

which just over 10 per cent. were large mononuclear and 20 per cent. eosinophiles. Examination on March 30th, nearly ten weeks later, showed a similar condition of the blood. His symptoms have been exactly the same—there is always blood in the urine, and at times he has to pass urine every half hour. Ova were found on both occasions and hatched out freely.

Consideration of these cases leaves no doubt that they were absolutely unaffected by the administration of salvarsan.

The first case was not followed up; his liability to re-infection prevented his being a good test case. The chief point proved was that in his case salvarsan, given intramuscularly, exerted no effect on the life or discharge of the ova. Since it is this method which is stated by Dr. Joannides to have produced a complete absence of ova in all his cases in less than a week, it is useful for comparison.

The other two cases were injected intravenously. If any drug is to produce a rapid effect on parasites which live in the blood-vessels, clearly the most effective way is to introduce it directly into the circulation. Unluckily the death of the worms cannot be recognised by any immediate change in the symptoms, which depend, as has been explained above, on the presence of the eggs already laid in the tissues. The only possible indication of the death of the worms would be a marked fluctuation in the degree of eosinophilia, which would ultimately tend to disappear. This was accordingly investigated repeatedly with a negative result. The persistence of symptoms, and particularly the continued discharge of living eggs, leave no doubt that the effect on the eggs themselves was absolutely *nil*. Both cases were carefully watched over a sufficiently long period to establish this point.

We, therefore, conclude that salvarsan as a remedy for bilharziasis is absolutely valueless, and that it should not be used or recommended for this purpose.

## CAN AS GOOD RESULTS BE OBTAINED BY THE TREATMENT OF PULMONARY TUBERCULOSIS IN THE LOWLANDS AS AT HIGH ALTITUDES?<sup>1</sup>

By PROFESSOR CHR. SAUGMAN,

MEDICAL DIRECTOR OF VEJLEFJORD SANATORIUM, DENMARK.

SINCE the year 1899, when Turban issued his famous book "*Beiträge zur Kenntniss der Lungentuberkulose*," it has appeared to many physicians as an established dogma that a mountain climate, and more especially a high altitude climate, is one of the most important conditions for the treatment of pulmonary tuberculosis, and that the results which were obtained at the high altitudes in reality were far better than those which could be obtained in the lowlands. Turban's statistics were so much more satisfactory than those published hitherto that this opinion seemed to be well founded. Experienced authors, however (such as Meissen, Schröder, and others), have maintained the opposite standpoint, but up to now no proof based on statistics has been offered to show that it is possible to obtain just as good results at a low level as at a high altitude. On the other hand, there are still authors (for instance, Williams in his Harveian oration, 1911<sup>2</sup>) who strongly maintain that treatment at high altitudes is far superior to all other climatic or hygienic forms of treatment.

After having worked for some years in Denmark at Vejle fjord Sanatorium, which is close to the sea and only 25 metres above it, it was clear to me that our results were hardly inferior to Turban's, and now, after a period of 12 years' work, I consider myself entitled to offer the proof thereof based on statistics.

I am well aware that it is extremely difficult to compare the results of two methods of treatment, or the results from two sanatoriums, and that it is very easy to go astray into a wilderness of statistical lies. It would not be correct to make a simple comparison between the figures obtained from different localities, especially with regard to the results gained at the time of the patient's discharge, when a more or

less optimistic temperament on the part of the physician in charge quite involuntarily affects the figures.

To begin with, in classifying the material it is impossible to obtain complete uniformity. In every classification into stages there must always be boundary cases which two observers may judge somewhat differently, so that it is hardly to be expected that two physicians will classify a great number of patients quite in the same way. But experience has shown that Turban's original division into stages,<sup>3</sup> when his definition is followed exactly, answers practical requirements excellently, and gives figures which may very well be compared. This is especially the case when the Turban method of classification is supplemented by Sofus Bang's divisions of field,<sup>4</sup> as used at all Danish sanatoriums since the year 1907. By this method as homogeneous results as possible are obtained.

While, as mentioned, a general comparison of the results at the time of discharge cannot be made, there are still some results which can be expressed numerically, and which, when due criticism is exercised, may be used for comparison. These are the disappearance of tubercle bacilli from the sputum, and a normal temperature at the completion of the treatment in patients who exhibited tubercle bacilli, or were febrile at the beginning of treatment.

