

She noticed that there was a swelling on the right side of the abdominal wound; there was no vaginal discharge of blood. The pain gradually passed off, and her state of health again became satisfactory. On April 26th, 1910—that is to say, four and a half months after the operation—she observed a vaginal discharge of blood, accompanied by acute pain in the abdomen, and she noticed that the swelling on the right side of the abdominal wound had again appeared. She suffered also from a dull pain across the sacrum, from headache, and from lassitude. This discharge, which was thus associated with the usual signs and symptoms of a normal menstrual period, continued up to April 30th, 1910, and subsequently gradually diminished.

When the patient was readmitted on May 4th, 1910, there was slight leucorrhoea, but no discharge of blood. The os was unduly soft. The ovary in the right abdominal wall was tender and much swollen, measuring approximately 5 in. in diameter. There was no redness nor oedema of the overlying tissues. The temperature was 99° F., the pulse was 76, and the respirations averaged 24. The heart and lungs appeared to be normal, and the urine, which had a specific gravity of 1005, was acid in reaction and free from albumen and sugar.

On the following days the ovary steadily diminished in size, and by May 10th it was only just palpable, only very slightly tender, and the patient was practically free from all pain.

If we are to venture, in view of the facts of this case, to put forward any hypothesis regarding the nature of menstruation, we would say that the female organism is, in the first place, during a month under the influence of a toxin the origin of which is at present unknown but whose action is elective for the ovary; that the toxin produces an intense congestion of the ovary and perhaps a special metabolism; and that then an internal secretion derived from the ovary is formed which has a special action on the uterus, and which determines the discharge of blood. In the above case, for a period of four and a half months there were present certain signs such as the swelling of the ovary, flushings, and general lassitude, which were strong evidence of the presence in the organism of a poison having an elective action for the vasomotor system. After this period the grafted ovary had become permeated by new vessels originating from the parent body, newly-formed blood vessels had penetrated into the central portions of the ovary, and the menstruation, which up to that time had been in abeyance, was influenced by the grafted ovary, and occurred again in the usual manner.

## REFERENCE.

<sup>1</sup> *Les greffes ovariennes*, Thèse de Paris, 1910.

## A CASE OF SLEEPING SICKNESS SHOWING REGULAR PERIODICAL INCREASE OF THE PARASITES DISCLOSED.\*

BY

PROFESSOR MAJOR RONALD ROSS, F.R.S.,

AND

DAVID THOMSON, M.B., CH.B., D.P.H.

[*Prefatory Note by R. Ross.*—For a long time it has appeared to me that much light might be thrown on infectious diseases, immunity, and treatment, by more exact enumeration of the infecting organisms, and that we might even be able ultimately to apply mathematical reasoning to the study of these subjects. In 1903<sup>1</sup> I elaborated a method of blood examination, called the *thick-film process*, which enables us to detect small organisms in the blood about twenty times more easily than in ordinary preparations; but for the lack of the necessary assistance I was long unable to apply the method to the laborious enumeration of such organisms. Recently, however, the Advisory Committee for the Tropical Diseases' Research Fund has placed considerable funds at the disposal of the Liverpool School of Tropical Medicine for the study of cases in the tropical ward of the Royal Southern Hospital, Liverpool, with the result that the investigations referred to were commenced by Dr. David Thomson and myself from the beginning of this year. As I expected, methodical counting of the parasites has at once verified or disclosed several facts of importance in connexion with malaria and trypanosomiasis.]

In this communication we limit ourselves to a brief

description of the remarkable periodical increase of *Trypanosoma gambiense* revealed by careful daily counting in a case in the Tropical Ward, Royal Southern Hospital; it is still under treatment, and the eventual outcome will be reported later.

W. A., male, aged 26 years, a strong young man born in Northumberland, was infected in North-East Rhodesia in September, 1909, the trypanosomes being found in his blood in Africa on November 17th. He was admitted into the Southern Hospital, Liverpool, on December 4th. From then until February 16th (seventy-three days) the number of trypanosomes in his blood was estimated only by the rough methods in common use—that is, by the proportion of trypanosomes to red cells or leucocytes, or to "fields" of the microscope examined. These methods are obviously open to such great error that they can scarcely be depended upon to indicate any but very large differences in the numbers of objects counted. During the seventy-three days forty-six counts were made; but on several occasions none was attempted for three or four days in succession, so that, even if the methods of counting employed had been more accurate, sudden fluctuations might easily have been missed. Hence, as was to be expected, the graph during this period is very irregular and almost worthless. On admission on December 4th the patient was reported to contain about 6,000 trypanosomes per cubic millimetre of blood, and large numbers, amounting to about 3,000 per cubic millimetre, were found on December 17th and 28th and on January 16th. All this time the patient was given the usual treatment with atoxyl and mercury, and received altogether ten doses of 2 to 4 grains of the former. Nevertheless, the parasites never fell below about 200 per cubic millimetre, as roughly estimated.

