



# The Prevention of Tuberculosis

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The disease known as Tuberculosis, Phthisis, or Consumption, altho a very grave one, is certainly a preventable one. Nearly everybody knows that if taken early it is curable, but what I want to impress on my readers at present is that it is preventable. It is a disease which can be prevented from fixing upon people—usually young people—in a way which it is not possible to do, as regards prevention, in the case of a great many other infectious diseases, for Tuberculosis or Phthisis, is certainly infectious. Thus one cannot prevent measles, chicken-pox or cancer in the same certain way in which we can prevent or ward off Tuberculosis. This immense achievement has only comparatively lately been put within our power: for hundreds of years the disease was thought to be hereditary and practically incurable. Only quite recently have we known how to protect ourselves from the Tuberculosis because only recently have we learned the actual cause, the definite source, of the infection of Tuberculosis. Nothing about it is hereditary except a predisposition to be infected. It was a great day for suffering humanity when the late Professor Robert Koch in Germany found in the year 1881 that the true cause or origin of the infection known as Phthisis was the growth within our bodies of a very minute vegetable parasite or microscopic fungus, thenceforth called the *Bacillus tuberculosis*. In popular language this is the "germ" or "microbe" of Phthisis.

Before we go any further, we might clear up the names given to this disease. Phthisis is derived from the Greek word meaning "to waste away", the Latin equivalent of which is consumption, since a wasting away of the flesh is a sign of the late stages of this affliction. Tuberculosis comes from a Latin word meaning, a little lump, because when the disease is well established we can find little masses or tumors of damaged and no longer living tissue crowded with millions of living *bacilli*.

"Lupus" is the medical name for that variety of tuberculosis which attacks the skin, and "scrofula" is a more or less chronic (long drawn out) form of Tuberculosis where the infection is working very slowly in glands and bones.

So long as we did not know the cause or origin of the disease, we could not possibly avoid anything in particular as likely to produce it. But since Koch's discovery, we know that a special kind of bacillus, gaining entrance into our bodies, lives there and sets free in them a chemical substance, the poison of Tuberculosis (tuberculin) which, circulating in the blood, saps the strength and reduces the vitality of the person or animal infected. For some of the lower animals can take Tuberculosis even more easily than human beings; the monkey, cow, rabbit, and guinea-pig can all have it severely. This fact, as regards the cow, is evidently very important, because we eat the flesh of cows and drink their milk, and it is therefore possible, in both ways to take into our bodies large numbers of tubercular bacilli.

#### The Avenues of Entrance.

Broadly speaking, the bacilli can invade us thru the skin, thru the mucous membrane of the stomach and intestines and the lungs. Now Tuberculosis of the skin (Lupus) is entirely a dirt disease. That is, only unwashed and neglected skins can be infected: in a sense it ought never to be seen. Washing the skin sufficiently prevents Lupus.

We cannot quite so simply protect ourselves from being attacked thru the alimentary canal. Meat containing tubercular bacilli would certainly in the ordinary course of events be cooked before being eaten, the heat kills the bacilli if not their spores; but this does not apply to milk because so much milk is taken uncooked. Since cow's milk is the food of nearly every infant, we can see that infants run a great risk of intestinal infection if fed on the raw milk of tubercular cows. Clearly this mode of infection may be prevented only by our being sure that the cow is not yielding tubercular milk. To be sure of this is possible only to the expert called a bacteriologist, so that people nowadays usually assume that there are bacilli in the milk and proceed to "pasteurize" it, as it is called, that is, warm it to such a temperature (160° F.) that its bacilli will be killed and yet the milk not be altered in taste. Altho certain objections can be alleged against pasteurized milk, yet the rarity of its defects is not to be compared with the value of its virtues in protecting infants from having their intestines infected with the tubercular bacilli of milk. It is perfectly certain that in the past, immense numbers of infants have been so infected and there

fore handicapped in the struggle for existence. According to Dr Philip of Edinburgh, 75% of infants become tubercular in one way or another; obviously also a large number are cured later on.

But the commonest and gravest form of tubercular infection is by the lungs, which important organs become directly infected by bacilli floating in the air.

