

### 3. *The Removal of Unhealthy Surroundings.*

The State is fully competent to deal with this part of the subject; and again its duty may be stated in one word—sanitation.

First, by the provision of healthy homes. Tuberculosis has been rightly termed a "house disease." I have myself shown in my paper on tuberculous infective areas, published in 1888, that the disease clings to certain districts in Manchester and Salford, and even to certain houses, and similar observations have been made by Dr. Niven and by Dr. Flick of Philadelphia. Dr. Flick says: "Of all diseases, tuberculosis, more than any other, is a house disease. It is implanted in the house, develops in the house, and it matures in the house."

Dr. Koch, also, in his Nobel Lecture, remarks: "Tuberculosis has been frankly and justly called a dwelling disease."

Obviously, then, the first duty of the State is to see that the people are healthily housed; and not only must the houses themselves be properly constructed, under stringent "building by-laws," but, by wise "town planning," by the destruction of neighbouring unsanitary property, by proper drainage and water supply, and by other measures, the air that circulates around these houses must be kept pure, and all such sunlight as this country affords must have full play upon them.

Fresh air and sunlight are the best disinfectants for the virus of tubercle; and it is therefore the duty of the State to see that these important requisites are provided so far as may be possible. No one can, indeed, be compelled to open the windows of a dwelling, but householders can at least be tempted to do so by securing for them as far as possible the purity of the outside atmosphere.

The subject of ventilation as regards the prevention of tuberculosis is a very large one. It is probable that in confined air there exists some special nutriment which either serves to prolong the life of the bacillus or which increases its virulent properties, this special element being either the organic matter exhaled from human bodies or the emanations from polluted ground air or from badly drained subsoils.

It follows, therefore, that the State must not only make provision for cubic space in dwellings and for the admission of so many cubic feet of air to them, but that it must also see that this air is fairly pure, and that the ventilation shall sweep away "air sewage" from these rooms and from all places where human and other beings congregate. Hence, also, in town planning, and in the reconstruction of unhealthy areas, free course must be given to the winds of heaven; there must be no blind alleys or courts, and any pollution of the atmosphere must, as far as possible, be mitigated.

The ventilation not only of schools but of all places of public resort—such as churches, chapels, theatres, even of public houses, restaurants, and shops—must be placed under State control; and all work-places and factories must be kept as clean as possible and well supplied with fresh air.\*

The height of buildings in the streets must be correlated with their width; and ample "lung space" must be provided in the shape of public parks and playgrounds.

The State will also be strictly within the scope of its legitimate action if it provide for the dangerous cases of open tuberculosis, if it subsidizes homes for the dying and tuberculosis dispensaries, and if it assists the formation of herds of cattle, free from disease, as has been done in Denmark. But again I venture to protest against its meddling with the treatment of the disease in any of these cases.

In concluding this address, pray let me apologize for having once again repeated what has already been many times told. I am conscious that I have been preaching a very old sermon; but, in mitigation of my offence, let me plead that my remarks have really been addressed to our rulers, that the State is well known to be very thick-headed, and that, as Jan Ridd said of the Devon folk, "At Oare, you must say a thing three times, very slowly, before it gets inside of the skull of the good man you are addressing."

\* With reference to the last-mentioned places, I cannot help turning aside for a moment to complain of the recent retrograde step taken by the present Home Office in lowering the standard of ventilation of work-places and factories, which had been fixed by a former Committee of this Office. In place of restricting the amount of respiratory impurity, 9 vols. of CO<sub>2</sub> per 10,000 vols. of air, they now permit 11 vols. This is distinctly a retrograde step.

## TUBERCULOSIS IN GENERAL PRACTICE.

WITH SPECIAL REGARD TO TUBERCULIN TREATMENT.

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THE question whether tuberculin can be looked upon as a rational therapeutic measure or not is still being thrashed out, but any one who has had any experience of this method must have realized its undoubted value. For the last two years I have had the opportunity of treating a fair number of cases of tuberculosis, and in consequence I have dipped somewhat deeply into the subject to gain as much knowledge of its management as possible. The progress in the knowledge and administration of tuberculin has been very marked within the last two years or so. Tuberculin must not be looked upon as the Alpha and Omega of treatment—it is an adjunct, and a very important one; in fact, one may go so far as to put it in the very forefront of therapeutic measures. One thing is certain: no practitioner is justified in undertaking vaccine-therapy without a good knowledge of, at any rate, the theory of immunity.