It was then found, however, that atoxyl was injuring the patient's sight (as sometimes happens), and other treatment was substituted. At the same time we elaborated a much more correct method of counting all the parasites in measured quantities (one quarter to 1 c.mm.) of blood taken in thick film; and from February 16th onward the trypanosomes were estimated daily by this method by one of us (D. T.). The attached chart gives the remarkable graph obtained up to the present (April 30th).

The numbers of trypanosomes found were scrupulously recorded, and the smoothness and regularity of the graph suggest that there was no very great error of observation. The blood was taken every day at about 10 a.m., but on April 5th and 6th several counts were made daily.

It will be seen that between February 16th and April 30th (seventy-three days) there were eleven rises in the number of the parasites. Up to April 7th there were seven rises, at intervals of seven or eight days. During this period the patient was given no atoxyl, but was treated with large doses of quinine (30 to 40 grains) daily, with frequent doses of methylene blue, and with trypan red on March 17th, 18th, 19th, and 20th.

On April 5th it was decided to administer atoxyl again, as shown on the chart, together with mercury and other treatment.

The temperatures were taken by the Sister of the ward, and it will be seen that there has always been a tendency to a slight rise in temperature concurrent with the rise in the number of parasites—the two curves thus confirming each other. Only the maximum and minimum temperatures are entered in the chart.

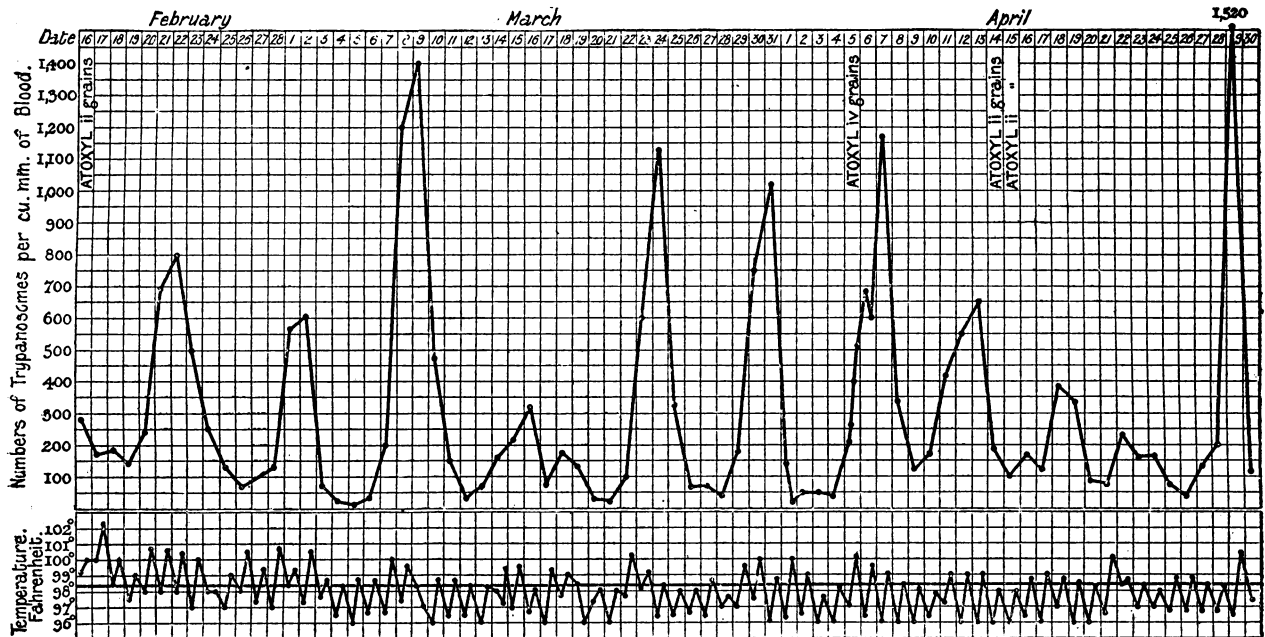
The great regularity of the rises can scarcely be compatible with a mere chance distribution. It will also be observed that the rises were of two kinds—namely, high rises and low rises; and that the two kinds alternated with regular periodicity until April 18th, at which point the cycle appears to have become distorted—probably in consequence of the treatment. The regularity of alternation of the high and low rises is so well marked as to recall the picture of a double tertian malaria, and to suggest that two independent sets of parasites may exist in the patient, just as often happens in malaria.

The large dose of atoxyl given on April 5th seems to have had no effect whatever on the following rise; but the succeeding rises were apparently modified for some reason. The value of the enumerative method for therapeutical research is obvious.

Of course many other facts in connexion with the case have been recorded, and parallel work is being done on subinoculated animals and on the parasites. It is, therefore, inadvisable to attempt at present any discussion of the many interesting theoretical questions which arise.