Now whereas we can wash our skin and cook our food, it is quite impossible to avoid breathing bacilli carried in the air entering our lungs. For these bacilli are practically in all places where men do congregate, but not in the air of the open country, or mountains, or over the ocean. The bacilli are more numerous according as the air of the room or building is the less frequently changed. Unventilated rooms, that is, rooms where the air is unchanged, changed every rarely, or very slowly, contain myriads of bacilli, a large proportion of which are tubercular. The ordinary dust of rooms swarms with them. Sunless rooms always have more of them than sunny ones. Damp places always have more of them than dry places.

There is, then, little difficulty in seeing to what this knowledge is leading us. We shall take into our lungs fewer tubercular bacilli the more perfectly the air is filtered as it passes into the lungs, the more we live out of doors, the more perfectly the air of our houses is changed, the more we live in the sunshine, and the drier the air is around us. But how can we escaped dust? It is inevitable that it accumulate around us. Dust is composed of particles of soil and sand, of wood, clothing, carpets, curtains, rugs and all manner of materials made of animal and vegetable fibre along with epidermal scales from our skins.

Now no domestic process is more familiar to us than "dusting," which in its usual form consists of the dust on the carpet being thrown up into the air by means of a switch or broom. Falling out of the air in due time it settles on the furniture, ornaments, etc., from which it is removed by a "duster" or dry cloth and thus thrown back on to the floor again. Some that adheres to the cloth may be carried from the room that has just been "dusted." Hygienically, dust lying undisturbed is better than dust floating in the air. The ideal of a dustless room and therefore of dustless air is, outside of a surgical and operating theater, unattainable. The old domestic device of throwing wet tea-leaves on to the carpet, or wet saw-dust on to floors (as in the case of schools, halls, etc.) certainly lessens the dust-raising nuisance by making the dust adhere to the wet particles. Science has, however, provided us with a covered, rotary brush

which collects the dust instead of driving it up into the air, and still more lately there has been devised the method of extracting dust by suction—the “vacuum” method—from all sorts of materials.

Such dust as lies on hard surfaces which would not be injured by being wetted, ought to be removed by a wet sponge which, of course, can quite easily be cleaned. It need only be wrung out of water: a bacillus wet, not merely in damp air, is a bacillus imprisoned.

Out-of-doors dust is by no means blameless in the spreading of disease; there is the London sore throat caused by the bacilli in the dust blown up from the wood-paving blocks of the streets. In dry weather in the country a septic sore throat prevails when the wind blows over manure-covered fields in Spring. Recently several diseases of children have been traced to road dust raised by the draughts of motor-cars. There is a tendency now to use wall-papers, for instance, of such a smooth surface that they can be washed without being destroyed. Rough soft papers should always be avoided as able to harbor much dust and germs. But even in a room, dustless so far as the eye is concerned, a person could be made tubercular provided the air was never changed and it never got any sun.

An indoor life is much more liable to lead to tubercular infection than an out-door one; in fact, we can put it positively and say that those who live in the open air do not contract Phthisis, and that if persons who are already tubercular live in the open air they will almost certainly be cured, unless indeed their cases have entered on the incurable stage.

It is to be remarked that aboriginal tribes—Red Indians for instance—living a wholly out-of-doors life do not contract Phthisis, but not from any special immunity therefrom, for, as soon as they begin to live in the badly ventilated houses of cities they contract Phthisis more readily than the civilized dwellers.

As every one knows, tubercular patients are nowadays treated by the open-air cure which simply consists in their breathing as much previously unbreathed air as possible: the Sanatorium is the modern representative of the cave or open air dwelling of our prehistoric ancestors who spent their days under the expanse of heaven surrounded by ozone and bathed by the sun.

"Overcrowding" is the great cause of tuberculosis in cities, and overcrowding really means, (1) too many people for the available space, (2) poverty and (3) its attendant imperfect nutrition. It is this low nutrition and depressed vitality that is the so-called predisposing cause of Phthisis.

No doubt it is true that the microscopic bacillus is the real or physical cause of the infection, but there is the susceptibility to be infected, the constitutional weakness or predisposition.

