Tuberculosis of children : its diagnosis and treatment / by Hans Much ; translated by Max Rothschild.

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TUBERCULOSIS OF CHILDREN

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Max Rothschild.

Tuberculosis of Children

Its Diagnosis and Treatment

BY

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TRANSLATOR'S PREFACE

The sceptical attitude of the medical world respecting new discoveries relating to the treatment of tuberculosis, is, in a sense, justified by the many disappointments which have been experienced during the last twenty years.

When, however, a method is presented for investigation, supported by authentic research and logical deductions, old prejudices ought to be laid aside long enough for its fair and unbiased consideration.

This volume, edited by Hans Much, presents the results of the co-ordinated efforts of himself and George Deycke of Hamburg.

These men are representative of the world's leading tubercular therapists, and are well known to the medical profession, the one by his discovery of Much's granula, and the other by his Nastin investigation in the treatment of leprosy. Their assertions of the value of their latest discovery, the partial antigens or "partigens," are most emphatic, and if they can be verified by other therapists Much and Deycke

have given to the world a method of treatment which equals in its importance any medical discovery made during the last century.

The translation here presented is divided into a general treatise of Much's startling theories of immunity and a special section which is a translation of one of his latest monographs "Tuberculosis of Children."

The ideas advanced and the comparisons made are, in many instances, very apt and unique and Much's manner of drawing deductions makes this volume most convincing and intensely interesting.

It has been a pleasure to translate and present this book to the medical profession.

M. R.

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GENERAL PART

TUBERCULOSIS OF CHILDREN

INTRODUCTION

By the discovery of the tubercle bacillus and its toxin, tuberculin, the study of tuberculosis and its many complexities were greatly facilitated. But it was due to the efforts of Behring that the then unsatisfactory research work was concentrated upon a definite purpose, namely: the practical study and treatment of tuberculosis.

The determination of the origin of this disease and its treatment would have been impossible without the science of immunity.

The principal question in the modern research of tuberculosis is: "Does an immunity exist in the human being against this disease?" The answer to this question must be

in the affirmative, but to prove such a positive statement we must digress from the subject, to present a few fundamental facts.

HUMAN AND BOVINE TUBERCULOSIS

Tuberculosis is particularly fatal to human beings and cattle. The human type of the tubercle bacillus differs from the bovine type in certain respects, particularly in its virulence for animals. The bovine tubercle bacillus, being more virulent, kills rabbits and cattle through extensive tuberculous processes—the human type causes, in the same animals, only a more or less pronounced local inflammation. The question arises: Are these types really different?

Behring calls attention to the example of the anthrax bacillus. He experimentally changed spore-forming anthrax bacilli into those without spore-forming properties. Also, artificially, it was possible to weaken a most

virulent type to such a degree, that it became entirely non-virulent. In regard to the origin of these types, there could not be any doubt, that they were developed from the same culture.

Arloing demonstrated the possibility of changing, artificially, a human type of tubercle bacillus to such a degree that it lost all resemblance to its original form in its cultural reaction and its effect on animals, when used experimentally. For this reason it resembles and acts in many respects similar to the typus Gallinaceus.

Furthermore it is probable, that there occur natural transitions from the human to the bovine form. It has been claimed that the correctness of these findings could be doubted, as one had to deal in such cases perhaps with a mixture of both types, of which in the culture-medium the human, in the animal the bovine type, were prevalent. But without a

doubt a transition from one type to the other is possible, and this is of greatest importance. The virulence of the human type can be increased to such a degree that it resembles the bovine form. And conversely, a bovine type of high virulence can be attenuated to such an extent that it exhibits only the characteristics of the human type.

Further we find human-type cultures which are just as virulent for cattle, or even more so, than bacilli which have been cultivated directly from cattle. And vice versa: so-called typical bovine tubercle bacilli, which have all the characteristics of the bovine form, can become dangerous to human beings. The possibility that man can become infected from cattle has been established beyond a doubt.

The fundamental fact must be admitted that an absolute immunization against infection through the bovine type can be achieved with human tubercle bacilli.

