

## WHITHER TUBERCULOSIS?\*

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I must crave the indulgence of my audience if I commence on a personal and reminiscent note since my interest in tuberculosis stretches over rather more than half a century—56 years, to be exact.

My association with Dr. R. W. Philip (later Sir Robert Philip), begun in my student days, became much closer after my graduation, when I worked with him and received an inspiration from him which has never flagged. Philip was a most remarkable man, with scientific, clinical, administrative and prophetic gifts far above his fellows. He became an international figure, and the first professor of tuberculosis at the University of Edinburgh. Somewhat belatedly his own country acknowledged his eminence and rewarded him with a knighthood. Looking back today on his achievements one is amazed at the depth and greatness of his foresight in the light of the complete fulfilment of so many of his prophetic pronouncements. His great part has been to design the scheme of control for tuberculosis, and with such insight and clarity that it remains today for universal adoption the most logical and effective method. My personal association with Philip in those days, and constantly since, until his death in 1938, has given direction to my life work. Thus I was soon drawn into tuberculosis work on my return to South Africa. I am very thankful to have been able for half a century to watch the successful direction of Philip's control scheme as reflected in many countries: and now in the penultimate stage with the application of chemotherapy I should be very happy if I could convey to my colleagues a vision of the future with a fraction of the assurance and clarity of my old master.

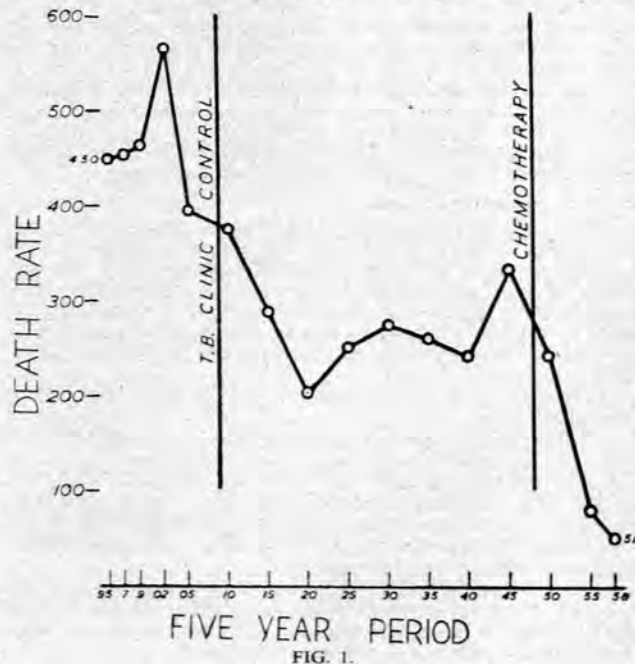
### Mortality Rates

Much can be learnt from a study of the national tuberculosis mortality rates of countries possessing an organized statistical service. Thus the effects of war are clearly shown in the increased death rate from tuberculosis. Over a long period of years since 1860 the general death rates and also those from tuberculosis have slowly decreased—owing at first to general improvement in sanitation. The tubercle bacillus was discovered by Koch in 1882, and since the 1890s in Great Britain, and 1900 in the USA, there has been a steady acceleration of the rate of fall of the death rate from tuberculosis, out of proportion to the fall of the death rate from all causes.

This decline of tuberculosis, which is reflected in the mortality returns of most countries, shows the effect of three events in the history of tuberculosis, viz.: (1) The discovery of the tubercle

bacillus by Robert Koch in 1882, (2) the operation of the coordinated control plan as first laid down by Philip, who opened the first 'dispensary' in Edinburgh in 1887 and worked out his universally adopted scheme in the 1890s; and (3) the introduction of chemotherapy about 1948.

The quinquennial death rate from tuberculosis per 100,000 of the population (all races) during the years 1895—1958 in the municipal area of Cape Town is an illustration of the decline of tuberculosis in a local area (Fig. 1). The establishment of clinics in 1910 and the introduction of chemotherapy in  $\pm$  1948 both led to a sharp fall in the death rate from tuberculosis. The rise in the rate after 1920 was due to the incorporation of Wynberg and other areas into the metropolitan area, and the lack of housing after



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World War I; and the rise after 1939 was due to the incorporation of a large area of the Cape Flats and to increased industrialization which, together with World War II, caused a shortage in housing and the creation of new slum areas.

#### CONTROL OF TUBERCULOSIS

Today we know with some certainty the conditions which encourage the onset and spread of tuberculosis, and we know also that by opposing those conditions we can limit both onset and spread.

The fundamental elements which underlie our ideas of tuberculosis control must first be considered in any organized scheme. To these we can now add a highly coordinated scheme with BCG, lung surgery, mass radiography and chemotherapy in support. Having done our best to correct environment, faulty habits, and dietetic deficiencies we can also, by BCG vaccination, build up in susceptibles some grade of natural resistance against the germ's attack. Granted that this resistance is not absolute, that it is temporary and evanescent, nevertheless in the Scandinavian countries and elsewhere BCG vaccination seems to show good results. Yet there remain the problems posed by drug-resistant bacilli and the creation of chronic cases. If, however, in 1924 it was clearly shown that it was within man's capacity to lower the death rate from tuberculosis significantly with the only means then available—general control, segregation and rest—it must surely be within his capabilities now, when earlier diagnosis are available to masses of the population, and with all the accessories (BCG, chemotherapy and surgery) at hand, to make a still greater impression on the downward plunge of the death rate. So now today I think I may say that we are several steps nearer the complete control and perhaps elimination of tuberculosis with a certainty never before possible.

