4. The highest fatality rate occurred in the age period 21-40.

5. The mortality during the first year is high (75 per cent.), and thereafter diminishes rapidly with every year of survival.

6. The most unfavourable type of the disease is that showing an acute onset, and the least unfavourable is that characterized by intermittent attacks with complete freedom from symptoms in the interim.

7. Various methods of treatment have been briefly reviewed.

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TREATMENT OF CHOREA BY INDUCED PYREXIA

BY

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The present aim of treatment in Sydenham's chorea may be summarized in a single word—rest. The heart is involved in such a high proportion of cases (50 per cent.)¹ that a minimum of three months' rest in bed has been arbitrarily fixed in all cases, whether or not there is clinical evidence of carditis.² Unfortunately it is impossible to attain complete rest in these cases owing to the persistent spasmodic movements. Sedatives of various kinds are used in order to control as far as possible these movements. Of these aspirin, chloretone, and nirvanol have been most extensively used, the last-named having now been abandoned as dangerous.

It was suggested in 1931 by Sutton³ that instead of the present expectant methods of treatment active measures should be adopted to cut short the attack of chorea. The method she advocated was the induction of artificial pyrexia by T.A.B. vaccine. She claimed that by producing a temperature of 103° to 106° F. each day for seven to ten days the choreic movements are brought to an abrupt conclusion, and the child can be allowed up about two weeks after the commencement of treatment. Granted the truth of these claims, there is yet a very important part of the clinical picture upon which the effect of the treatment must be observed before any conclusion can be drawn as to the efficacy of the method. I refer to the cardiac complications. It might reasonably be supposed that a constitutional disturbance such as is produced by this treatment might have an adverse effect upon the heart, which in so many cases is already affected. Before the method can be generally adopted, therefore, it must be clearly shown that the induction of a temperature of 103° to 106° F. for ten days will not accelerate any existing carditis. This aspect of the problem, not mentioned by Sutton³ or Bateman,⁴ has been given special consideration in this article.

TECHNIQUE

This consists in the daily intravenous administration, for a period of seven to ten days, of T.A.B. vaccine in sufficient quantity to produce a temperature of 103° to 106° F. The vaccine contains in 1 c.cm. *B. typhosus* 1,000 million, *B. paratyphosus* A 750 million, and *B. paratyphosus* B 750 million. The initial dose is 0.1 c.cm. intravenously, which almost invariably produces a satisfactory response. There is a severe constitutional reaction. The patient vomits and develops a peculiarly cyanosed appearance. The choreic movements are

markedly increased for the time being. Subsequent doses are increased in accordance with the response to the first injection. An approximate rule is to double the previous day's dosage on each day. The final dose may be as much as 2.5 c.cm. Sutton recommends the administration of aspirin and an ice-bag to the head if the temperature rises above 106° F. With careful attention to dosage, however, this is a rare incident, and did not occur at any time in my series of cases. The injection is given in the early afternoon to enable the subsequent reaction to subside before night, and thus not to interfere with the child's sleep. The constitutional reaction becomes less marked with each injection, until the final injection produces no obvious reaction apart from the pyrexia.

REPORT OF CASES

As space will not permit of the detailed description of all the cases, I have chosen as examples those which appear to throw most light on the subject. The cases have been divided according to Sutton into mild, moderate, and severe. (1) *Mild cases*: Those in which there was occasional twitching of the limbs and face, but no hypotonia or speech disturbance. (2) *Moderate cases*: Frequent gross choreic movements of limbs, trunk, and face, with some disturbance of speech. (3) *Severe cases*: Those in which the movements were so severe and the hypotonia so marked that the child was unable to perform any voluntary movement whatever.

Case 1.—Aged 11 years. History of rheumatism and chorea four years previously. On admission, a typical chorea of moderate severity. Heart sounds normal. Intravenous T.A.B. vaccine in increasing dosage given for seven days. At the end of this time there was marked improvement, there being practically no evidence of chorea. The heart sounds were still normal. Eighteen months later the mother says she has been quite well since discharge. There is no evidence at the moment of any rheumatic manifestation, and the heart sounds remain normal.