It is impossible to show a difference between the two types by their reaction to anti-bodies. An agent infected by the human type reacts in the same manner against the human and the bovine forms, and vice-versa. Tuberculins (bouillon-cultures), as well as the partial-antigens of human and bovine types, are identical.

Therefore human and bovine tubercle bacilli must not be considered as belonging to different families, but as being different forms of the same family of organisms. These different characteristics are probably caused by their adaptation to their host.

In our country most forms which are cultivated from tuberculous processes in human beings belong to the human type, but this fact does not definitely prove that their origin might not have been bovine. Even if all cultures, made from tuberculous lungs, are of the human tubercle bacilli, it is possible that in

some cases the original cultures might have been dangerous to cattle. Besides, as will be discussed later, the foci in the lungs are mostly old forms of tuberculosis. The bacilli have been in the body a long time and may have become adapted to the same. This theory carries much value as an attenuation of the virulence of the bovine tubercle bacilli is possible, if the same has passed through a human being.

It has been tried to prove the respective harmlessness of the bovine bacillus by stating:

1. Infection of the human being with bovine bacilli can produce a cessation of active tuberculous processes and can also produce a cure.

2. Infections with bovine bacilli are rather harmless for the adult and are only a source of danger for the child.

Obviously this is a serious error, as the same reasoning could be applied in regard to the human tubercle bacilli. Also it must be con-

sidered that the number of infections by human bacilli which remain latent or heal spontaneously, are more common than infections by the bovine type. How could the great immunity against tuberculosis be otherwise explained?

And in reference to point (2): Bovine bacilli are practically without danger for the adult, because in the great majority of cases the individual is already immune, and not because he might be less sensitive. One has to consider these facts in the light of our newly gained ideas regarding tuberculosis-immunity. The bovine bacillus does not differ whatsoever from the human bacillus in this instance, as also an infection with the human bacillus is equally rare for the adult.

Many wrong deductions have been drawn in the consideration of this particular subject.

To reconcile our former ideas of a sharp distinction between these two forms, may I call

attention to a few simple examples apropos of the subject. A certain form of digitalis growing in Germany acquires entirely different biochemical qualities, if it is transplanted to certain parts of France, and it loses these again, if it is re-transplanted in Germany. Or: The Russian Jew, who immigrates to America, loses his type within a short time, accepts the American standards of living and fashion, and appears quite different when he again meets the old friends and acquaintances of his youth on neutral ground, as Jerusalem. He keeps his newly acquired habits and characteristics for a long time, even if he returns to the country and people of his birth.

TUBERCULOSIS—INFECTION

Conceded, the human being can become infected from cattle as well as from man, the question arises, when does this infection take place?

Behring was the first to claim that the infection occurs in childhood. Schlossman accepted this view, and many other children's specialists followed. Now all are quite reconciled to the statement, that tuberculosis is a disease of childhood.

The valuable and convincing statistics of Naegeli and Burchard proved, by autopsies, that in practically all human beings, who had lived past their eighteenth year, certain tubercular changes could be found.

Franz contributed valuable data by his work in a certain regiment of the Austrian Army, which represented the flower of the Austrian youth. Injecting tuberculin intracutaneously, he found that 70 per cent. of these young men reacted positively.

It became the task of the children's specialists to investigate the value of this data, and this was done most thoroughly by Hamburger. He first furnished the incontrovertible proof

for his opinion through post-mortem examinations of children. He found tuberculous changes in an increasing proportion, especially when a tuberculin reaction ante exitum had been made. These examinations are of great importance as they furnish statistics in cases, which did not actually die of tuberculosis, but which showed tuberculous processes concurrent with diseases, that caused the death of the individual. He presented the following:

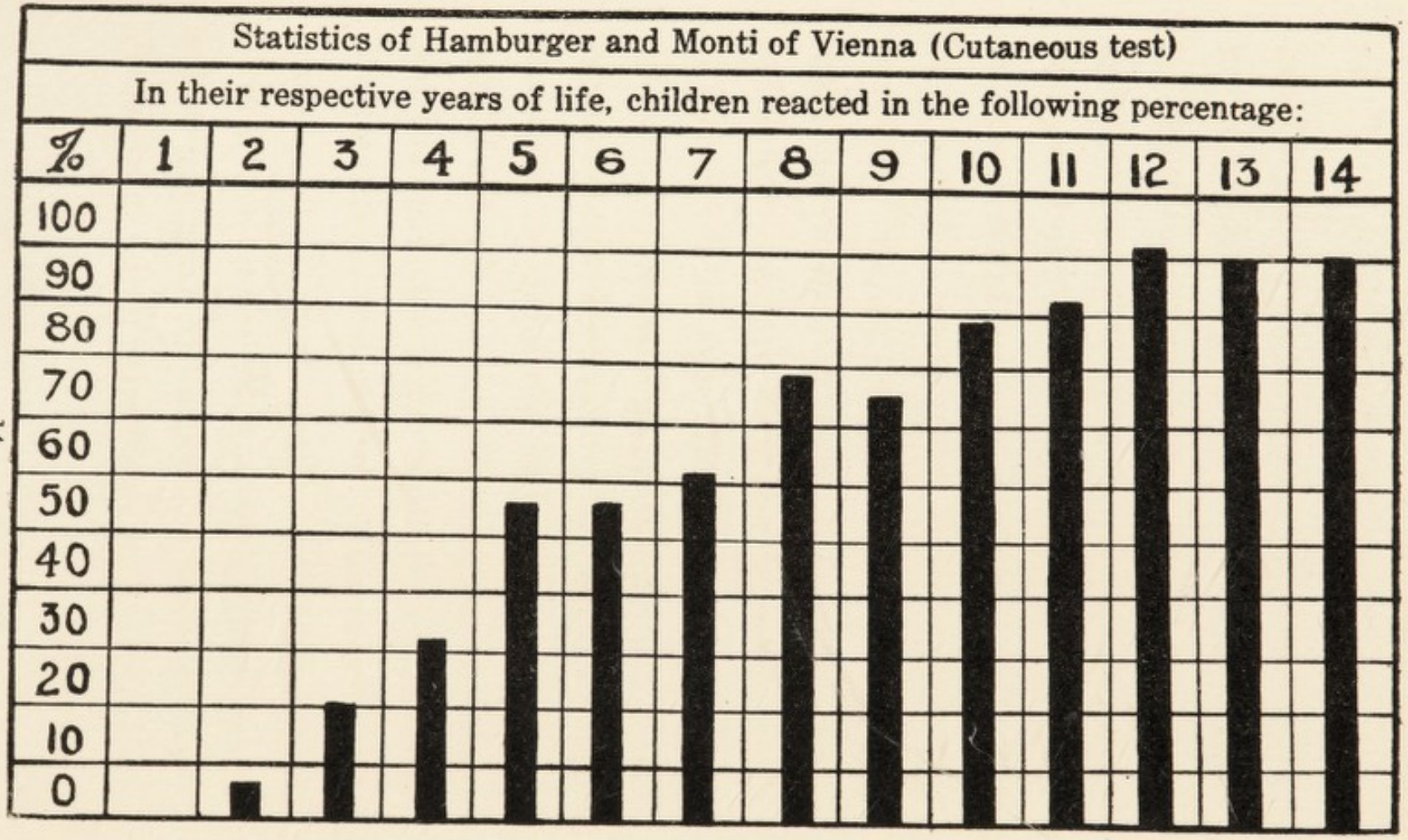
1 year	2 years	3–4 years
1.5%	9%	30%

5–6 years	7–10 years	11–14 years
44%	86%	77%

However, pathological-anatomical and post-mortem changes are not entirely sufficient, to prove the vast extension of tuberculosis-infection. One observer has stated that a tubercular infection could only be established by the finding of pathological changes. This can be

proven incorrect by the work of Wolff, who found the granular forms of tubercle bacilli (granula of Much) in entirely normal glands of children. These children exhibited absolutely no other visible anatomical or pathological tubercular changes. Implantation of these granula-containing glands produced active tuberculosis.