It is not my intention to discuss here the technical difficulties of treatment, such as the knowledgeable application of the antibiotics, and the appropriate time for applying surgery. Such matters require the highest knowledge and experience in these routines; and for this reason the treatment of tuberculosis (pulmonary, especially) must be left to those trained and skilled in these matters. Disasters and chronic cases arise, in the majority of instances, from delayed diagnosis, and from unskilled application of treatment. I shall therefore follow the broad lines of the application of control, and leave aside all technical considerations. For, after all, the most important factor remains in really early diagnosis, and immediate and adequate treatment.

In dealing with tuberculosis, with its silent and subtle onset, the matter is much more complicated. Nevertheless our fundamental methods can be summed up very aptly by three slogans: (1) 'Every case comes from another.'; (2) 'Early discovery means early recovery'; and, if we add a third in its original idiom, (3) *Jedermann hat am ende ein bischen tuberculose*, we identify the factor of resistance which man has painfully acquired over the many centuries of his fight against the disease, but for which his suffering must have been greater, and his hope of recovery smaller. Here then are the basic elements of our scheme of attack, viz., early detection, almost synonymous with rapid recovery, infection controlled by segregation, and the development of the natural resistance by all means possible in the course of the fight.

#### Principles of Control Scheme

So far we have considered the problem in the light of the experiences of the older countries. We can learn much from these well-tried methods, and with suitable modifications they may well be applied under our local conditions. Modifications will naturally be necessary in our form of application, but the sound and logical methods of Philip's Edinburgh scheme remain as the substance of our control scheme. Briefly then the measures we must take are as follows:

1. Discover by all means available, and notify, every case of tuberculosis.
2. Isolate, control, and treat promptly every 'open' case.
3. Treat and control every case until arrested and safe.
4. Search for and examine all immediate contacts of cases discovered. It is most important to search the environment of the case; to wait for cases to apply for examination is to wait too long.
5. Correct the environment and the social factors which generate and permit tuberculosis to remain.
6. Watch especially the child contacts who may harbour the bacilli. Correct their environmental and nutritional faults so as to build up some grade of physiological resistance, which may later prevent the development of clinical tuberculosis.

7. Eliminate faulty conditions of housing and nutrition, the former by legislation, the latter by teaching and example, having special regard to workers in our new industries who have recently become urbanized.

8. Safeguard wherever possible all workers against strain, especially in hazardous conditions of work. The magnificent work of the Silicosis Bureau of our gold mining industry has become a pattern for emulation by all countries with a similar problem.

9. Protect by BCG vaccination all tuberculin-negative contacts of active cases, and especially those more than usually exposed to the risk of infection—medical students, doctors and nurses.

10. Rehabilitate into gainful occupation all disabled cases.

Such are already the broad lines on which our SANTA, our tuberculosis care committees and our National Christmas Stamp Fund for child contacts work. We have all the machinery for carrying this out in our State Health Department together with our voluntary associations.

#### Facilities Available

How is this working out? The cost of tuberculosis control for the Union in the last financial year was rather more than £5 millions. The departmental estimate of effective control is placed at £5 millions *per annum* with an annual increase of about £1 million. Great progress in the discovery of new cases is reported; thus, 5 years ago notification had uncovered 45,000 cases in the Union, and then only 6,200 hospital beds were available. Today at least 70,000 cases are known, and we have under control 20,000 in beds provided by the Department and by local authorities, SANTA and various missions, and many more as out-patients at 'clinics'. There are 18 mobile X-ray units in the Health Department, and 228 approved points for diagnostic radiography. The role of SANTA has become increasingly important since its inception in 1948, and especially since its national appeal for funds in 1952, when £700,000 was raised, and a very vigorous programme was instituted.

In 7 years SANTA has increased its bed establishment from 422 to 5,440 (in 28 centres). These beds are of a much less expensive type than hospitals can provide, and cost about £150—£170 each to establish and equip. SANTA 'centres' accomplish a new and important role; they receive cases for treatment, as soon as possible after notification, and sort them out according to the type of treatment required—ambulant, bed rest, hospital (surgical), with eventually a residue of resistant cases, so-called 'chronics', i.e. cases not responding satisfactorily to treatment. This linkage between the SANTA 'centre', the diagnostic tuberculosis clinic which feeds it, and its corresponding chest hospital, fulfils a most important function in the general control scheme—logical and basic as in the original Edinburgh plan, and the results are as satisfactory.