The predisposing cause—lowered vitality—is a real thing; for vitality is a real thing, and in this connection it means power to resist infection, therefore reduced vitality means lessened power to resist infection.

Certainly we have to recognize the kind of soil as well as the kind of seed. But as acorns will give rise only to oaks, so the bacillus tuberculosis will give rise only to Tuberculosis; and just as acorns will not germinate on a dry rock, neither will the bacilli of Phthisis multiply in perfectly healthy and, therefore resistant tissues.

It is this factor of resistance to disease which is so exceedingly important; healthy tissues are resistant to, refractive or inert towards the bacilli of Tuberculosis: were this not so, we should all be tubercular in very early youth.

Some of us inherit constitutions more resistant than others; but supposing that our inherited susceptibilities were all equally slight, those who lived out of doors would strengthen and those who lived indoors would weaken the natural resistance toward the bacilli of this disease. Of course, out-of-doors the chances of infection are infinitely small as compared with those indoors.

There seems to be no doubt at all that tubercular bacilli flourish best in air which has been breathed over and over again, that is, has practically not been changed. Ventilation consists in the coming in of fresh air and the going out of impure air without causing a draught, and a draught is the carrying off of one's bodily heat by moving air at such a rate as to be unpleasant and, it may be, injurious to the health.

When a couple of thinly clad, over-heated dancers leave the ball-room and stand on the door-step on a frosty night they do not complain of a draught, and if they do not stand there too long they will not get any harm; but if a person who was not at all hot were to stand beside them in equally thin clothing he would almost at once complain of a draught and say he was being



"chilled to the bone." He has far less heat to lose than those who have been exercising themselves. Now a draught by taking away heat lowers the resisting powers of the tissues to any kind of infection. A draught is local cold produced by cold moving air; but local cold produced in any fashion would lower vitality just the same.

Pasteur proved in a very interesting fashion that local cold could predispose to a general infection. He had a certain strain of the microbes of fowl-cholera of such lessened virulence that they did not affect a healthy bird, but if he inoculated them into a healthy bird whose feet had been kept for some time in cold water, it took the disease in quite a serious form. Cold, in all except quite slight degrees, depresses vitality. It is cold that mankind wishes to avoid. People do not prefer bad air to good, but they do prefer warm air to cold—however much "hatless brigades" and other schools of cheerful sufferers desire to persuade us to the contrary. If it comes to a choice between bad, warm air and good, cold air, the former is almost always preferred. Thus it happens that Tuberculosis is exceedingly common in such windswept but cold places as the Islands of the Scottish Hebrides and Newfoundland, where the fisher-folk in the winter shut themselves up in cottages tightly closed to "keep out the cold." Here they live quite warm in air continually re-breathed and otherwise polluted in which the bacilli of Tuberculosis multiply exceedingly. Altho, then, the inhabitants of these and similar places are surrounded by the purest air on the globe, they are suffering from Phthisis to an extent truly deplorable.

All windows should be made to open from the top, and the upper sashes should be accessible by means of rope-pulleys. If there is a fireplace in the room it should never be blocked by any obstruction—sack, "damper" or any other device emanating from below. An open chimney ventilates a room even when no fire is burning, and, of course, more in windy than in still weather. No one should ever sleep in a room which does not in some way or other communicate with the open air. Architects should be implored to give a little more attention to the ventilation of private dwellings. The problem of the ventilation of large buildings seems solved, if we may judge by the admirable system installed in the Chateau Laurier Hotel at Ottawa.

Now not only cold, (exposure), but insufficient food, (poverty), great fatigue, mental worry, or debilitating emotions and the having had certain other infections, notably Influenza and Pneumonia, all predispose to tubercular infection.

Hence persons who have been under-fed, children imperfectly fed, persons who have undergone prolonged strains—nursing for instance—or who have just had a severe illness are sent into the country to get plenty good food, complete rest and fresh air and sunshine.

The good food fortifies the natural resistance to Tuberculosis, the fresh air gives the ozone which cannot be got indoors, the rest re-vitalizes the nervous system and that of itself increases one's resistance to infection, and finally the sunshine is an antiseptic or destroyer of germs.