Therefore, it became necessary to search for more accurate methods than anatomical controls, with which it would be possible to recognize tuberculous infections. The tuberculin reaction was most tempting. Comparison of tests made in different localities under the same conditions furnished most astounding information. Tests conducted on children, who had reached the tenth year, showed an almost invariable positive reaction to tuberculosis, a negative reaction being an exception. The following is Hamburger's statistics from Vienna:


Statistics of Hamburger and Monti of Vienna (Cutaneous test)
In their respective years of life, children reacted in the following percentage:
%
1
2
3
4
5
6
7
8
9
10
11
12
13
14
100
90
80
70
60
50
40
30
20
10
0

The increasing proportion of positive reactions with the increasing age of children was confirmed by other investigators although not all found the percentage as high as recorded by Hamburger. This fact is not due to any difference in different cities, but to the variations in the methods of examination. Also, not all tuberculin reactions are equally sensitive. The subcutaneous test is negative in many cases, where von Pirquet's method is positive. But to get the correct idea of the extent of tuberculosis-infection it is necessary to use the most sensitive test. Franz, for instance, would have found a higher percentage in his examination of soldiers, had he used the von Pirquet instead of the rather crude subcutaneous test. The best results are obtained by the intracutaneous method.

Similar results can be obtained by using other biologic reactions. A large percentage of adults respond positively to the rather crude

agglutination-test with tubercle bacilli. In my institution much work has been done with the complement-fixation test. Positive reactions were found in cases presenting well advanced tuberculous lesions and also in cases without any clinical signs of tuberculosis. For example, out of 118 positive reactions only 11 showed clinical signs of tuberculosis. Also with this method the reactions are least positive in children, and the percentage increases with the age of the patient tested.

By these deductions it is most evident that the infection takes place in childhood. The portal of infection, whether intestinal, respiratory, lymphatic, or circulatory, loses its great significance and importance when compared with the startling fact, that all children at some time during their childhood have a tubercular infection.

The next problem to determine is, how do these infections occur? Why do some or any

escape? Baumgarten is of the opinion that the foetus becomes infected in utero. While this opinion is not entirely erroneous, especially as tubercle bacilli have been demonstrated in the placenta, it is the exception.

We have to consider the human being the chief source and danger of infection, with the exception of those few cases, in which cow's milk has been responsible for the same. The child becomes infected from or by its parents or, rather, because it lives in a tubercular environment.

Admittedly the statistics might be somewhat more favorable in wealthy families, but this does not change the fundamental fact, that *wherever tuberculosis is found, it has started in the first years of childhood, and that during this age most people pass through a tuberculous infection.*

TUBERCULOSIS—IMMUNITY

Infection can occur without actual sickness. In comparison of the large number of persons showing tubercular infection, with the relatively small number that succumb, it is clearly seen, infection can occur without illness or even the knowledge of the patient. What then really becomes of the large number of tuberculous infections which do not develop acute illness?

1. The individual case may develop a progressive tuberculosis, which may be acute, subacute, or chronic. Or successive combats between the infection and the anti-bodies may cause periods of quiescence and periods of activity, thus continuously menacing the life of the patient.

2. The infection can become entirely arrested. The absence of all clinical signs and symptoms and the biologically ascertained

presence of anti-bodies would prove this. Tuberculin-tests have shown us already that the majority of adults react to tuberculin-injections but are entirely healthy. *Therefore, this test, as well as all other immunity tests, is not a proof of an infection which exists at the time the test is made.* Every immunity test per se proves only, that an infectious substance has at some time invaded the body, and that the body has responded defensively. When the infection advances very slowly it is, naturally, only in the earliest childhood possible, to ascertain the time of infection with immunity-tests. In rapidly developing sicknesses certain conclusions may be drawn in regard to the time of infection through immunity-tests, but these conclusions have nothing to do with the nature of the test.

3. Through very exact analysis of immunity, the fact has been established that cellular, as well as blood-qualities are present in the body,

and that these represent the means for defense. The healing of an infection produces an immunity which in this instance is a spontaneous, naturally acquired immunity.

Several proofs can be brought for the high immunity which is present after a conquered tuberculous infection. Only a few shall be mentioned:

Behring has first shown definitely that a tuberculosis-immunity can be produced, through his "prophylactic" vaccination of cattle against bovine tuberculosis and he proved further, that this immunization through human tubercle bacilli on a large scale is possible. Lately an immunization through products from dead tubercle bacilli has been achieved by Deycke and Much.