When tuberculosis follows on such diseases as whooping-cough, measles, etc., latency must always be kept in mind. Pleurisy is one of the most insidious diseases of a tuberculous nature in its development. An exciting cause of tuberculosis is excessive indulgence in *alcohol*; his lowered vitality makes the alcoholic an easy victim. In addition he passes on a susceptibility to tuberculosis to his offspring (Lauder Brunton).

### *Urinary Tuberculosis.*

I have had two cases under my care: one showed improvement for a time, but relapsed and left off coming to the hospital; the other is still under my care at his home. In both cases the tubercle bacillus was present. If the kidneys are severely affected tuberculin may not only be useless, but, so far as we know at present, harmful.

In wide areas of infection of the bladder Pardoe found tuberculin not successful; the reason for this may be that these cases are mixed infections; the early and circumscribed are likely to be pure cases of tuberculosis, and in these better results may be looked for. Pardoe found that he got a site reaction more or less severe depending upon the dose. He found that the local condition was hyperaemia or deep congestion, which might be followed by sloughing. If the ureters are both affected suppression after large doses is a natural consequence, but with present day knowledge should never be possible. All cases of renal tuberculosis should be examined with the cystoscope.

### *Glandular Tuberculosis.*

In the case of the cervical, those most commonly affected, the seat of infection is invariably in the nose and throat. When bronchial glands are affected, the superficial veins, tributaries of the intercostal veins, are prominent. There is usually a dry cough and some rise of temperature. In cases in which the abdominal glands are affected, if they cannot be felt, in addition to the usual constitutional symptoms, flatulence and prominence of superficial veins, either in the portal area or that of the inferior vena cava, may be observed. This was well shown in the case of an adult whom Sir Lauder Brunton was good enough to see with me. All these glands cases do well under tuberculin.

### *Tuberculosis of the Skin—Lupus Erythematosus and Vulgaris.*

These cases yield more readily to tuberculin treatment if the temperature is normal or subnormal than when the temperature is raised. I have not observed a rise of temperature in lupus erythematosus, but I have seen a case of lupus vulgaris with a temperature of 99°; the patient had been under the light treatment in London. After cessation of light treatment for a short time the condition relapsed rapidly, but is now yielding to tuberculin treatment. A low opsonic index in lupus is an indication for tuberculin treatment; a high opsonic index indicates light treatment (Bulloch). A case of lupus of the interior of the nose affecting the inferior turbinate has improved, but is yielding very slowly. The most gratifying result I have

ever had has been in an eye case, the condition yielding readily to treatment, all constitutional signs disappearing rapidly. In another eye case complicated with lupus erythematosus the eye symptoms have cleared up, and the lupus erythematosus is yielding.

#### Joint.

I have had one case of tuberculosis of the knee-joint, in which relief of pain and general improvement followed the use of tuberculin and the patient was able to return to his business.

#### General Treatment.

As the nose and throat form one of the points of attack of the tubercle bacillus, proper attention should be paid to this area. Enlarged tonsils and adenoids, when present obtusively, should be removed. The individual should be taught how to breathe; he should be advised as to his clothing, which should be warm and light. In the case of the poor the question of housing is difficult of solution. All that they can be recommended is to keep their windows wide open night and day, to do away with all carpets with the exception of a bedside mat, to wash floors with some antiseptic once a week, to fold all clothes and not hang them up, to have no curtains, and to wash all bedclothes at least once a fortnight; exercise should be regulated according to the temperature, and due attention paid to body cleanliness. All milk should be boiled and food generally well cooked. These may appear trivial details, but it is astonishing how necessary they are. The district nurse takes their temperature daily and records it.

