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GENTLEMEN: I have brought this array of patients before you to-day in order to preach a sermon. I want to preach to you the gospel of hope in the treatment of tuberculosis.

We cannot say that patients in this hospital are subjected to the most favorable conditions for the treatment of pulmonary tuberculosis; we do the best for them that circumstances will permit; and we do much better for them than could be done by their relatives and friends at home. But we are not able to command all that we would like in the way of nutritive and other therapeutic measures. Notwithstanding this, we are still able to keep a large number of our patients comfortable, and to prolong their lives for considerable periods.

The patient to whom I first call your attention—Henry D.—is aged fifty years, and has been in this hospital about five years. When you read in the newspapers that somebody or other, perhaps a so-called physician, for many quacks have "regular" diplomas, and of all quackery the quackery of a physician fallen from grace is the worst—when you read that such a one

has invented or discovered some wonderful remedy for consumption, and that he has given it to one or two or four thousand patients, and that in ten minutes or ten days they have all been cured, just remember that this patient has been here for five years and, though he is kept very comfortable and has frequently for many months together been without cough or night-sweats or febrile temperature, enough improvement, therefore, to build several newspaper "cures" upon, he is not well yet. Cases of pulmonary tuberculosis have, even when left to themselves, an average duration of life of some four years. Those, therefore, who talk about "curing" pulmonary tuberculosis by novel methods and who report cases of "cure" under anything less than five years, are either unfamiliar with the natural history of the disease or, for reasons sufficient to themselves, do not make use of their knowledge. In a few months, or even in one or two years, nothing can be said as to the ultimate issue of the case; and I want to impress this upon your minds, because I do not want you to be misled, either by quack things, like the "Amick Cure," or semi-quack things, as was the "Koch Cure" in its incipiency, into the belief that there is a "specific" against tuberculosis, or by the unfortunate example of Koch and his followers into premature announcement or premature adoption of any line of treatment. Six years at least must be allowed to elapse after the institution of any particular treatment in an ordinary case of pulmonary tuberculosis before one is entitled to say whether or not it has been curative. We may, of course, say in any reasonable time, in a few months if circumstances warrant, and more especially if the treatment has stood the test of years in other cases, that it has kept a patient comfortable, that it has increased his strength, that it has apparently augmented his chances of recovery; and this word—recovery—is the one that I would like you to use rather than *cure;* because *cure*

implies that something brought in from the outside has conquered the disease, and *recovery* means that something within the patient has wrought a change in his condition which has brought the morbid processes to an end. We have to aim, in the treatment of this disease, at recovery, to be brought about not by "specifics," not by miracles, but by various measures, principally hygienic, which put the patient into such condition that the exciting causes of the disease are powerless to harm him. It is the *vis medicatrix naturæ* which limits and finally brings to an end the pathologic processes, and the physician's function is to stimulate that inherent tendency to recovery, to assist its action, to remove the obstacles that hinder its success.

The theory which I hold as to the causation of pulmonary tuberculosis, and tuberculosis in general, is somewhat different from that which is generally taught, and the treatment advised is, therefore, based upon a conception of the essential nature of the disease, differing in some respects from the generally accepted view. In order that you may understand the reasonableness of the treatment, it is necessary for me to say a few words concerning the etiology and clinical pathology of pulmonary tuberculosis. I assume a full knowledge upon your part of the morbid anatomy and histology so far as determined. Now do not understand me as claiming that the treatment to which these preliminaries are to lead up is novel or a special discovery of my own ; there may be some points of detail founded upon personal experience, but the only personal element I wish to impress upon you is a point of view which will necessarily influence your estimate of the relative importance of the different therapeutic measures.

We all know, since Koch has shown us, that in tuberculous lesions there is usually found a certain microorganism which is called the *tubercle-bacillus ;* and we all know that injections of the sputa of tuberculous sub-

jects, or of cultures of the tubercle-bacillus, or of toxic materials containing either bacilli or their products, or products of the organism infected with bacilli, will set up a disease having lesions resembling those of human tuberculosis, in susceptible animals—in rabbits and guinea-pigs particularly. But we also know that injections of any of these substances will not ordinarily set up the disease in certain other animals—in horses or donkeys, for example, or in dogs, or in goats. Evidently, then, the poison administered to the one group of animals being the same as that administered to the other group, while the result is different, there must be some difference in the two sets of animals which causes this difference in result. The only possible conclusion, therefore, is that the tubercle-bacillus and its products are not alone sufficient to cause the disease, but must act in conjunction with some peculiarity or defect in the constitution of the infected animals; because if the bacilli and their products were of themselves a sufficient cause of tuberculosis they would cause it in goats and dogs and horses just as readily as they cause it in guinea-pigs and rabbits and in certain kinds of cattle.

