

AGGLUTINATION REACTIONS IN RELATION TO SONNE DYSENTERY.

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SINCE Sonne (1915) in Scandinavia called attention to the prevalence of dysenteric infection due to a late lactose fermenting organism, various workers—Bamforth (1923), Nabarro (1923), Smith (1924), Fraser, Kinloch and Smith (1926), Channon (1926), Clayton (1927), Wiseman (1927), Kerrin (1928), Fyfe (1927), Richards (1927), Charles and Warren (1929)—have reported on outbreaks of disease due to the same organism in this country. The various characteristics of *B. dysenteriae* Sonne have recently been summarised by Gardner (1929), and the production of agglutinins in cases of this type of dysentery has been studied to some extent by Sonne (1915), Thjøtta (1917), and by Fyfe (1927).

An epidemiological, clinical and bacteriological survey of endemic bacillary dysentery in Aberdeen by Fraser and Smith (1930) has shown that from 1923 to 1928 there occurred 147 proved cases of this disease. Consequently the admission to hospital of numerous cases has provided the material for a study into the presence or absence of agglutinins.

METHODS.

Samples of blood were obtained from various patients, and after clotting, were centrifuged and the sera pipetted off into other sterile tubes. The agglutination tests were carried out by the usual macroscopic technique. One volume of various dilutions of the sera (1/50, 1/100, etc.) were placed in Dreyer agglutination tubes and an equal volume of a formalinised suspension of *B. dysenteriae* Sonne was added. A tube containing one volume of salt solution and one volume of bacterial emulsion was used to control the tests. The tubes containing these various mixtures were incubated in the water bath for 2 hours at 55° C. and thereafter the agglutination titre of the serum was read.

RESULTS IN ACTUAL CASES OF SONNE DYSENTERY.

In all agglutination tests were made with 60 specimens of serum obtained from 48 individuals who clinically were found to be suffering from dysentery, which was proved by bacteriological examination of the faeces to be due to *B. dysenteriae* Sonne. The majority of the cases occurred in children 5 years of age or under, since blood was obtained from only five cases over this age. The results of these tests are given in detail in Table I. Agglutination in a dilution

Table I.

Case no.	Age		Sex	Agglutination test	
	Years	Months		No. of days after onset	Titre of serum
1	1	—	M.	7	1/800
2	—	8	F.	{ 7	{ 1/50
3	2	—	F.	{ 17	{ Neg.
4	—	7	F.	{ 21	{ 1/200
5	1	10	F.	{ 27	{ Neg.
6	—	7	F.	{ 3	{ 1/800
7	—	7	F.	{ 14	{ 1/1600
8	4	6	M.	{ 7	{ 1/800
9	3	—	F.	{ 8	{ 1/1600
10	3	—	F.	{ 16	{ 1/200
11	30	—	F.	13	1/1600
12	4	—	M.	5	Neg.
13	40	—	M.	5	Neg.
14	1	—	M.	5	1/1600
15	1	—	F.	5	1/6400
16	1	2	M.	{ 16	{ 1/1600
17	—	10	F.	{ 29	{ 1/1600
18	1	—	F.	4	1/50
19	—	10	F.	10	1/200
20	—	4	M.	10	1/800
21	6	—	M.	4	1/200
22	17	—	F.	10	1/800
23	5	—	M.	4	1/200
24	—	3	F.	4	1/800
25	4	—	M.	2	1/200
26	—	> 8	F.	11	1/800
27	2	—	F.	6	Neg.
28	1	3	F.	{ 10	{ Neg.
29	3	—	M.	{ 22	{ Neg.
30	1	6	F.	{ 1	{ 1/50
31	—	4	M.	{ 10	{ 1/400
32	—	3	F.	1	Neg.
33	—	7	M.	9	1/800
34	—	4	F.	4	Neg.
35	22	—	F.	2	Neg.
36	—	9	F.	22	1/100
37	—	9	F.	8	1/50
38	1	2	M.	{ 14	{ 1/50
39	—	2	M.	{ 5	{ 1/200
40	—	4	F.	{ 12	{ 1/200
41	—	3	M.	5	1/200
42	1	1	F.	{ 3	{ Neg.
43	1	3	M.	{ 10	{ 1/100
44	3	—	M.	2	Neg.
45	1	6	M.	9	1/200
46	—	6	M.	9	Neg.
47	1	10	F.	{ 8	{ Neg.
48	2	7	M.	{ 11	{ Neg.
				{ 18	{ Neg.
				7	1/100
				7	Neg.
				5	Neg.
				6	1/100
				8	1/200
				4	1/50
				16	1/800
				21	1/400
				4	Neg.
				17	1/400
				{ 9	{ 1/50
				{ 21	{ 1/50
				13	1/400
				2	Neg.

Sonne Dysentery

of 1/50 or greater was regarded as a positive result, and an analysis of the figures on this basis showed the following:

Day after onset of illness on which sera were obtained													
0-3		4-6		7-9		10-12		13-15		16 +			
Pos.	Neg.	Pos.	Neg.	Pos.	Neg.	Pos.	Neg.	Pos.	Neg.	Pos.	Neg.		
2	4	8	6	11	4	8	1	4	0	10	2		
% positive		33		57		73		88		100		83	

These findings indicate that the percentage of positive results increases from immediately after the onset of the illness until a maximum is reached a fortnight after the illness, and thereafter a decrease in the percentage positive occurs. In 12 cases in which the tests were repeated at intervals the serum from only one case gave a persistently negative result on the 8th, 11th, and 18th days after the onset. The actual titres of the sera varied between 1 in 50 and 1 in 6400.