A third fact which can be expressed numerically is the increase in weight, but this depends largely upon the patient's state of nourishment on admission. Well-to-do patients who have been properly fed before their admission will, as a rule, show less increase in weight than less well-to-do patients. While an average increase of weight for each patient during the treatment at Turban's sanatorium was 4 kilogrammes, at Vejle fjord sanatorium it was 5-8 kilogrammes. This need only indicate that Turban's patients were richer than our patients.

The percentage of patients who during treatment were relieved of tubercle bacilli in their expectoration can be seen from the following table:—

	Turban's Sanatorium.	Vejle fjord Sanatorium.
Stage I. ... ..	74 per cent.	79 per cent.
Stage II. ... ..	41 "	65 "
Stage III. ... ..	11 "	17 "

It will be seen that the figures throughout are more favourable at Vejle fjord Sanatorium than at the high-altitude sanatorium.

The percentage of those patients who were admitted with fever but became afebrile during the treatment is as follows:—

	Turban's Sanatorium.	Vejle fjord Sanatorium.
Stage I. ... ..	85 per cent.	83 per cent.
Stage II. ... ..	80 "	96 "
Stage III. ... ..	44 "	69 "

The figures cannot accurately be compared as the temperature is taken in the mouth at Turban's Sanatorium and in the rectum at Vejle fjord Sanatorium. These figures also show that the results are in no way better at Davos than at Vejle fjord Sanatorium. This fact is still more emphasised in that the average duration of the treatment at Turban's Sanatorium was 222 days, while at Vejle fjord Sanatorium it was, up to 1908, 176 days.

When in practice an estimate is to be made of the results of a method of treatment, the question arises at once how the results will appear a number of years after its termination. The value of such an estimate is, however, limited, as the permanence of the results often are dependent upon circumstances which are quite without any connexion with the treatment. And with pulmonary tuberculosis, where so much depends upon the patient's ability subsequently to take such precautions as are necessary in order to maintain the result gained, it is evident that the financial position of the patients is of great importance. When, therefore, a comparison is made between the results from Turban's Sanatorium and from Vejle fjord Sanatorium, it must be remembered that Turban's charges are 50-100 per cent. higher than at Vejle fjord, the patients being considerably better off. For this reason it is to be expected that Turban's patients would keep in better health than those from Vejle fjord.

<sup>3</sup> The Turban-Gerhard classification into stages "internationally adopted," unfortunately, is quite useless in the treatment of material such as ours; we would scarcely have 5 per cent. in Stage I. and 5-10 per cent. in Stage II., and more than four-fifths of the patients in Stage III.

<sup>4</sup> Zeitschrift für Tuberculose, vol. xii., p. 384.

<sup>1</sup> A paper read before the International Congress on Tuberculosis at Rome, April, 1912.

<sup>2</sup> THE LANCET, Oct. 21st, 1911, p. 1117.

At both sanatoriums investigations concerning the later fate of the patients have been made—by Turban in the year 1897 for patients discharged from 1889-96, or 1-7 years after their discharge; at Vejle fjord Sanatorium every year since 1903, so that statistics compiled in 1911 include those patients who have been discharged from April, 1900—December, 1908, or from 2-10½ years after their discharge.

A simple comparison of figures is, as mentioned before, not permissible. Each separate stage comprises at both places most heterogeneous material, a most unequal number of cases, with or without tubercle bacilli in their sputum, and a great difference in the number of patients admitted with or without fever; and the figures are of course highly influenced thereby. It is therefore necessary to select a more exact limitation within the separate stages, and such a one presents itself quite naturally, partly in regard to the bacilli, and partly in regard to the temperature. I have first made a comparison between the cases with bacilli—i.e., such cases where tubercle bacilli have been found in the sputum at the time of admission or during the stay at the sanatorium, within the separate stages, and the results of the comparison are given in Table I.

TABLE I.—Statistics from Turban's Sanatorium and Vejle fjord Sanatorium regarding the Later Fate of Patients Admitted with Tubercle Bacilli in their Sputum or in whom Tubercle Bacilli have been Found during their Stay at the Sanatoriums.

	Turban's Sanatorium (after 1-7 years).			Vejle fjord Sanatorium (after 2-10½ years).		
	Stage I.	Stage II.	Stage III.	Stage I.	Stage II.	Stage III.
1. Able to do ordinary or light work ... ..	36	99	17	32	72	189
2. Unable to work on account of tuberculosis ... ..	2	25	8	0	2	40
3. Unable to work on account of other illnesses ... ..	1	0	1	0	1	5
4. Died from other illnesses ...	0	1	2	4	3	11
5. Died from tuberculosis ...	0	54	73	3	26	522
6. Unknown ... ..	0	5	3	0	1	8
Total ... ..	39	184	104	39	105	775 5

5 The considerable number of patients in the third stage at Vejle fjord Sanatorium is easily explained, for it is the only large sanatorium in Denmark intended for well-to-do, or fairly well-to-do, patients, and the sanatorium is therefore always sought by a number of patients who are very ill. And all patients who apply are admitted if there is but some possibility of improvement.