I am unable to express a very definite opinion in favour of sanatorium treatment for the poor, except in the very early cases. At the same time it is much easier to deal with a case in an institution where treatment and the necessary discipline can be enforced. A poor patient may be sent to a sanatorium for six months; he comes out much relieved, and after a short time looks out for a job; he probably has to go on short commons for a time before he is able to get suitable work, and very soon after starting breaks down and returns to the sanatorium, or is sent to an outdoor shelter at the workhouse, does another three or six months' cure, comes out relieved and goes through the same round of troubles as before, and finally is marked down as being unfit for any more work. This is not an imaginary picture; I have three cases in my mind—one has recently died, and the other two are in the last stages of the disease, both receiving outdoor relief at the present time.

Everything depends upon an early diagnosis and treatment at the tuberculin dispensary with pecuniary assistance for himself and dependants. The additional advantage of the home treatment is the opportunity it gives for getting at the contacts. We advise strict precautions as to the disposal of sputum, and insist upon oral cleanliness. The case is reported to the health authorities, and they in turn give directions, and in case of death deal with the disinfection of the premises. We advise hospital cases to apply to the Poor Law authorities for assistance in the way of extra food, and they usually get it.

Patients suffering from urinary tuberculosis should be as careful in the disposal of their urine as those suffering from pulmonary tuberculosis have to be with their sputum. I am of opinion that these urinary cases should be notifiable.

#### Diagnosis.

At the present day the diagnosis of tuberculosis must to a great extent depend upon the region affected and the possibility of demonstrating the presence of the tubercle bacillus. In pulmonary tuberculosis with sputum this is practicable; in urinary and cerebral tuberculosis it is also possible to obtain the tubercle bacillus; but there are cases of pulmonary tuberculosis where the sputum is scanty or absent. In glandular tuberculosis, tuberculosis of the eye and bone and joints, there is no possibility of obtaining the bacillus.

Generally speaking the evidences of active tuberculosis are: The physical signs, the subjective symptoms, and certain tests. The general practitioner should be conversant with von Pirquet's test and the gradual improvement noted on the administration of tuberculin, which are the most reliable tests.

Tuberculous antibodies are present in the blood of most people, whether tubercle is active, latent, or completely cured; it therefore follows that von Pirquet's test cannot be said to be diagnostic of active tuberculosis unless the rapidity of the reaction and its marked character are taken into consideration. There are fallacies in von Pirquet's test; in advanced tuberculosis reaction may be absent, owing to the oversaturation of antibodies, and in some cases of acute and rapidly fatal tuberculosis it is absent, owing no doubt to toxic surcharge. In children von Pirquet's test is of distinct value. It may be used as a test of the sensitiveness of the patient to tuberculin, and thus it may act as a guide to dosage.

#### Prognosis.

In selected cases the results of tuberculin are most hopeful, and even in unfavourable ones the improvement is such as to justify one in recommending it in quite advanced cases. In early cases, with or without rise of temperature, the outlook is good. Mixed cases are not unfavourable for treatment unless there is evidence of no reaction to tuberculin. In very acute and so-called galloping cases tuberculin may fail.

As it is held that nearly all cases of tuberculous meningitis are terminal of a general infection, it is obvious that treatment of any kind is not very hopeful; but if, as I believe, some of these cases are examples of "meningism," then the prognosis is certainly not bad. Cases of meningitis have recovered and remained apparently cured for some time, and then relapsed and died.

The more I see of tuberculosis, the more am I impressed with the fact of the necessity for the recognition of the disease in children and its treatment then. Amongst the poor, owing to lack of proper food and housing, the prognosis cannot be as favourable as in the class able to afford a more leisured existence. In tuberculous disease of the eye, my experience, although limited, leads me to regard the outlook of tuberculin treatment as most favourable.

Surgical tuberculosis reacts well to treatment, and on the whole one is justified in giving a favourable prognosis.

The unfavourable signs may be summed up as follows: High pulse-rate, high blood pressure, loss of weight, continuing elevation of temperature, and no improvement in the physical signs and the subjective symptoms. The favourable signs are: A fall in temperature and a corresponding improvement in the subjective symptoms, improvement in pulse and blood pressure, increase in weight, cessation of cough and sweats, disappearance of bacilli.

