bund trypanosome which was quite incapable of forcibly detaching particles, as its movements were of the feeblest character. A useful standard is to recognize extrusion of a granule only after the trypanosome has been under observation for some time and the swinging of the granules carefully watched.

When free in the wet preparation the granule seems to be rather larger than the small particles known as blood dust. It shows two forms—one circular, the other pear-shaped—not unlike a common form of poikilocyte in stained blood films. The explanation of this seems to be that it is actually pear-shaped, but when looked at “end-on” a circular appearance is presented, as the base of the pear-shaped body is nearer the observer’s eye. There is more than sufficient depth of fluid between the slide and cover-slip of a wet preparation for a small body like the granule to turn over on itself; therefore, if the granule, while circling in the free fluid, turns from the “end-on” position to a direction parallel with the slide, it displays its long diameter and is seen to be pyriform. It seems improbable that it actually changes its form so rapidly.

In the granule immediately after extrusion there appears to be no flagellum, but later it is indicated, though in gland puncture preparations it is indistinct. A point in favour of the existence of a flagellum is that very frequently there is to be seen a minute particle of blood dust, apparently attached to the granule by a short invisible filament; for some time the particle follows all the movements of the granule, but is afterwards left behind. This seems as if the particle had been attached temporarily to the flagellum, which was too delicate to show up clearly in the space intervening between the granule and the particle.

The difference from blood dust, leucocyte particles, etc., is clearly brought out by focussing. When the granule is slightly out of focus there is seen to be a very much greater disturbance of the medium round about it.

Motility is distinct. The granule may be carried along in the various currents and eddies encountered in wet preparations, but at other times it moves across or against the stream, and in open lacunae where there are no obvious currents it may be seen to progress across the field in any direction.

The dark ground illumination gives a better picture of the granule within the trypanosome, but the vital staining method suggested by Balfour² demonstrates the extruded granule much more clearly. By this means the granule within the trypanosome shows as a dark-coloured dot against the clearer cytoplasm, but the free granule, even in its earliest stages, stains well, and is seen as the small motile pyriform body turning over on itself. A flagellum appears soon after extrusion, and is a more distinct feature than in the dark ground preparations; this gives the granule the appearance on a very small scale of a tadpole with a short tail. I have never seen a flagellum showing undulations. It has been noted in a case with very scanty trypanosomes and granules that one granule lying close to a trypanosome had a well-defined short flagellum; this is evidence in favour of its early development, as it is highly probable that the granule had been recently extruded and sufficient time had not elapsed for the granule to move far away from the parent trypanosome, while the latter contained only one granule and was very sluggish, bearing a close resemblance to trypanosomes seen in the dark ground after they had extruded granules.

Motility is made very evident by vital staining, and frequently a granule has been watched making its way over half the diameter of a field.

Fresh blood preparations from various animals have been examined by vital staining, and observations made as to the presence or absence of the granule. A few of these cases may be quoted:

1. A rat, inoculated with a drop of gland juice, was examined on the eighth day; five slides were prepared, but in a prolonged search no granules were seen. This rat did not become infected.

2. Mule sent for examination as nagana was suspected. Blood examination by the ordinary method was negative on more than one occasion. After a long search through many slides (vital stain preparations) one very suggestive, though non-flagellated, granule was seen, but no trypanosomes. In view of this granule I suspected strongly that the case was positive, and the follow-

ing day, after many examinations, a trypanosome was found with an actively motile flagellated granule in the same field. This case may almost be said to have been diagnosed by the discovery of the granule at the first examination.

3. Monkey infected with *T. gambiense*. At an early stage of the case five wet preparations were made; only one trypanosome was seen, but motile granules were present in all the five slides.

4. Mule suffering from epizootic lymphangitis; granules were not seen.

In gland puncture vital stain preparations from man motile granules were never seen in a case that did not prove positive by the discovery of a trypanosome.

Granules have been found in fluid obtained by puncture of internal organs—liver, spleen, and lungs—but the number to be seen in such preparation does not seem to bear a definite relation to the severity of the gland infection. It is, I think, probable that the granule undergoes development in the internal organs, and suggestive forms have been seen. Some phenomena have also been noted after treatment. Further observations are to be made on these points.

SUMMARY.