Case 2.—Aged 8 years. Admitted on January 5th, 1932, with one week's history of twitching of arms and legs and incoherent speech. No previous history of chorea. On examination the child presented the picture of a severe case of chorea. Heart sounds were normal. A series of nine injections was given, with satisfactory pyrexial response. The movements were diminished at the end of this time, but were still fairly well marked. The patient was kept in bed for two weeks, during which time the movements became slightly worse. A second course of seven injections was therefore given. At the end of this the movements were very slight, and disappeared entirely within a few days—that is, during the sixth week from the onset of the attack. Fifteen months later the child is well, has had no recurrence, and has no evidence of valvular disease of the heart.

Case 3.—Aged 5 years. Had chorea in January, 1930, and was admitted on November 24th, 1931, with a recurrence. Choreic movements of moderate severity. No clinical evidence of cardiac involvement. A series of eight injections was given ranging from 0.1 to 1.5 c.cm. At the end of this time the choreic movements had almost disappeared. The patient was kept under observation for three months, at the end of which time she was again admitted to hospital with a recurrence. T.A.B. treatment was not given on this occasion, and under the usual sedative treatment all movement ceased after a further two months. Now, eighteen months after the treatment with T.A.B., she is in the throes of yet another attack. The heart sounds are still normal.

Case 4.—Aged 10 years. Admitted on January 14th, 1932, with a mild attack of chorea. Previous history of acute rheumatism in June, 1930. Heart enlarged. Blowing mitral systolic murmur conducted towards the axilla with rough mitral diastolic murmur. After a course of seven injections of T.A.B. the choreic movements were no longer in evidence. In view of his heart lesion he was kept under observation at a convalescent home. He was readmitted to hospital on May 26th, 1932, with severe chorea and acute pericarditis. The heart enlarged progressively, and death occurred on July 10th, 1932.

DISCUSSION

The response to treatment in these cases is very varied. Case 1 appears to justify Sutton's claims, since the attack lasted only about seven days without the subsequent development of heart disease. In Case 2 a second course of treatment was necessary. The movements only subsided during the sixth week after the onset of the attack. It is therefore possible that, in the absence of treatment of any kind, the attack would have come to an end by then. Case 3 was under observation during two separate attacks, one treated with T.A.B., the other by the usual sedative measures. The attack treated with T.A.B. lasted about two weeks, that treated by conservative methods two months. This case therefore appears to confirm the claim that the new treatment cuts short the duration of choreic movements. On the other hand, it demonstrates that there is the same liability to recurrence with either method of treatment. Finally, Case 4, whilst bearing out the effect on the choreic movements, shows in a rather tragic manner that the pyrexial treatment has no retarding influence on the course of the cardiac complications. It is even possible that it had an accelerating effect.

CONCLUSIONS

The conclusions to be drawn from the results are that the treatment of chorea by artificial pyrexia (1) shortens the duration of choreic movements, (2) does not prevent recurrence, (3) appears to have no beneficial action on rheumatic carditis.

In view of these conclusions it is clear that the method requires exhaustive trial before it can be generally adopted. Its grave danger lies in the tendency to produce a false impression of cure by abolishing the movements, which in themselves are merely a symptom, when serious changes may be occurring in the heart. We do not allow a child with acute rheumatism out of bed as soon as the joint swellings have subsided under the influence of salicylates. In the same way it is undesirable to allow a child out of bed two weeks after the onset of an attack of chorea unless it can be conclusively proved that the treatment which cuts short the choreic movements also cuts short any accompanying carditis. When these facts are borne in mind it is clear that the use of artificial pyrexia has a very limited place in the treatment of chorea.