Extending our observations to man, we find upon clinical evidence that men can also be divided into two groups; that certain individuals cannot be infected with tuberculosis, and that other individuals can readily be so infected. Shall we then say that some persons are "susceptible" to the disease and others "insusceptible" or "resistant," and rest satisfied with that—imagining, perhaps, as is too often the case in medical problems, that by simply re-stating a fact in somewhat technical phraseology we have explained it.

Suppose that it had been determined, in this city, for example, that certain structures were more liable than others to be burned down—that if the torch were applied to certain houses they would quickly be in a blaze, but

that certain other houses could not be set on fire, what would be the most rational method of preventing conflagrations? Would it not be to try to make all the houses alike "insusceptible" to fire, and before that was possible would it not be necessary to definitely find out in what the difference consisted that made the one house "resist" and the other "yield?" And the same principle must guide our steps in seeking the rational treatment of tuberculosis. We must not give time to the study of the bacillus alone—we must study it, of course, and find out all there is to find out about it—but we must study more particularly the human constitution and determine definitely why it is that some persons are resistant and others non-resistant to the tuberculizing process.

And this is the point wherein my teaching departs from the accepted doctrine. The existence and, at last, the importance, of "susceptibility" is acknowledged by all. A favorite comparison is that of "seed and soil." But I wish to go much farther than this. I hold that normally the human body is never a "favorable soil" for the "seed" of tuberculosis. To be such it must first become abnormal—that is, diseased. In other words, the condition that renders human beings liable to the invasion of tubercle-bacilli, and to the morbid processes thus set up, is the preëxistence of disease; and this disease is something definite, something to be sought, located, described, treated. It is the fundamental pathologic process concerned in the morbid complexus we call tuberculosis; the invasion of the bacillus and its results are epiphenomena. These epiphenomena involve dangers and require treatment on their own account—we must try to put out the fire if possible, but more important is the study and treatment of the condition of primary disease, without which the bacillus might come and go harmlessly. We must try to make our patients *fireproof*, and they need not fear the incendiary.

But first let us take a step further toward the substitution of a definite conception for the vague term "susceptibility." In guinea-pigs and rabbits lesions histologically indistinguishable from those produced by living bacilli can be produced by dead bacilli, by powdered glass, and other non-living irritants. Similar lesions similarly caused have occasionally been seen in man. Cornil and Toupet report a case due to irritation by a fragment of oyster-shell. These lesions are called *pseudo*-tubercles nowadays, because they do not contain living bacilli—a remarkable illustration of the fallacy called in logical terminology *petitio principii*, "begging the question" or "arguing in a circle."

In pseudo-tuberculosis we have the histologic lesion, but not the toxemic symptoms of bacillary tuberculosis. But certain forms called "zoöglear tuberculosis" present both lesions and toxemia, although a different microbe from Koch's bacillus is found—probably several different microbes.

The evident conclusion is that long ago formulated by Formad: "a definite soil, an indefinite irritant," for the lesions, and for the toxemia different living organisms and chemic poisons resulting from their development and the reaction of the tissues.

In most cases, I grant, the irritant producing the lesions, and the organism producing some of the toxemia is Koch's bacillus; but even so, it is by no means certain as yet that some of the most destructive lesions and most of the toxemic phenomena are not due to the action of other associated organisms or of poisons produced by them.

Be that as it may, the lesions wherein we can best discover the nature of the "definite soil," in which alone tuberculous lesions can develop, are the pseudo-tubercles, because here the problem is purely histologic and uncomplicated by intoxication and its results. While the morphologic and chemic peculiarities that must

exist have not yet been satisfactorily or completely elucidated, it seems to me that a certain broad generalization is fully warranted: that the production of the histologic tubercle is an evidence that *the tuberculized tissue lacks reparative force.* With dead bacilli and mechanical irritants the lesions are strictly localized to the points irritated. With living bacilli they are more or less diffused, because the irritant is reproduced within the body and carried to new areas. Yet in cases killed by "Koch's remedy" recent lesions without bacilli have been found, apparently indicating that under the peculiarly depressing effect of the tuberculous intoxication, tubercles may form even without local irritation.