We have to deal in these instances with immunization without real infections. But in connection with these questions we desire to study the immunizing value of an arrested in-

fection. The answer can be found in the animal experiments, and in the facts which the study of whole populations of certain countries furnish. Animal experiments were satisfactorily made by Roemer, after Koch had previously determined that one tuberculous infection protects an animal against a re-infection. This means that a tuberculous animal is *immune against a second additional tuberculous infection* to which it might be exposed, and this immunity is very strong. This fact has been established beyond the possibility of a doubt. The original infection might progress or might become arrested.

To demonstrate the existence of immunity to tuberculosis in the human being, we must also consider the proven phenomena, occurring in communities or races taken as a whole.

In countries, where tuberculosis has existed for many years or centuries, the action of the disease is very different from that seen in the

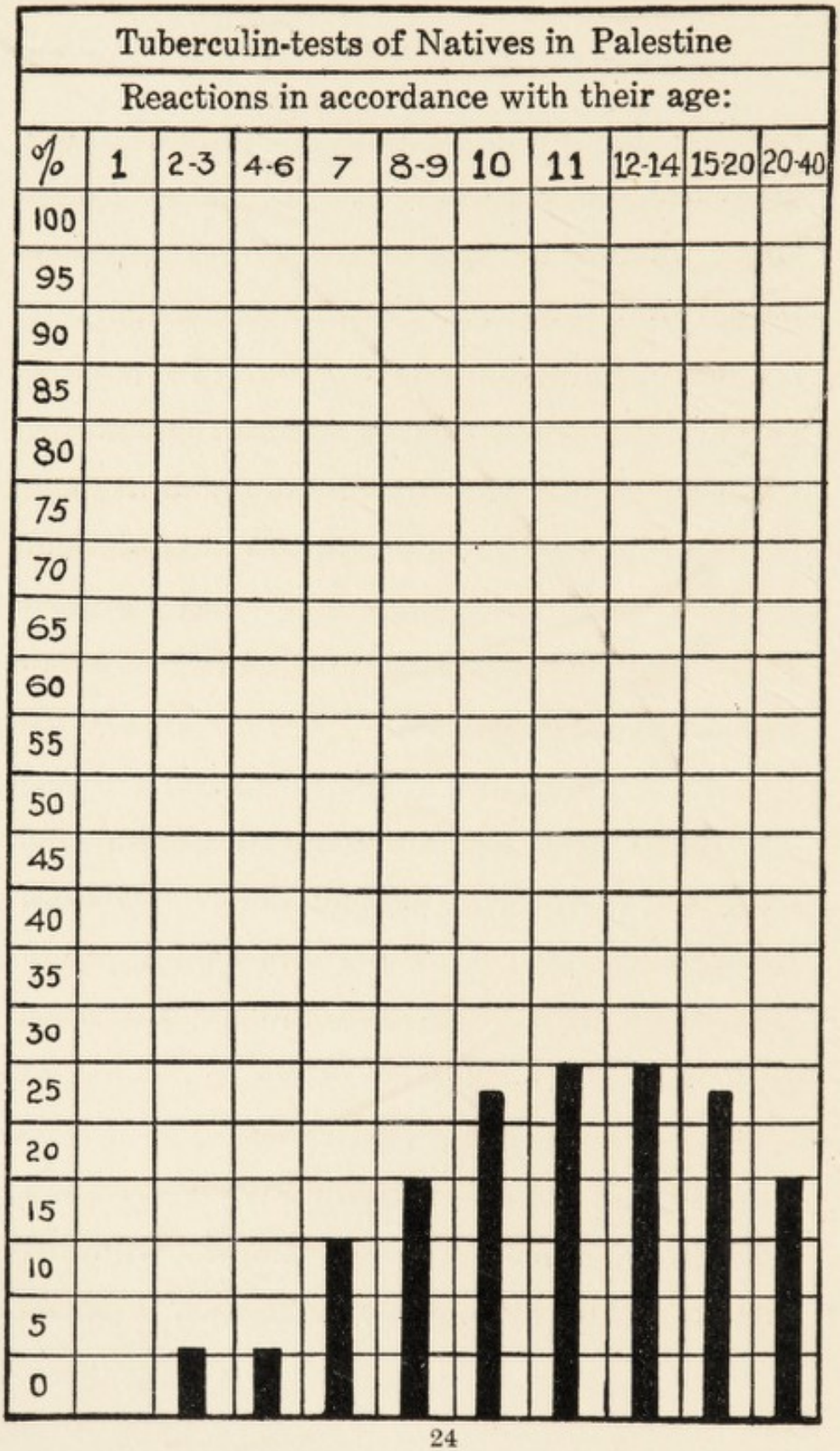
countries where tuberculosis has never or only for a comparatively short time has been known. To illustrate this, there are certain localities in Turkey which are isolated from the rest of the world, due to the inaccessibility to commerce and general travel. Tuberculosis has never been demonstrated there. Deycke found that soldiers, who came from such places and enlisted in Stamboul, became easy victims of tuberculosis. On the other hand, if tuberculosis was carried into such places, it acted like an epidemic or plague and caused entirely different pathological changes, than those usually produced. And only after such a country had been thoroughly infected, did the disease lose its destructive character. Similar conditions have been described in the Argentines by Roemer and in Africa by Wolff-Eisner. In the same direction Much studied conditions in Palestine, where tuberculosis was practically unknown, until several decades ago. Partly

