of the upper respiratory passages to an acute bronchitis with marked increase in the respiratory rate, frequent cough and râles throughout the lungs. The duration of this catarrh is from a few days to a week. The involvement of the respiratory system in a catarrhal process is a notable feature of Sonne dysentery. It occurs more frequently in children than in adults, and it is much commoner in Sonne dysentery than the analogous bronchitis which appears in the early stages of enteric fever, particularly in young adults.

In the mild form of the disease, the abdominal symptoms develop early. The stools become loose and green and contain a variable quantity of mucus but no blood. Blood does appear in the stools in certain cases of the mild form of the disease, but these form the exception and not the rule. As a rule the diarrhoea is not urgent, there being from five to eight stools in the 24 hours. Examination of the abdomen at this stage shows a slight abdominal distension only. There is no tenderness in any area and pain is absent, the slight abdominal distension being the only clinical feature consistently observed. There is loss of appetite, but sickness occurs only in the very exceptional case. The acute symptoms endure for about 48 hours, and are followed by lethargy and a considerable degree of bowel upset which expresses itself in a loose green

stool being passed once or twice daily for a period of 7 days to a fortnight. Recovery is apparently complete in from a few days to a fortnight, and there is no enduring deterioration in general condition.

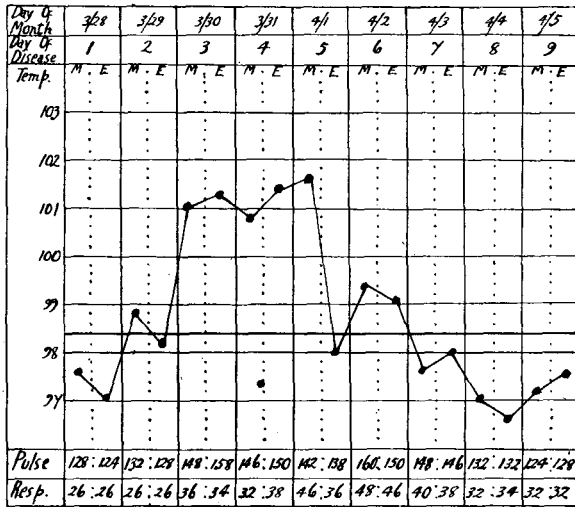


Chart I. Sonne dysentery (severe form of disease), 1926.
Case—I. W. (female).

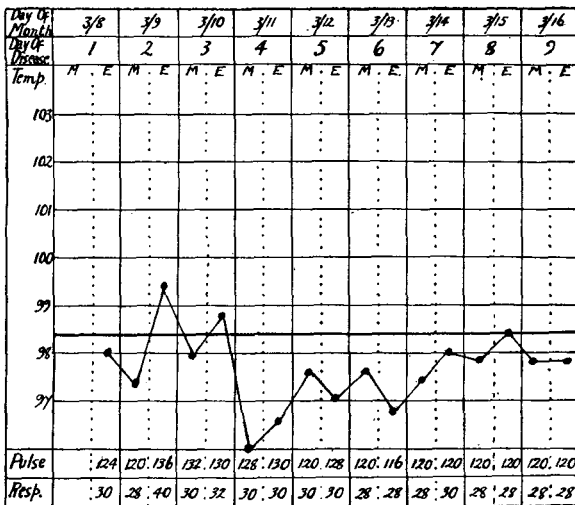


Chart II. Sonne dysentery (mild form of disease), 1926.
Case—M. B. (female).

Mortality. So far, none of the cases of Sonne dysentery confirmed bacteriologically have died. In the vast majority of cases the disease is relatively mild as compared with Flexner dysentery, and death is likely to happen only in

the exceptionally acute choleraic case or in patients previously debilitated with other diseases.

Treatment. In the absence of a specific therapy, the treatment is symptomatic and resolves itself into aiding the elimination of the Sonne bacillus and its toxins by salines or castor-oil and by water diet during the acute phase of the illness.

Control of infection. The control of Sonne dysentery is similar to the control of other enterica infections for which there is no specific prophylaxis. The early recognition and isolation of cases, the search for carriers, and the prevention of spread of infection by food and by nurses are the chief requirements.

Bacteriological findings.

Flexner dysentery. From the 17 cases of Flexner dysentery seven strains of the Flexner type of organism were isolated. These strains produced the typical sugar reactions and were agglutinated by a polyvalent Flexner agglutinating serum.