We are much indebted to the Director of the Sleeping Sickness Bureau (Dr. Bagshawe) for having given us references to the literature on the subject of such fluctuations. In the original case of Dutton and Ford it was noted that the parasites varied in numbers, and that a parallel rise in the patient's temperature occurred. Manson and Daniels<sup>2</sup> chart the number of parasites compared with 500 leucocytes; but the error of this method is very large, and their graph is quite irregular. They abandoned

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counts in measured quantities of blood as "unreliable." Thomas and Breinl<sup>3</sup> showed that in three cases of sleeping sickness the numbers of trypanosomes found in "fresh cover-slip preparations" varied irregularly from time to time. Koch, Beck, and Kleine (1909) remark on the irregularity of the appearance of *T. gambiense* in African natives, and state the parasites are present for two to five days, and absent for two to three weeks. Salvin-Moore and Breinl<sup>4</sup> show a graph with two undulations and a final premortal rise in two heavily infected rats, and give a detailed description of corresponding changes in the parasites. Apparently, hitherto, only irregular variations in the numbers of the parasites seem to have been recognized; probably the large error due to inadequate methods of counting has disguised the regular periodicity of the

variation shown by more exact counts in the eleven successive undulations observed in our case.

We should add that our methods enable us to detect parasites when they are in numbers so small that their detection by the ordinary methods would be exceedingly laborious. Hence, if our case had been studied by the ordinary methods, probably only the crests of the rises would have been visible in the chart, and it would have been said that the parasites had disappeared in the intervals.

REFERENCES.

<sup>1</sup> *Lancet*, January 10th, 1903, and *Thompson Yates Reports*, vol. v, Part I, 1903. <sup>2</sup> *BRITISH MEDICAL JOURNAL*, May 30th, 1903. <sup>3</sup> *Memoirs of the Liverpool School of Tropical Medicine*, vol. xvi, 1905. <sup>4</sup> *Annals of Tropical Medicine, Liverpool*, vol. i, No. 3, 1907.

Memoranda :

MEDICAL, SURGICAL, OBSTETRICAL.

A POST-MORTEM REPORT OF A CYSTIC SPLEEN.

On Friday, May 20th, I was called to view the body of a Portuguese, aged 48 years, who had been working—coaling a ship that day, and had complained of feeling sick. He had retired to his bunk, was given a little stimulant, and a few minutes later had died. I found the body lying partially on the left side. There was a considerable amount of foaming at the mouth. On inspection he was found to have a double inguinal hernia, easily reducible. The abdomen was moderately distended, and on the left side, slightly below the costal arch, was a swelling extending to a level with the umbilicus and across the middle line for about 1½ in. There were no marks of violence, and the body was just warm. I was unable to certify the cause of death, and by direction of the coroner made a *post-mortem* examination the following morning. An incision was made from the suprasternal notch to the pubis, and the parts exposed.

*Thorax.*—The pericardium contained some clear fluid, and on opening it the heart showed signs of fatty degeneration. The ventricles and auricles were filled with dark clotted blood; there was no valvular insufficiency, but there were a few calcareous deposits at the base of the aorta, and the muscular walls were much thinner than normal, and friable. The right lung was typically anthracosed, but otherwise normal. The left lung was also anthracosed, pushed up to about the lower margin of the sixth rib, and extremely adherent at all points, apically, towards the root, at the base and sides. The pleura was not visibly thickened.

*Abdomen.*—The first thing that presented itself was a large tumour about the size of a large melon, larger at the free border, and tapering slightly to its attachment below the ribs; about one-fifth of the tumour was underneath the costal arch and resting against the diaphragm, and the remaining four-fifths below the level of the costal margin. The tumour was extremely adherent to the surrounding tissues and organs, except the stomach, which was pushed away to the right, occupying a position below the liver against the gall bladder. On attempting to remove the tumour, which was evidently the spleen, it was ruptured at its lowest margin, and a quantity of thick whitish-yellow fluid, of the consistency of custard, escaped. With a pair of scissors I opened the tumour in its entirety, and found a clear fluid in which were floating globules of various sizes, from the size of a Tangerine orange to that of a hazel nut or almond. These floating bodies consisted of a clear, translucent membrane containing a fluid similar to that in which they were suspended. The cavity in which they floated was unilocular. The thickness of the walls of the tumour was about half an inch. The stomach was very small, and measured about 5 in. in length and 3 in. in breadth. It was not further examined. The kidneys were congested. The liver was enlarged, and extended for 1 in. below the costal margin, and was congested. The gall bladder appeared normal.

*Diagnosis.*—I took specimens of the cystic bodies to the Sanitary Commissioners' Laboratory, where there were kindly examined for me by Mr. Abrines. Hooklets were found, and the diagnosis of *Taenia echinococcus* made.

An examination of the literature of *Taenia echinococcus*, or hydatid, shows that of 1,862 collected by Davaine, Cobbold, Finsen, and Neisser, the liver was affected in 953, the intestinal canal in 163, the lung and pleura in 153, kidneys, bladder, and genitals in 186, the brain and spinal cord in 129, bone in 61, blood vessels in 62, and other organs in 158. Of 50 cases treated by Mosler, the liver was affected in 36, the lungs in 10, the kidney in 3, and the spleen in 1.

L. H. GILL, L.R.C.P. and S. Edin., L.F.P.S. Glasg. Gibraltar.