through Jewish immigration, partly through temporary emigration of inhabitants to America, Palestine became infected with tuberculosis. And now the disease appears among the native inhabitants in the form of a terrible plague which causes death within a short time, while among the Jews it exhibits the same form as seen in countries, where it has been present for many years, with the exception of a branch of their race which immigrated from a tuberculosis-free part of Arabia.

The interpretation of these facts is: Persons who have once become infected with tuberculosis are protected against the omnipresent tubercle bacillus; while persons, who have not been infected in childhood, are not protected and succumb.

This definitely proves, that association with tuberculosis produces immunity; where this association is lacking there is no protection.

It is furthermore a fact that such tribes of

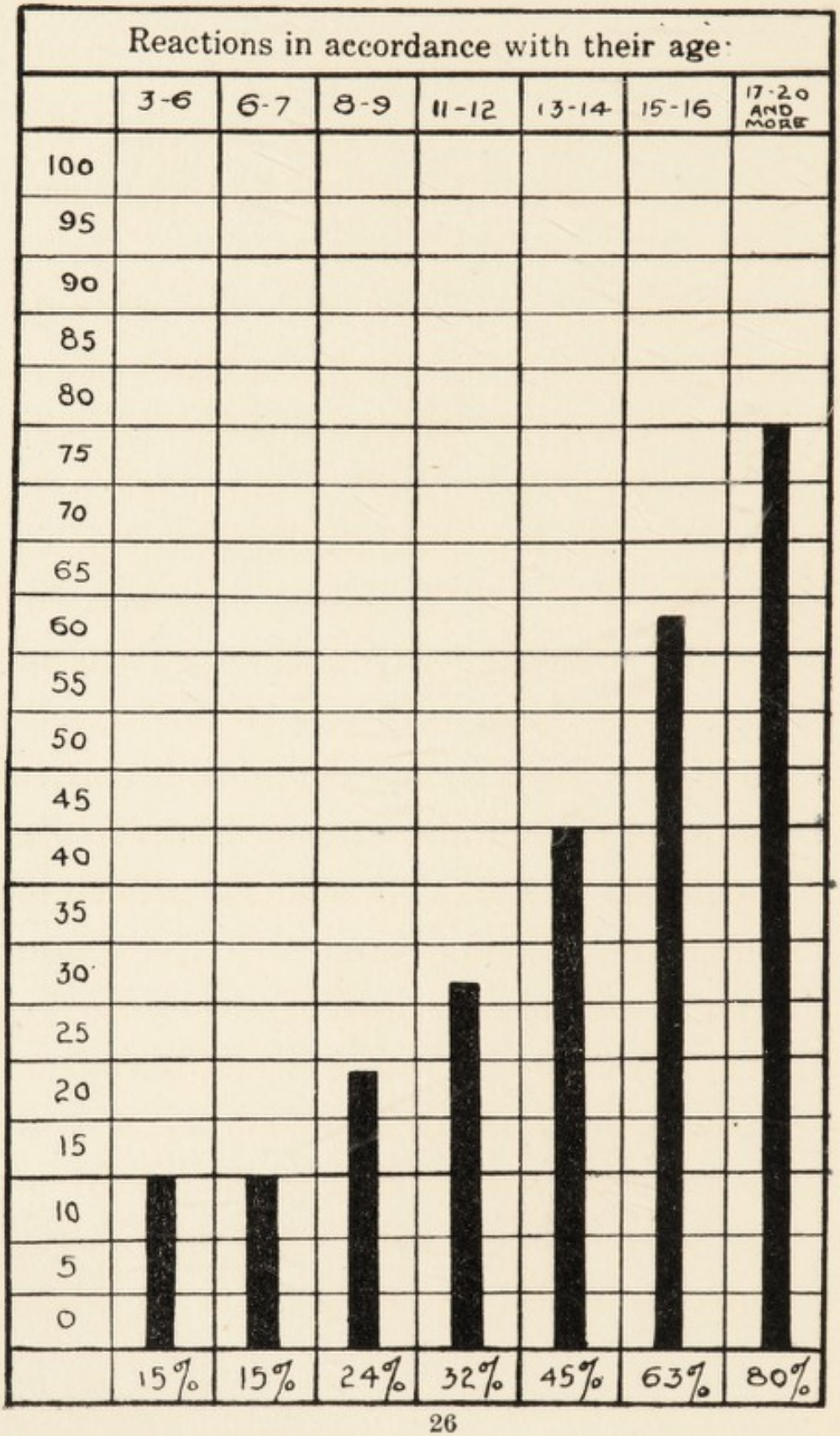

Tuberculin-tests of Natives in Palestine
Reactions in accordance with their age:
%
1
2-3
4-6
7
8-9
10
11
12-14
15-20
20-40
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0

apes, which most resemble the human race, succumb to tuberculosis almost without exception, when they are transported from their virgin tuberculosis-free forests to Europe.

These deductions have been proven clinically. It must further be considered that frequently at autopsies only one tuberculous focus is found. There exists only one explanation for this fact: this single focus had provided protection against later infections, to which that individual had been exposed during his life.

And another illustration of this point can be found in some professions. For instance, the mortality from tuberculosis among physicians, who are brought continuously in contact with the disease in all its forms, is not higher than that of any other profession.

Therefore: the less tuberculosis is spread in a population, the less is the existing immunity against it, and the greater the mortality. The


Reactions in accordance with their age
3-6
6-7
8-9
11-12
13-14
15-16
17-20 AND MORE