In normal tissue partial breaking down or complete death of cells through exercise of function, through exhaustion of vitality, and probably through injury, is constantly taking place. As you have seen in non-infected wounds, repair takes place by the production of new tissue-elements or cells, which either produce a new tissue like the original or a fibrous scar-tissue.

In subjects who become tuberculous the vital energy resident in the cells or tissues is not sufficient to produce either new tissue like the original or durable scar-tissue; but when irritated, as by tubercle-bacilli or their toxin, or by powdered glass, etc., or broken down by function or by disease of various kinds, the tissues in an ineffectual attempt at repair produce degraded cells incapable of organization—in other words, tubercle-cells. Tubercle-cells perish from lack of nutriment or under bacterial attack, and ulceration or caseous degeneration takes place. In some subjects, to whom we will recur in a moment, the surrounding tissues react to form a scar, or calcareous deposit takes place, and healing is thus brought about. The therapeutist's object is to put all his patients into such a condition that this may be the outcome. To learn how to do it a study of the different degrees of "susceptibility" is necessary.

First, in studying the group of susceptible persons, or as I prefer to call them, using a term introduced by Jaccoud, *hypotrophic* subjects (hy*po*, not hy*per*), we find them sharply divided into two classes—those in whom the condition is congenital, and those in whom it has been acquired after birth. Therapeutics can do most with the latter class, but much even with the former class. The congenitally hypotrophic may further be divided into those in whose families tuberculosis is hereditary, and those in whom other conditions than parental tuberculosis have given rise to hypotrophy in the offspring. For instance, carcinoma, syphilis, diabetes, alcoholism, and other conditions which lower the parents' vital energy make the children prone to tuberculosis. Among those who are not congenitally hypotrophic, the condition may be induced by privation, by excess, by depression. Thus it may be due to a life of poverty, or of debauchery, or of overwork; to the effects of influenza, of typhoid fever, of measles, of diabetes; to residence in damp places, especially if light and air are excluded; to severe exposure; to the exhaustion of prolonged lactation, or of too many or too frequent pregnancies. The rigorous practices and depressing doctrines of certain religious sects and orders notoriously render their members liable to consumption, as may mental or emotional shock or profound grief, as in disappointed love or defeated ambition; and one of the most potent causes is confinement, as in prison, or in certain occupations which must be carried on indoors, in crowded, ill-ventilated, and over-heated rooms.

Thus carnivorous animals, which in the wild state are probably not liable to tuberculosis, almost invariably die of this disease after a certain period of captivity; and, on the other hand, even animals so susceptible as rabbits may escape all evil consequences from inoculation with virulent cultures of tubercle-bacilli if, after

infection, they are allowed liberty in the open air and sunlight.

Graves, one of the greatest of clinicians, said: "It is important to know how to make a man phthisical, as by pursuing an opposite course we may prevent it." The deduction from what I have said is so obvious that I need not take time now to elaborate it. One point only let me make in passing: If you want to keep healthy lungs you must give them facility for proper development in the open air; if you want to make tuberculous lungs healthy once more, you must exercise them in the open air; or, if they cannot properly exercise unaided, you must resort to artificial means, such as the inhalation of compressed air.

To resume our study of that particular group of persons who are susceptible to the action of the exciting causes of tuberculosis, we find certain differences in their susceptibility. In some the fire, once started, burns rapidly, and cannot be estopped until the structure is destroyed; in others it can be checked after it has burned half-way, or less, but remains smouldering indefinitely, ready to flame up again; in others, it can be quickly checked, and finally brought to an end.