Sometimes the temperature drops without improvement in the other signs. This is distinctly unfavourable, and often the patient survives but a short time.

#### Specific Treatment.

There may be said to be two schools at work in the tuberculin or specific treatment of tuberculosis—one which holds that doses large enough to cause reaction are beneficial, and the other which holds that the dose administered should be so diluted as to cause no toxic action, or "reaction," as it is now popularly called. My experience began with the former mode of treatment, but now I take every precaution to avoid a reaction by giving a very small dose to begin with and very gradually increasing the amount and strength of succeeding doses.

I am now using Sahli's method of administering tuberculin. He has always held that very small doses of tuberculin was the correct method in treatment, and his aim all along for the past ten years has been to avoid reaction. He holds that the specific effect of all tuberculins, whether human, bovine, old or new, is the same; that the active principle of any of those tuberculins is the same; and that the beneficial effect depends upon the strength and mode of its preparation. He uses Béranec's preparation, and gives the following as his special reasons for his preference:

1. The chemical nature of the preparation. It has a large content of specific immunizing substances, while the use of peptone-free culture medium practically excludes non-specific toxins. The high specificity of Béranec's preparation is most clearly proved by the fact that tuberculous, and only tuberculous, patients react by fever to minute doses of tuberculin, the healthy tolerating large doses without displaying any signs of reaction.



2. It is a true solution of tubercle bacillary protein held in solution as an acid albumen. It is, therefore, superior to all tuberculins not filtered through porcelain, and especially to bacillary emulsions in which high dilutions cannot be accurately prepared, owing to their non-homogeneous character.

3. It is supplied ready for use in suitably graduated dilutions and the absolute amount of tuberculin guaranteed.

Sahli's dilutions are on the scale that each dilution is twice the amount of the one above. Philip of Edinburgh uses Béraneck's tuberculin, but makes his dilutions on the decimal scale. Philip's dilution is the same as Sahli's at two points.

#### *Cause of Reactions.*

Various theories as to the causation of tuberculin reactions have been advanced.

1. The summation theory attributes the general reaction to the addition of the injected tuberculin to that already preformed in the focus and circulating in the organism, and the focal reaction to its addition to the focal toxin.

With regard to the summation theory, it should be remembered that the further away from the focus of disease the less tuberculin there is. From this it will appear that if tuberculin is injected into the circulation there will be a greater focal reaction than a general reaction. Moreover, a focal reaction will be obvious when no general reaction can be detected; this, I take it, is in favour of the individual.

2. The difference theory supposes that the tuberculin calls forth an antitoxin, and that if too much tuberculin is injected the amount of antitoxin necessary to cope with it being insufficient a reaction results (general and focal).

3. The theory which regards innate sensitiveness as the chief factor is disproved by the fact that the sensitiveness is not a fixed condition, but is the result of the tuberculous condition present in the individual. Normal individuals are not sensitive to tuberculin, infected individuals are.

4. Wolff-Eisner supposes that when tuberculin is injected into an infected organism it unites with the lysin which is present as the result of the disease infecting the organism, and that the large molecule of tuberculin is split up by the lytic action, forming tuberculinolysin.

Sensitiveness to tuberculin must be looked upon as a favourable sign in the treatment of tuberculosis; this does not mean that pronounced reactions are desirable, they must be avoided; but if a reaction is not evident clinically. How is its presence to be realized? Sahli says by an increased leucocytosis, but for all clinical purposes the temperature and the subjective symptoms must be the guides; if there is no rise in temperature and no marked increase in focal signs and no malaise, it is justifiable to assume that the dose is not too large.

At the Inselspital, Berne, Professor Sahli is now using Koch's old tuberculin as lymph is used in vaccination. He begins, say, with two marks on the arm twice a week, increasing the number to four twice a week; in advanced pulmonary tuberculosis he found that the patient made a general improvement, as shown by an increase in weight and lowering of temperature; there was never any increase in the physical signs in the lung but a gradual improvement. By this method a very much stronger dose of tuberculin can be given.