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
15%
15%
24%
32%
45%
63%
80%

more extensively tuberculosis is spread, the greater the immunity and the lower the mortality.

4. Even if we know that the recovery from an infection may produce a high immunity, we cannot believe that a single infection in childhood with tuberculosis would be sufficient, to protect that individual during the rest of his life against it. If, in spite of this fact, the majority of human beings is protected against tuberculosis, there must exist another reason. We have to suppose that the prime immunity (acquired through the conquered infection in childhood) becomes continually reinforced during the following years. As the human being is constantly exposed to tubercle bacilli, it has to overcome these new infections continuously, and this combat becomes easier each time, because with each defensive attempt of the body, its immunity becomes stronger. Tubercle bacilli can be found in the blood

stream at times in not only the tuberculous individual, but also in persons, who are clinically tuberculosis-free; but these germs have lost their danger for the last mentioned group. This supposition of uninterrupted efforts of defense becomes more plausible and more easily demonstrated after further consideration and by other phenomena. If we estimate the immunity of a healthy person at different times by means of the partial antigens (their use being indispensable for the test), thus demonstrating cell-immunity by the intracutaneous test and blood immunity by complement-fixation reaction, we find the following: The cell-immunity, representing the main and lasting immunity, remains practically unchanged in short intervals. But sometimes one of the partial antibodies increases or decreases suddenly, for instance, the one against fat-acid-lipoid. If we were to make our tests with tuberculin or with emulsions, this change in

the respective condition of immunity would of course escape notice. If we take longer intervals, we always can detect changes in the partial antibodies, even if at times only inconsiderable ones.