We find, for example, a patient like Henry D., in whom there is a certain tendency to a limitation of the morbid processes, purely by the natural powers of reaction. Pathologic processes, like all others, can be limited in two relations—duration and extension, that is, in time and in space. We have extension in space and duration in time. In our tuberculous cases we must study the natural tendency of the human organism to limit the disease, and whether these natural powers limit the extension of the lesions in space, or the duration of the process in time, or both. Let us take, for example, the case of a normal or nearly normal man —one of the "insusceptible" group—who is performing

the autopsy of a tuberculous subject, and is inoculated with the products of the disease. What happens? There may be no result, or there may be developed upon a wounded finger the "anatomist's tubercle." You have seen the growth—it resembles a wart. It is the result of a tuberculous process. But, although there are bacilli present, and histologically the characteristic cells of tuberculosis, the morbid product does not extend in space and the morbid process does not endure in time. Even if left to itself, the growth will in most cases disappear, and it always disappears very quickly if treated with lactic acid—a very simple therapeutic measure. This is an illustration of the highest tendency to limitation both in space and in time. Next in order, confining ourselves now to pulmonary lesions for the sake of simplicity, is the condition termed by Sir Andrew Clark "fibroid phthisis," or later, "fibroid tuberculosis." Histologically, tubercles consist of aggregations of degraded tissue-elements incapable of progressing to the formation of tissue like that from which they took origin, or even of durable scar-tissue. They are devoid of vascularity, and break down from want of nutriment, or under bacterial attack. Healing can take place only through the formation of scar-tissure, fibrosis, fibroid proliferation, by surrounding tissue. In fibroid phthisis cicatrization keeps pace with ulceration, the lesions are long confined in space, and the patient retains a fair degree of general health. Such cases are frequently mistaken for asthma. The process, however, is not limited in time, and may last for twenty or even forty years, the patient dying sometimes of intercurrent disease. In some instances the extension is at times, or toward the end, rapid, and the patient does not survive so long.

In Henry D., and in the man beside him, we have illustrations of a third degree of tendency to limitation in space, without much limitation in time. The process

in these patients is confined to a limited area, principally at the apices of the lungs, and extends very slowly, but yet endures. It has endured, under our own observation, for five years in the one case, for three years in the other, notwithstanding the fact that the patients' resistance has been increased by treatment. In Henry's case there are two large cavities, one in each lung, in which from time to time we detect signs of activity, which, however, subside under treatment, and even without treatment. In another group of patients we will have an exactly opposite tendency. General reaction is good when aroused, but there is little local resistance. The lesions are but feebly limited in space, but there is a strong tendency to limitation of the morbid process in time; that is to say, so long as it lasts it spreads more or less rapidly, and may involve a considerable extent of pulmonary tissue, yet it comes to an end in a comparatively short time. An illustration is shown by the patient G., in whom at present all active manifestations of the disease have ceased, but who has in a few months lost so much pulmonary tissue that a cavity in the middle of the right lung is easily demonstrated. The question, in a patient of this kind, is: Will the time-limitation come into play before the destruction of tissue has gone too far? Nature has been bountiful to us in the matter of lungs and other organs, and a total loss of half the normal amount of pulmonary structure is not incompatible with good health, as is shown by a remarkable case of Tillmann's, in which disease and surgery had practically removed the whole of one lung, the other lung remaining healthy.

And then we have, unfortunately, another group of patients, those in whom there is no tendency to limitation either in space or time, and they form the type of what is termed "galloping consumption." The morbid process extends rapidly, and is not limited, except by the death of the patient. I have never seen cases of that

kind recover. Of the other classes, I have in many, many cases seen the recovery prolonged for a sufficient number of years to enable one to say positively—yes, this patient has recovered.

In some patients who exhibit a tendency to limitation of the process in time, or limitation of extent of the lesions in space, there happens a series of phenomena which it is very important for us to understand. The processes apparently come to an end; the patient is to all appearances well; upon physical examination we elicit not the signs of an active process, but merely the signs of the result of previous destruction. That state of affairs continues a number of months, or a number of years, and suddenly, without any well-recognized cause, or perhaps through the intervention of some exposure, or of something which reduces the vitality of the patient, such as mental anxiety or bad nutrition, everything starts up again. The patient gets into a very alarming condition, and the family expects his immediate dissolution. Then, just as the process stopped the first time, it stops again before very much damage has been done. We may thus have a case which goes on for almost an indefinite number of years with alternating periods of apparent good health and of acute disease. I have in mind now a case which has been under my observation for many years, in which there have been three such attacks, and yet the patient (from a letter which I received about two weeks ago) is now in such good condition that she weighs about 175 pounds; has no cough, no fever, and is, to all intents and purposes, well. That woman has been in an alarming condition, under my own observation, a least three times. Here is one illustration of what I mean by "preaching the gospel of hope." Never give up the ship in any case of pulmonary tuberculosis! You do not know until the final issue whether or not it is a case susceptible of limitation; and the harder you try,