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TREATMENT OF CHOREA BY INDUCED
PYREXIA

BY

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In the *British Medical Journal* of June 10th, 1933, Dr. Donald Bateman gives a description of the treatment of Sydenham's chorea by pyrexia induced by intravenous injections of a triple typhoid vaccine. The following is an account of a case treated by this method. The author intends to apply the treatment to a series of cases, but in the absence of any other suitable ones the experience gained from the first seems worthy of publication.

CASE RECORD

The patient was a girl, aged 9 years. She had had two previous attacks of chorea. The first one, starting in December, 1930, lasted four months. The second, starting in

December, 1931, lasted ten months, five of which were spent in a hospital and three in a convalescent home in the country. The present attack started in January, 1933, two months after her return from the above-mentioned convalescent home. The child's mother stated that this attack was worse than either of the other two. When admitted to High Wood Hospital on June 28th, 1933, the child had been continuously in bed for six months—three at home, and three in a general hospital.

State on Admission.—Choreiform movements of the upper part of the body were severe. The child grimaced, waved her arms about continuously, and made writhing movements of her trunk from side to side. Voluntary movements were very clumsily performed. She could not hold a pencil in the writing position, and was unable to put on her bed jacket. There were no movements of her legs, in which there was slight loss of muscular power. Both knee-jerks were absent. Speech was very little affected, except that the child was reluctant to talk, and never did so spontaneously. The condition of the heart was as follows. The apex beat was in the fifth intercostal space, 7 cm. from the mid-sternal line (in the nipple line). The area of cardiac dullness was normal. A soft systolic murmur was faintly audible in the mitral area, and conducted towards the axilla.

Treatment.—The first injection of vaccine was given ten days after admission. During this time no appreciable change took place in the child's condition. She was kept lying down in bed all the time on an open-air balcony. The vaccine used contained 1,000 million typhoid and 500 million each of paratyphoid A and B per cubic centimetre. (This is slightly weaker than Dr. Bateman's vaccine, which contained 750 million each of paratyphoid A and B.) It was administered intravenously, three hours after breakfast on each occasion. The details of the management of the pyrexia were the same as those described by Dr. Bateman, with the exceptions that no aspirin was administered and the intervals between successive treatments were longer. The child was nursed between blankets, and hot-water bottles were used to help raise the temperature. The first injection was 0.05 c.cm. As this produced only a moderate pyrexia (103° F. rectal), 0.1 c.cm. was given next time. The temperature now rose very rapidly to 106°, and in spite of tepid sponging it reached 107° before it was finally brought down with ice-packs. The third injection was the same quantity as the second, and this time the temperature rose rather less rapidly to 105°, and was then successfully controlled with ice and sponging. For the fourth injection 0.15 c.cm. was given, and 105° was again reached. The interval between the first and second injection was two days. After the second injection, which produced a temperature of 107°, it was thought advisable to watch the child's general condition and the state of her heart for a few days before continuing. As no ill effects were observed, the third injection was given ten days after the second, and the fourth three days after the third. During the early stages of the pyrexia the child was very fretful and irritable. She complained of headache, and vomited from one to three times. Later she became drowsy, except during the last bout of pyrexia, when she was so restless and excitable throughout that considerable difficulty was experienced in taking the temperatures. During the second bout a rigor occurred. Sweating was not a very prominent symptom, which probably accounts for the rapidity with which the temperature rose. On the morning following each bout the child felt quite well.

Effect on the Heart.—An examination of the heart was made before and after each bout, and also at the height of the pyrexia. During the first and third bouts there was no evidence of cardiac disturbance beyond a tachycardia, which was not out of proportion to the pyrexia. During the second bout, at the height of the pyrexia, there was slight cardiac dilatation, the apex beat being palpable about one centimetre outside the nipple line. It had returned to its normal position the following morning. During the fourth bout there was again slight dilatation, and the child complained of pain over the praecordium. On the following day the dilatation was still present, although the pain had gone. The murmur at the apex was louder and better conducted than it had been previously. This, however, was presumably only due to a relative incompetence of the mitral valve, for on the next day the apex beat had returned to its normal position, and the murmur was only faintly audible.