If the percentage is calculated, and Nos. 3 and 4 are omitted from this calculation (those who are otherwise ill or have died from other illnesses than tuberculosis, and whose fate does not influence the judgment of the present facts), then the figures will be as shown in Table II.

TABLE II.—Cases with Bacilli (omitting those who are ill or have died from other illnesses).

	Stage I.		Stage II.		Stage III.	
	Turban's Sanatorium (after 1-7 years).	Vejle fjord Sanatorium (after 2-10½ years).	Turban's Sanatorium (after 1-7 years).	Vejle fjord Sanatorium (after 2-10½ years).	Turban's Sanatorium (after 1-7 years).	Vejle fjord Sanatorium (after 2-10½ years).
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
1. Able to work ... ..	94.7	91.4	54.0	71.3	16.8	24.7
2. Unable to work on account of tuberculosis ... ..	5.3	—	13.7	2.0	7.9	5.3
5. Died from tuberculosis ...	—	8.6	29.6	25.7	72.2	6.8
6. Unknown ... ..	—	—	2.7	1.0	3.0	1.2

Table II. shows that although a considerably longer period has passed from the time of discharge, still the results from Vejle fjord Sanatorium are in no way inferior to those from Turban's Sanatorium, and that they are even considerably better with regard to the more severe forms of the disease.

The other relatively homogeneous category within each separate stage is composed of those patients who have been admitted to the sanatorium with fever. The results for patients admitted with fever at the two sanatoriums are shown in Table III.

TABLE III.—Statistics from Turban's Sanatorium and Vejle fjord Sanatorium regarding the Later Fate of Patients admitted with Fever.

	Turban's Sanatorium (after 1-7 years).			Vejle fjord Sanatorium (after 2-10½ years).		
	Stage I.	Stage II.	Stage III.	Stage I.	Stage II.	Stage III.
1. Able to do ordinary or light work ... ..	18	40	10	20	37	91
2. Unable to work on account of tuberculosis ... ..	0	13	6	0	0	15
3. Unable to work on account of other illnesses ... ..	0	0	0	0	0	2
4. Died from other illnesses ...	0	0	1	2	1	6
5. „ „ tuberculosis ...	1	34	63	0	11	336
6. Unknown ... ..	1	3	2	0	0	2
Totals ... ..	20	90	82	22	49	452

Table IV. is a re-calculation of Table III. to percentage figures in the same way as Table II. in its relation to Table I.

TABLE IV.—Febrile Cases (omitting those who are ill or have died from other illnesses).

	Stage I.		Stage II.		Stage III.	
	Turban's Sanatorium (after 1-7 years).	Vejle fjord Sanatorium (after 2-10½ years).	Turban's Sanatorium (after 1-7 years).	Vejle fjord Sanatorium (after 2-10½ years).	Turban's Sanatorium (after 1-7 years).	Vejle fjord Sanatorium (after 2-10½ years).
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
1. Able to work ... ..	90	100	44.4	77.1	12.3	20.5
2. Unable to work on account of tuberculosis ... ..	—	—	14.4	—	7.4	3.9
5. Died from tuberculosis ...	5	—	37.8	22.9	77.7	75.6
6. Unknown ... ..	5	—	3.3	—	2.5	0.5

As will be seen, Table IV. tells the same story as the table for the cases with bacilli, and shows that the results obtained at Vejle fjord Sanatorium, situated by the sea coast and just above the level of the sea, are more favourable as far as the severely, and even the most severely, attacked patients are concerned than the results obtained at Turban's Sanatorium, which is situated 1573 metres above the sea. The table also shows that the results are about the same at the two sanatoriums as far as the slighter cases are concerned.

Even if the possibility is taken into consideration that pulmonary tuberculosis in the course of time seems to show a certain tendency to take a milder course than before—a possibility I am personally not inclined to deny—and that the ten years which have elapsed between the dates treated by the two sets of statistics might have a slight influence in favour of our statistics, still I consider myself entitled to hold as proved that by the treatment of pulmonary tuberculosis in the lowlands it is possible to obtain results which are just as favourable as the results obtained at high altitudes—results that for Stages II. and III. of the disease are even better.