the greater will be the number of cases in which you will bring about the limitation in space, sufficient to save life for the time, even if the process remains latent, to break out again. Even if you strive hard in ten cases, and only one of them shows a good result, it is worth wasting your work on the other nine to save that one. But the proportion of successful results possible is much larger than one in ten. Under favorable circumstances —if we exclude galloping consumption and acute miliary tuberculosis—I should consider 50 per cent. of recoveries much under the mark. Further than this, even when recovery is impossible, life can be prolonged and suffering can be relieved.

The degree of success achieved will depend upon the hopefulness with which the treatment is undertaken and the persistence with which it is carried out, notwithstanding the supervention at times of alarming symptoms. Now, what is the proper line of treatment? I have already said that it is devoted almost entirely to increasing the resisting power of the patient. Let the bacillus alone and strengthen the patient, and if you strengthen the patient to the proper point, his own vital forces will sbe ufficient to take care of the bacillus. I think the French records show that in at least 50 per cent. of the cases submitted to autopsy in which there has been no other evidence of tuberculosis, clinically or pathologically, the bronchial glands are found to contain tu bercle-bacilli. What does that mean? It means that all of us are practically attacked by tubercle-bacilli all the time, and that those of us who are in a normal condition possess the requisite amount of vital energy to enable the bronchial and other glands to closely imprison and finally destroy the invaders, and no harm is done. Therefore, let me once more repeat, for this is the lesson I want to teach, that the aim of treatment must be to make other people as strong as those who resist naturally. You remember what Oliver Wendell Holmes

says in *The One-Horse Shay*, and it is good policy even in medicine:

". . . It's mighty plain
The weakest place must stan' the strain;
An' the way to fix it, ez I maintain,
Is only jest to make that place as strong as the rest."

You remember that the one-horse shay ran for one hundred years without breaking down and then crumbled into powder. What the deacon did as a carriage-builder we must try to do as physicians—*make the weakest man as strong as the rest.* In the case of patients whom we know to be by heredity liable to tuberculosis, we must early institute preventive treatment. This has two branches: First, the avoidance of infection. Of this I will not now speak, except to emphasize the necessity for teaching your patients not to spit around indiscriminately, but to take such care of the sputa and other discharges that they may not become dried, ground into dust, and being wafted about by the air become a source of danger to others. Avoidance of infection is not always within our control, therefore the other branch of preventive treatment is even more important. This consists of invigoration, or in other words the reinforcement of vital energy.

The methods by which we may bring about this reinforcement of the vital energy of the patient are fortunately quite simple; the details are very many. To lecture upon the details would take several hours, but the principles are few, and if you once have a grasp of the principles you can make the detailed applications of them from your own common sense. The principles are the same, whether applied in prophylaxis (in the endeavor to prevent disease) or in therapeusis (in treatment having for its object the facilitation of recovery). We must try to control the daily life of the patient—control it, so far as may be possible. First, in relation to his place of residence. That includes his

exposure to light and air. The subject of climate cannot be treated in the few words now at my disposal. But this I will say: while proper climatic treatment can do much good, improper climatic treatment does much harm. One climate is not suitable for all cases, just as one coat will not fit everybody. As a rule patients with a robust tendency do better in cold and elevated regions, while those who are in need of soothing and protective measures, who easily take "cold" and have a tendency to fever or nervousness, are better off in warm, and if possible, comparatively dry places. Dryness is a great desideratum always, but it must not be excessive, as it may provoke hemorrhage. The open sea is beneficial in nearly all cases, but the seashore is to be avoided whenever active destruction of tissue is in progress. Many patients cannot avail themselves of change of climate. Such patients must be gradually encouraged to be much out of doors in all weather, proper means of fortifying them against violent changes being resorted to. Secondly, we must control the patient's clothing. We must see that he wears such clothing, light and porous, and not constricting the body at any point, as will best protect him from vicissitudes of weather. Woollen or silk underwear is preferable, as it keeps the skin, as regards moisture and the body-temperature, as nearly as possible in the same condition in different circumstances of weather. Women must be told to give up corsets, tight-waisted bodices, and the like, and all must avoid overheating scarfs, boas, and the like around the neck. Waterproof coats and overgarments are objectionable. Thirdly, we must control the patient's food; administering such aliment as will yield the greatest amount of energy with the least expenditure of vital force in its digestion and assimilation. Nitrogenous and fatty foods, predigested if necessary, and a moderate amount of greens, best fulfil the requirements. In most cases overfeeding, six meals a day, or feeding