In Table II there are presented the results of the agglutination tests in nine individuals on whom one observation was made prior to the onset of the illness,

Table II. *Serum agglutination before and after an attack of Sonne dysentery.*

Initials	Age		Sex	1st agglutination test		2nd agglutination test	
				Days prior to onset of illness	Titre of serum	No. of days after onset of illness	Titre of serum
	Years	Months					
A. M.	—	5	M.	32	Neg.	9	1/800
B. McR.	1	6	F.	33	Neg.	5	1/200
A. D.	—	2	M.	25	Neg.	6	1/100
N. M.	—	4	F.	6	Neg.	8	1/200
D. G.	—	3	M.	19	Neg.	4	1/50
F. H.	1	1	F.	8	Neg.	6	1/200
D. W.	2	7	M.	23	Neg.	7	1/400
M. T.	1	1	F.	17	Neg.	16	1/800
R. S.	1	3	M.	13	1/50	21	1/400

and a second test was made after the occurrence of Sonne dysentery. The tests were made with the sera of individuals who actually contracted the disease in hospital. Prior to the onset of the illness, eight cases gave a negative test in the lowest dilution of the serum used (1/50), and when retested later all these cases gave definite agglutination with *B. dysenteriae* Sonne in dilutions of the sera varying from 1/50 to 1/800. One case, however, showed an agglutination reaction of 1/50 before a definite attack of Sonne dysentery, and after the attack the titre of the serum rose to 1/400. It is just possible that this child aged 1 year 3 months may have had a previous attack of the disease to account for the original agglutination titre of 1/50.

RESULTS OF AGGLUTINATION TESTS IN NON-DYSENTERIC CASES.

In a series of individuals who were not suffering from Sonne dysentery while in hospital, specimens of serum were obtained for agglutination tests, the results being given in age groups in Table III. In all, tests were made with

the sera of 138 patients of varying ages. Of these 138 sera, 33 or 24 per cent. gave agglutination against *B. dysenteriae* Sonne in a dilution of 1/50 or over. Sera from 43 individuals at the 0-½ year age-period gave 9 per cent. of positive reactions, at the ½-1 year period 34 per cent. of 31 specimens gave a positive

Table III. *Agglutination of B. dysenteriae Sonne by sera from various individuals.*

Age group	Number negative	Dilution of sera						Total tests	% positive
		1/50	1/100	1/200	1/400	1/800	1/1000		
0-½ year ...	39	4	0	0	0	0	0	43	9
½-1 " ...	17	6	2	3	1	1	1	31	34
1-2 " ...	26	0	1	1	0	0	0	28	7
2-3 " ...	16	2	0	0	0	0	0	18	11
3-4 " ...	5	0	0	0	0	0	0	5	—
4-5 " ...	0	0	0	0	0	0	0	0	—
5-10 " ...	0	2	0	0	0	0	0	2	—
10-15 " ...	0	0	1	0	0	0	0	1	—
15-25 " ...	1	1	1	0	0	0	0	3	—
25-45 " ...	1	1	0	3	0	0	0	5	—
45 years and over	0	0	1	1	0	0	0	2	—
Total	105	16	6	8	1	1	1	138	24

reaction, at the 1-2 year period 7 per cent. of 28 specimens, and at the 2-3 year period 11 per cent. of 18 sera similarly gave positive results. Thus in the age group 0-3 years, of 120 individual sera 22 or 18 per cent. showed evidence of agglutination for *B. dysenteriae* Sonne.

DISCUSSION.

The results of these various tests show that in the majority of cases an attack of Sonne dysentery gives rise to the presence of specific agglutinins in the blood serum of the individuals concerned. If it happened, that clinically Sonne dysentery could be distinguished from the disease produced by the Flexner strains then the agglutination test might have been of value for diagnosing this clinical entity. Dysentery due to the Sonne bacillus and Flexner types cannot, however, be distinguished clinically, and accordingly one would require to show that the serum contained no agglutinins for the V, W, X, Y, Z types of the Flexner bacilli before any justifiable conclusion could be made. When, however, an outbreak of Sonne dysentery occurs in a specific group of individuals from certain of whom the specific bacillus has been recovered, then the positive agglutination test is of value as a corroborative test. It is believed further that an agglutination titre of 1/50 or greater of the serum of an individual indicates a past infection with the Sonne bacillus, provided a suitable suspension of *B. dysenteriae* Sonne is used in the test.

Finally, since 33 out of 138 individual sera from patients admitted to hospital for other diseases show agglutinins in a dilution of 1/50 or over, it must be believed that Sonne dysentery is widespread, and in the majority of cases is not of sufficient severity to attract medical attention.

SUMMARY.

A study of the agglutinin content of the sera of individuals who have suffered from attacks of Sonne dysentery has shown that in the majority of cases specific agglutinins are produced.

In a series of agglutination tests with sera from 138 normal individuals 24 per cent. were found to give a positive reaction in a dilution of 1 in 50 or greater.

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