1. The “infective granule” of trypanosomiasis occurs in *T. gambiense* in cases of sleeping sickness.
2. Granule shedding has been observed, and the free granule seen in lymph glands and internal organs—liver, spleen, and lung.
3. The granule is at first pyriform, but develops a flagellum. It is actively motile, and can be distinguished from “blood dust.”

REFERENCES.

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THE RESULTS OF SANATORIUM TREATMENT.

BY

F. W. BURTON-FANNING, M.D., F.R.C.P.,

VISITING PHYSICIAN TO KELLING SANATORIUM,

AND

W. J. FANNING, M.R.C.S., L.R.C.P.,

LATE RESIDENT MEDICAL OFFICER TO KELLING SANATORIUM.

In this communication we record the results of treatment and the after-histories of 1,102 patients, who passed through Kelling Sanatorium between January, 1903, and March, 1910. We think certain other facts elicited from this number of patients are also worth publishing.

Our patients have been drawn from all parts of England and Wales and the Isle of Man, but more than half of the total number came from London and Norfolk. They belonged to the wage-earning classes, and their admission to the sanatorium depended solely upon their inability to pay the fees of private institutions and upon their being certified as medically suitable. It scarcely need be said that applications for treatment have always exceeded our number of available beds, and that we have never been without a formidably long waiting list. The following information was obtained from these 1,102 patients.

Age and Occupation.

Their average age at the time of the first observed symptom of their malady was 25 years and 10 months; 718, or about 65 per cent., were town-dwellers; 384, or about 34 per cent., were country-dwellers. As regards their employment: Of the 707 men, 71.7 per cent. worked indoors, while 28.3 per cent. worked out of doors. The 372 women were, practically speaking, all employed indoors.

Family History.

A family history of pulmonary tuberculosis in the direct line was obtained from 459, or 41.6 per cent.; 363 patients stated that they had been exposed to the risk of infection from other consumptives, and 37 had occupied infected houses.

Personal History.

The vital importance of proper treatment in the very earliest stages of their disease is our reason for calling attention to the following notes.

The average time allowed to elapse between the first manifestation of the disease and application being made for sanatorium treatment was one year and six months.

The average interval between the first symptom and the giving up of work was ten months.

Furthermore, in the case of 80 patients, there were records of an antecedent tuberculosis, not of the lungs necessarily, which had disappeared from two to thirty years previously. In regard to 428 patients who have died, we find that the average length of time from the date of the first observed symptom to that of death was three years and four months.

On the point of the delay in seeking sanatorium treatment after symptoms of pulmonary tuberculosis have manifested themselves, we made some further inquiries in the cases of 170 patients, all of whom had been ill for a year or more before coming into the sanatorium; 68 were not aware of the true significance of their symptoms, and did not seek advice; 87 were more or less prompt in seeking advice, but radical measures were not adopted in the first instance. While many of this number were sent to convalescent homes or elsewhere for change of air, others were only supplied with medicine at home. In 12 cases it is clear that the nature of the malady was not diagnosed. The remaining 3 patients refused to undergo treatment when advised.

The above statements are partly based on what occurred several years ago, when the exact value of sanatorium treatment was not fully recognized in this country, and when the prime importance of early treatment was not appreciated. During later years a larger proportion of our patients have sought admission in the early stages of the disease, and there is noticeable an ever-increasing desire on the patients' parts to get into a sanatorium as soon as they are declared to have consumption. But even so, the vast majority of our inmates were obviously ill and had unmistakable physical signs of disease in one or both lungs. In the few exceptions the diagnosis was settled by the presence of tubercle bacilli in the sputum, or in a very few instances solely by the occurrence of definite haemoptysis. Some twelve persons altogether were judged not to be suffering from pulmonary tuberculosis, and are not included in this account.

Treatment and Results.

The 1,102 patients were classified as follows, according to the severity and stage of their affection on admission:

Class I (Turban) ...	...	445, or 40.3 per cent.
Class II ...	...	256, or 23.2 "
Class III ...	...	401, or 36.3 "

We would draw attention to the point that less than half of our patients were taken in hand while their malady was in a favourable stage for obtaining the best results.

The average length of stay in the sanatorium was for each patient a few days over twelve weeks. We had not commenced the use of tuberculin, but graduated labour has been a part of the routine of the patient's day since 1903.

Results of Treatment.