Sonne dysentery. The bacteriological findings in the 33 cases of Sonne dysentery are summarised in the following table:

Outbreak	Case No.	Bacteriological examination	
		Faeces	Serum agglutination
1	1	Negative	<1 in 50
	2	"	<1 in 50
	3	"	<1 in 50
	4	"	<1 in 50
	5	Positive	1 in 50
	6	Negative	<1 in 50
	7	"	<1 in 50
	8	"	<1 in 50
2	1	Positive	Not done
3	1	Negative	<1 in 50
	2	Positive	1 in 800
	3	Negative	1 in 800
	4	Positive	1 in 200
	5	Negative	1 in 200
	6	"	1 in 50
	7	"	1 in 50
	8	Positive	<1 in 50
	9	Negative	<1 in 50
	10	Positive	1 in 800
	11	Negative	1 in 50
	12	Positive	Not done
4	1	Positive	1 in 1600
5	1	Positive	1 in 1600
	2	Negative	1 in 6400
	3	"	<1 in 50
	4	"	<1 in 50
	5	"	<1 in 50
6	1	Positive	1 in 800
	2	"	1 in 100
	3	Negative	1 in 50
	4	"	<1 in 50
	5	"	1 in 200
	6	"	1 in 800

The repeated bacteriological examination of specimens of faeces from these cases indicates that it is of great importance to obtain specimens at the commencement of the illness. The colonies of *B. dysenteriae* Sonne, as obtained after culture on plates of McConkey's medium, are easily identified, since they are usually much larger and more opaque than colonies of *B. dysenteriae* Flexner and their edges are often crenated. The sugar reactions of the various strains are also fairly uniform in character. Acid is produced in lactose by the primary culture in from 3 to 5 days, but subcultures rapidly acquire the property of attacking this sugar, and acid production then occurs after an incubation period of 24 to 48 hours. After being maintained in culture the strains produce acid in media containing glucose, mannite, arabinose, rhamnose, maltose and saccharose, while no change occurs in media containing xylose, dulcete, sorbite and inulin. The organisms also produce rapid blackening of lead acetate agar.

When the primary cultures are tested for specific agglutination with a high titre agglutinating serum no evidence of agglutination is obtained after an incubation period of 4 hours at 55° C. After the strains have been subcultured several times, however, agglutination is obtained with low dilutions of the specific serum, and a later subculture will then be agglutinated to full titre. Absorption tests indicate that all strains can absorb completely the agglutinins from the antiserum.

The blood from 31 cases was obtained after an interval of 7 to 20 days from the onset of the illness. The serum from 17 cases was found to give agglutination against a stock culture of *B. dysenteriae* Sonne in dilutions ranging from 1 in 50 (the lowest dilution of the serum tested) to 1 in 6400. Further, the blood serum from three cases was examined on several occasions with the following result:

	Agglutination
Case A. Serum 8 days after onset	1 in 800
" 14 " "	1 in 1600
Case B. Serum 8 days after onset	<1 in 50
" 20 " "	1 in 200
Case C. Serum 4 days after onset	1 in 50
" 14 " "	1 in 200

As a control to these agglutination reactions the sera from 20 normal individuals have been tested and in three cases agglutination was only obtained in a dilution of 1 in 25. The possibility of previous infection in these three cases could not be excluded.

The exo-toxins of B. dysenteriae Sonne.

It has been recognised by various workers that an exo-toxin is produced by *B. dysenteriae* Flexner and *B. dysenteriae* Shiga, and, further, that the curative value of the antiserum depends partly on the presence of antitoxin. Accordingly, preliminary experiments have been undertaken to ascertain whether *B. dysenteriae* Sonne also produces a true exo-toxin. A strain of

B. dysenteriae Sonne was grown for 2 days at 37° C. in Hartley's modification of Douglas's trypsin broth (pH 7.6). After the addition of phenol to give a concentration of 0.4 per cent. the culture was passed through a Berkfeld M. filter. Intradermal tests were then carried out in a group of 28 young children with the result that it was found that when 0.2 c.c. of various dilutions (1 in 100, 1 in 500 and 1 in 1000) were injected intradermally, reactions were obtained in 19 cases with the strongest dilution of the filtrate. No reactions were obtained when the filtrate was diluted 1 in 500 and 1 in 1000. At this period culture medium diluted 1 in 100 was used as a control, but no reactions were obtained when 0.2 c.c. was injected intracutaneously. The reactions appeared within 24 hours and varied from 1 cm. to 2.5 cm. in diameter. They had practically disappeared after a further 24-hour period.

When the filtrate (diluted 1 in 100) was heated to 100° C. for 1 hour it was found that the substance producing the reaction was destroyed, since tests on several individuals who reacted to 0.2 c.c. of 1 in 100 dilution of the filtrate gave entirely negative results with the heated filtrate. Further observations are being made to determine the relationship of this reaction to the actual disease, and efforts are being directed to produce an antiserum to effect the neutralisation of the toxic substance.

SUMMARY.

1. In the absence of the epidemic prevalence of the dysenteries over a period of 30 months it is found that cases of the various forms of dysentery as occurring in Aberdeen have been in the proportion of 1 amoebic, to 3 Flexner, to 6 Sonne dysenteries, and it is concluded that *B. dysenteriae* Sonne is the most frequent cause of dysenteric outbreaks in Aberdeen in non-epidemic times.

2. A description of the clinical and bacteriological features of Sonne dysentery is submitted.

3. Preliminary experiments, undertaken with a view to ascertaining whether *B. dysenteriae* Sonne produces a true exo-toxin, are described.

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