with the stomach-tube twice a day, will be useful. Fourthly, we must control the patient's activities. We must regulate his exercise and his rest. One authority will insist upon rest in the treatment of pulmonary tuberculosis, another with equal propriety urges the importance of proper exercise. They are both right, both wrong. Whoever urges rest without exercise looks only at one side of the shield; whoever urges exercise without rest looks only at the other side of the shield. You must regulate both—the patient's rest and the patient's exercise. When there is a continuous tendency to fever, the temperature reaching or exceeding 100° F., put the patient to bed and use ice to the chest, over the heart, until the fever is controlled. Under all other circumstances see that the patient spends as much time as possible out of doors, walking, riding, cycling, driving, but never to the point of fatigue. In other words, exercise graduated according to the patient's ability is what is needed. We must likewise take into consideration the patient's vocation and his avocations—that is, his ordinary pursuits, the work he does for his livelihood, and those pursuits which he takes up for recreation and amusement. These must be so arranged, if possible, as to be a part of the treatment. A business that keeps the patient out of doors is the one to be preferably followed; and a most important therapeutic factor in putting the patient into that condition where he can recover, is to afford him cheerful and innocent amusement. Fifthly, we must teach our patients to use their lungs properly, and we must dilate the unused or little used portions. This is accomplished by certain gymnastic measures and by the inhalation of air at modified pressures. Patients can be overfed while inhaling compressed air, who could not be overfed otherwise. Sixthly, we must insist upon the free use of water internally and externally. The proper, judicious use of cold water, by douching, sponging, bathing, and the like is one of the

best measures we have for stimulation of nutrition and for education of the vessels to resist changes of weather. The drinking of hot water before meals keeps the digestive tract clean and facilitates secretion and excretion generally. This is especially necessary when large quantities of meat are eaten. Seventhly, we must pay careful attention to the patient's secretions and excretions, endeavoring by hygienic or medicinal means, as necessary, to keep them quantitatively and qualitatively normal. Finally, and least important—and yet of very great value—is the administration of drugs by the mouth, by inhalation, by the skin, or in any other way. I do not underrate drugs; I know we get much good from the use of drugs in the treatment of pulmonary tuberculosis, and I would not like to have to give up such agents as arsenic, strychnin, iodin in its various forms, alcohol, turpentine, hydrogen dioxid, and creosote. But if we should be compelled to choose between hygienic measures and drugs, I would unhesitatingly prefer the former. I believe that a greater proportion of cases would recover under the proper use of rest, exercise, air, sunlight, food, and water, than under the most approved medication with the neglect of the other means. And that is, I think, the reason why some physicians have taken too hopeless a view of the possibilities of therapeutics in the treatment of this disease; they have concentrated their attention upon drugs; they have looked for some specific which would work a miracle and change the constitution of a patient in an hour, or a day, or a year. It is an impossibility. But if, instead of simply writing a prescription for cod-liver oil or hypophosphites, which were the fads at one time, or for creosote, which is now the fad—all good fads in their way—if, instead of saying, "take this three times a day," the physician will talk with the patient for half an hour as to just how he is to live, just what he is to expect in the natural process of the disease, how he is

to guard against different accidents which occur in the course of the disease; and then, not only that, if every time the patient comes we question him closely: "What are you eating, drinking, doing in the way of rest, exercise, amusement, and occupation?" and insist that our directions shall be carried out literally and exactly, we will accomplish results which cannot be accomplished in any other way. And therefore I desire you to make every case of pulmonary tuberculosis that comes under your care an individual study, giving such drugs as may be indicated, and concerning some of these we will have a talk hereafter, but above all regulating the daily life of the patient in all the different relations of which I have spoken, in accordance with the different conditions which each particular case may exhibit.