	Total Number Discharged.	Alive.			Dead.	Not Heard of.
		Fit to Work.	Unfit to Work.	Total.		
Class I ...	445	289 (64.9 %)	54 (12.1 %)	343 (77 %)	75 (16.8 %)	27 (6 %)
Class II ...	256	107 (41.7 %)	38 (14.8 %)	145 (56.6 %)	102 (39.8 %)	9 (3.5 %)
Class III...	401	75 (18.7 %)	51 (12.7 %)	126 (31.4 %)	263 (65.8 %)	12 (2.9 %)
All classes	1,102	471 (42.7 %)	143 (12.9 %)	614 (55.7 %)	440 (39.9 %)	48 (4.3 %)

The above table includes all patients discharged from the sanatorium during the years 1903 to 1910. A certain proportion of the patients therefore have only been out of the institution a little more than a year, while with others the interval since their discharge ranges up to eight years.

Effects of Indoor and Outdoor Occupations on Discharged Patients.

Of the patients who returned to work on leaving the sanatorium, 61.4 per cent. resumed their former work,

38.6 per cent. took up new work. Dealing only with Class I patients, we ascertained at the end of 1910:

Of patients resuming their former outdoor occupations 80 per cent. were still able to work.

Patients resuming their former indoor occupations, 76 per cent. were still able to work.

Patients who had been formerly employed indoors and who after sanatorium treatment took up outdoor employment, 78 per cent. were still able to work.

So far as the above figures warrant the drawing of any conclusion, it would appear that there is little to choose between outdoor work and indoor work for the discharged patient, but it must be pointed out that the indoor occupations to which our patients returned were of the less injurious kinds. Everything possible was done to prevent them from returning to unhealthy factories and shops. Those who did return to indoor work have been encouraged to observe sanatorium principles as fully as possible. In fairness to the outdoor life it must also be remembered that the clerk or factory hand is at a great disadvantage in attempting outdoor work, for which special training is usually needed.

But the test by which the real value of sanatorium treatment is judged must be the durability of recoveries. In the next table we show the percentages of our patients who were alive at the end of each successive year after their discharge.

	Class I only.	All Classes.
Living 1 year after discharge	Per cent. 89.5	Per cent. 69.9
Living 2 years "	81.5	59.6
Living 3 " "	71.7	49.2
Living 4 " "	70.3	45.7
Living 5 " "	67.0	44.3
Living 6 " "	64.0	42.1
Living 7 " "	64.0	40.9

It will be seen that the first three years after treatment are the crucial period. The patients who survive that space of time possess a greater expectation of maintaining their ascendancy over the malady.

During the first triennium after residence in sanatorium there died: Class I, 28.2 per cent.; all classes, 50.7 per cent.

During the second triennium: Class I, 7.7 per cent.; all classes, 7.1 per cent.

We are convinced that the results of the sanatorium treatment of pulmonary tuberculosis promise to become better and better. Attention must be concentrated on the early diagnosis of the disease, and we welcome the advent of dispensaries where facilities will exist for this purpose. Experience has shown that the early consumptive does not discover himself, but must be actively sought out, and that for this work the service of an expert is required. At present the applicant for admission to a sanatorium is provided with a form certifying to the presence of more or less glaring physical signs in his chest. We should aim instead at utilizing our sanatoriums for patients certified to have no physical signs of lung destruction.

A SOMEWHAT belated report by the Inspector-General on the condition of the hospitals for the insane in Western Australia for 1910 has reached us recently. On December 31st, 1910, there were 798 persons certified insane in the State, an increase of 14 on the previous year. The population of the State in 1910 was 288,743, so that the rate of insane to sane was: Males, 1 to 296, or 3.37 per 1,000; females, 1 to 534, or 1.83 per 1,000; total, 1 to 364, or 2.74 per 1,000. Compared with the other Australian States, Western Australia has the lowest insanity-rate, with the exception of Southern Australia. Alcohol and venereal diseases are assigned as the principal causes of insanity, but heredity is stated also to play an important part. The forms of insanity most prevalent were delusional insanity, mania, dementia, and general paralysis of the insane. The recovery-rate was good—92 out of 212 admissions. The maintenance-rate seems to compare very favourably with the rate in this country—namely, £38 5s. 1d. a head per annum. When patients' fees and receipts from farm produce is deducted, the actual cost is reduced to £33 0s. 1d. per patient.