One exceedingly important precaution against tubercular infection is to avoid being a mouth-breather. By mouth breathing we short-circuit the germ laden air into the throat and tonsils, voice-box and lungs, a very fruitful source of infection of these parts. In normal breathing the germ-laden air has to travel over the moist, warm, mucous lining of the nasal chambers, on which it deposits its dust and bacteria and where it is warmed to the temperature of the body.

In consequence of the infection of the tonsils and throat, the lymph-glands in the neck become involved ("strumous" glands) and when they break down they have to be cut out, which leaves an ugly scar in the neck.

Now some one may say: "Well, this is all very unfortunate, but could it not be avoided if we could destroy all the tubercular bacilli around us?" Quite true; no matter how susceptible to Tuberculosis people were, they would not get infected if there were no bacilli; but seeing that these are omnipresent it is a practical impossibility to kill them all off.

Luckily we can, however, control some of the sources of supply of these micro-organisms. In paved cities one source of supply is the drying of the sputum from infected persons, sputum expectorated on to the stones which has dried and allowed its bacilli to be wafted about by every wind that blows. Until floating in the air, the bacillus is powerless for evil. The sputum of all persons suffering from pulmonary consumption should be received in some sort of receptacle which can be burned in a fire or furnace. Nothing short of complete cremation can put an end to tubercular bacilli; hence the corpses of persons and lower animals dying of Tuberculosis had better be burned; at least this is best in the interests of the living. Indeed, we might put an end by fire to very much more of useless, dirty, worn-out material than we do. It is far too much the habit of the lower orders, in England at any rate, to wear

the cast-off clothes of the upper classes rather than a costume suited to their occupation and surroundings. They begin in fact with dirty clothes and make them dirtier: clothes made of strong and washable material adapted to the requirements of working people would be very much better.

We are now in a position to summarize what we have learned about Tuberculosis and its prevention.

The disease, which may be chronic or acute, and may attack every organ of the body, has, as its physical cause, an extremely minute vegetable, a parasite fungus, which can live in the tissues of man, provided they are susceptible or debilitated.

The most resistant constitution can be made susceptible by underfeeding, improper feeding, feeding it with milk containing the bacilli, living in sunless, ozoneless rooms, sleeping in unventilated rooms, working in imperfectly ventilated factories, etc., or by having had a serious illness. "Overcrowding" is the term given to the disadvantageous social conditions just named.

The sources of supply of the bacillus tuberculosis are—the milk and flesh of tubercular cows, the corpses of all animals and persons dead of Phthisis, and the dried sputum of tubercular patients.

The distribution of the responsibility in the precautions which may be taken against this so called "white plague" may be stated under the following headings.

#### **Personal or Individual, Domestic, Municipal and National.**

The most important *personal* precautions are general cleanliness and breathing thru the nose.

As regards *Domestic* precautions, we could mention covering all our milk and cream, if necessary "pasteurizing" milk, dusting either by some wet method or by covered brushes or by the vacuum method. Under the domestic heading would also come, opening windows from the top, seeing that no fire-place or chimney is closed, and always sleeping in a room which communicates with the outer air.

*Municipal.* The inspection of all food-stuffs especially of milk, the seizure and cremation of all tubercular meat, the

keeping of cows, horses, etc., in well ventilated, well lighted, clean places; the inspection of schools, public halls, churches and railway carriages; the enforcing of regulations against spitting in the streets, etc., the provision in hospitals for cremating all tubercular sputum.

The Municipality would have to permit the erection of no buildings which were not efficiently ventilated and heated.

*National.* The subject of hygiene to be made a subject of instruction in Secondary Education, children to be got to understand that air is as real a thing and as easily contaminated as food or drink. The Nation would have to ensure that architects during their training were compelled to study the problems of ventilating and heating all sorts of buildings, small private houses as well as schools, halls, theaters, and churches.

The erecting of Sanatoria either as a municipal or national matter is, of course, more a curative than a precautionary measure. Fewer Sanatoria would be needed were more intelligent precautions taken individually, domestically, municipally, nationally.

19th April, 1913.