As the negative phase is concurrent with the rise of temperature and even prolonged beyond its fall (Wright), injections every day or every third day are wrong, as the negative phase would not be complete before another injection is given. It is wrong to give tuberculin in large enough doses to cause a rise of temperature, and it is this procedure which is no doubt responsible for some of the failures in tuberculin treatment. I have found that in my early cases, where I did get a rise of temperature as the result of improper dosage, the complete reaction lasted three or four days. There was a rise above normal, then a fall below normal, and a gradual rise to normal. I now give such small doses as will obviate a rise of temperature. If the temperature is subnormal, it rises gradually to normal under graduated dosage. In two cases (eye and knee) I gave an excessive dose, with the result that the temperature reached 103°, and there was headache, sickness, loss of appetite, and cough (tuberculinism). These symptoms disappeared on the third day, and were followed by a feeling of well-being, and by an improvement in the

local conditions. The knee case had a return of pain in the joint during the three days; in both I returned at the end of a fortnight to the smallest dose of the weakest dilution that they had had previous to the overdose. Cases with cavity and haemorrhage should be treated with very great circumspection; as tuberculin causes focal congestion it is obvious that there is a grave risk of causing haemorrhage in the one and increasing it in the other. I always begin by keeping the patient three days in bed; when going from one dilution to a stronger, I keep the patient in bed a day. If the blood pressure is low tuberculin will raise it; a high blood pressure, however, is not to be aimed at. I do not administer tuberculin during menstruation.

The immunity arising out of the use of tuberculin can in no sense be considered to be passive. The individual may show general tox-immunity, yet the focus of the disease may remain unhealed. On the other hand, the focus may heal without the individual showing a general tox-immunity. Again, focal healing may take place, and the individual show intense sensitiveness to tuberculin, healing being brought about by a local tox-immunity.

I have been in the habit of making the injections into the extensor aspect of the forearm. The place where the injection is to be made is rubbed with a piece of cotton-wool soaked in ether, and either a little tincture of iodine is applied to the place or a drop of some antiseptic, such as 1 in 2,000 mercury perchloride, placed on the arm and the puncture made through it. In lupus cases I sometimes make the injections into the diseased area, the point of the needle being entered just outside the area of the disease and the contents being injected into the diseased area. Sometimes a reaction takes place at the point of injection, but so far I have only found this marked when the dose has been very strong. In two of my cases, the eye case and the knee case, this local reaction was well marked, and in the eye case sanious material escaped some weeks after; in the knee case it was absorbed.

In young children I sometimes give tuberculin by the mouth. It has a distinct effect on the disease when given in this way; if too large a dose is given a big reaction will result, but will not be so marked as if the same dose were given subcutaneously. It should be given on a fasting stomach, the most favourable time being 6 a.m. As Béraneck's tuberculin is not made up with an antiseptic, the syringe should be made scrupulously clean for each injection. If the needle is kept in absolute alcohol, this should be removed before use, as alcohol inhibits the action of the tuberculin.

I have hitherto used T.R. human. I have not noticed any such difference in the results in the use of B.E. human, bovine T.R., or a combination of the two, or a combination of T.R. human and bovine, as to make me prefer them to weak doses of T.R. human.

Cases with a low blood pressure react well to tuberculin, as before said, the blood pressure rising. Cases with a high blood pressure, quick pulse, and fever require very small doses and rest.

Some cases of mixed infections do well, others do not, but I have not had sufficient experience to dogmatize. In mixed infections and advanced cases with mixed infections tuberculin may do good. I am treating four of these cases at the present time, and so far they show signs of improvement.

With regard to the time between each dose, I have usually allowed a week to pass; this, at any rate, is on the safe side.

Wright says that in the negative phase there is a diminished content of protective substances in the blood; the positive phase follows with an increase. At the close of the cycle there is a certain amount of protective substances remaining. The phases are affected by the strength of dose; too strong a dose prolongs the negative phase. The cycle lasts about three days, and, allowing a rest period of a day, this would bring the period between each dose very nearly to a week; but, as the aim should be to avoid reactions by giving small doses, a three-day interval is not unreasonable; injections may therefore be given twice a week. It is advisable that the injections should be given about 11 a.m., and the temperature taken twice in the twenty-four hours, or every four hours until 9 p.m.