Apart from its function of providing less expensive (so-called 'austerity') beds, SANTA's chief role is (1) to study the distribution of tuberculosis throughout the Union, (2) to plan and decide the location of its centres in close collaboration with Union Health Department and local authorities, and (3) to keep the public informed of its responsibilities in respect of tuberculosis, acting thus in the manner of a catalyst and a stimulator of the public conscience.

SANTA's record in the 7-year period is as follows: 17,000 patients treated, 10,000 persons returned home improved, 2,700 deteriorated cases transferred to hospitals, 2,500 patients absconded or discharged for misconduct, 500 patients lost by death, and 1,000 chronics remaining to occupy 1/6th of the beds. Soon 6,000 beds will be available, and then SANTA hopes to return as 'arrested' 4,500 cases annually.

Life in a centre is by no means an idle one; every endeavour is made to rehabilitate the patient and gradually to condition him to re-enter a line of gainful occupation on the happy day of his discharge. To this end approaches are made to chambers of industry, large employers, industrialists, farmers and agricultural employers to re-engage arrested cases that are now safe prospects and free from infection.

There remains the problem of the support of the family and dependants whilst the breadwinner is under treatment. For this purpose SANTA and allied care committees administer and distribute grants in payment of rent and towards food supplements, administering also grants from the Social Welfare and Child Welfare departments of the State. At the present time SANTA spends approximately £70,000 *per annum* in providing care work

covering approximately 6,000 patients and 12,000 of their dependants, but in order to carry out care work on an adequate and effective scale, a sum of the order of £200,000 *per annum* should be spent.

Our control system also makes provision for safeguarding child contacts, especially during the absence of one or both tuberculous parents. Such children are provided for in 'Sunshine Homes' supported by the Christmas Stamp Fund. Their general health and resistance is thus built up so that there is less danger of their becoming clinical or active cases of tuberculosis in later life. The results of this preventive work have been outstandingly good. The first 'Sunshine Home' was opened in Bellville in 1930, and its methods have provided the high standard which have given such satisfaction.

We are beginning to use BCG with which, by a vaccinating process, we can raise the resistance of susceptibles and of those whose work exposes them to greater risks of infection—nurses, doctors, students. Scandinavia, Denmark and Holland have pointed the way with encouraging results, and other countries with mixed populations like Uruguay and Argentine are following.

#### OUTLOOK FOR THE FUTURE

Such then, briefly, is the picture of our efforts to control tuberculosis in South Africa today. What can we say of the future? If it is unrewarding to speculate on how the first acid-fast saprophyte became a dangerous parasite, we might more profitably consider how to defeat the 'mutant' types of bacillus which now appear to resist antibiotic treatment. This line of research is being actively pursued in many research stations with hopeful results. Let me explain. The disappointment in the antibiotics we have available lies in the fact that they are not sufficiently lethal to the tubercle bacillus, which in some cases develops 'mutant' forms which resist extermination and defy the action of the drugs. This has caused the development of a type of chronic disease in certain cases, against which we are almost powerless. This means that we must segregate or isolate our chronic cases. France has already used some of her sanatoria which were nearly emptied after the introduction of the new chemotherapy, for this purpose.

The discovery of the longed-for *remedia magna sterilisans* that will constantly kill the tubercle bacillus may occur in the next few decades, but, having regard to the complexities of the whole

problem of tuberculosis and its intimate association with environment, that is, with housing, with nutrition, and with stress at work, we dare not relax in a single element of our all-embracing scheme of control.

In the Union our first steps towards control consisted of providing sanatorium beds instead of 'dispensaries' or clinics—which is the nucleus of the Edinburgh scheme. Now that radiology has assumed so important a role in diagnosis, the emphasis of our campaign has reverted to the tuberculosis clinic, and so with ambulant and earlier cases to deal with we find that the SANTA type of austerity beds function admirably. Selective treatment of the sorted cases is proceeding continuously at the centres, whence cases go to the hospital for surgical accessory treatment, or back to the clinic for a final spell of supervision in their homes as out-patients, or to the sanatorium, still to be fitted into our scheme for 'chronic' cases.

The effectiveness of our so-called 'austerity' beds in SANTA centres is made possible by our climatic conditions. They replace the more expensive sanatorium or hospital type of bed found in Europe. In the Netherlands the demand for beds has declined by more than 50% in the last 7 years. This is an indication of the effectiveness of their control system in its application of early diagnosis resulting in quick control and early recovery. The machinery for the control of tuberculosis in the Netherlands has operated so successfully during the last decade that it might well be said that the complete control of tuberculosis in that country is in sight.

And so might it eventually work out for us too in the Union if we will but have faith to push along the accepted lines of co-ordinated control. Given sufficient support in the form of full financial backing and the active cooperation of every enlightened citizen, we can move forward confident that it will be possible to halt the progress of this protean disease. I feel that sooner or later science will place in our hands perfected weapons so that maybe the centenary of the discovery of the tubercle bacillus may also see its complete capitulation to our fully organized and determined attacks.

I wish to thank Dr. E. D. Cooper, Medical Officer of Health, City of Cape Town, for his courtesy and assistance: his statistical department supplied the figures on which Fig. 1 is based.