On the other hand the picture of blood-immunity undergoes remarkably sudden changes. Examinations made on my co-workers are convincing. These showed frequently during their period of occupation in the laboratory, only few, and in some cases no partial-antibodies against tuberculosis in the blood, while the cell-immunity remained intact. When they were transferred to the tuberculosis-laboratory, where they handled tubercle bacilli, the partial-antibodies in the blood were formed often within a very short time and in very large quantities, so that their amount was amply sufficient. Gradually the cell-immunity increased at the same time. Frequently the blood-immunity changes from

day to day. The blood-antibodies destroy invading bacilli in a quick defense, but these antibodies of the blood are dispatched from the cells. After their task has been accomplished, the one or the other partial-antibody may disappear from the blood, maybe all, if longer intervals between battles take place. At the same time, the cellular antibodies are increased with each attack, if this does not become too severe.

Therefore, there exists in the healthy body a continuous movement for defense. But the protection does not have to be necessarily increased only by new stimulation from the outside. In quite a number of cases the body appears to be clinically healthy, but in spite of it some glands with caseous degeneration are present, which contain tubercle bacilli. This means, if they represent the only sign of an infection, that the body is keeping the enemy, by which it has been invaded, well under con-

trol through the continuous production of antibodies. At the same time it protects itself with their help against a new infection from the outside.

We have thus to acknowledge that there exists an immunity against tuberculosis in the human being, which has its beginning usually spontaneously through a vanquished or a well controlled infection in childhood.

5. Also, the tuberculous patient possesses antibodies, which do not differ in any way from those found in the tuberculosis-free immunized being. The efficacy of these antibodies is undoubtedly directed against a new infection from the outside, and to some degree, against the tuberculous infection already present. In small numbers it explains the slow but advancing progress of the disease. Only when those antibodies disappear, will the infection be able to make more rapid headway: a sure sign of the abandoned resistance is the

entire absence of antibodies, which occurs before death.

Even if in such cases these immune-bodies are not able to conquer the existing tuberculosis and only can retard its progress, they are amply sufficient, to repel new foreign infections, so that the patient can not be reinfected. *Therefore we are justified in speaking of a real immunity of the tuberculous patient.* This immunity ceases only with the disappearance of all partial antibodies before death.

One may mention here a race difference which was found by Much in Jerusalem. Arabians, who have overcome a tuberculous infection, have gained this mainly through the immune-bodies of their blood. They do not seem to possess the cellular antibodies which are so important for our race.

TUBERCULOSIS—DEVELOPMENT

Only after the consideration of all that has been said so far, shall we be able to discuss properly the origin and the development of the tuberculous infection. Each slowly progressing tuberculosis, whether phthisis, renal, or surgical tuberculosis, bears the closest relation to immunity.

It has been shown, that most individuals are protected against tuberculosis during their lifetime.

A so-called "quick-consumption" develops, if no antibodies whatsoever are present, and this is the case in miliary tuberculosis. Not only the migration of tubercle bacilli into the blood causes miliary tuberculosis, but the miliary form develops, if through some previous cause all partial antibodies may be absent. This may be due to two facts: either they had not formed at all (in small children, or in

adults who came from a tuberculosis-free country), or they had disappeared, after they had been present in insufficient quantities.

The slowly progressing tuberculosis is accounted for by the continually changing balance between immunity and infection. The mere fact that the disease is progressing slowly, is a sign that antibodies are present. But in some cases these are evidently not sufficient, either because their quantity is too small, or because one or the other partial antibody may be absent, so that with any exacerbation the disease makes further progress. But this new flare-up is, at least in the beginning, accompanied by two symptoms:—First, an increase of antibodies; second, even if the immunity present is not perfect at the time of the attack and if it is not able to replace the missing partial antibodies quickly enough, it resists the attack to such a degree, that the bacilli can in-

vade the body only slowly and under entirely different conditions, than if there were no resistance at all. In other words, it acts to ameliorate or diminish the severity of the exacerbation.

Pulmonary tuberculosis does not differ in this respect from glandular or bone-tuberculosis.

Therefore, if an imperfectly healed infection of childhood is progressing slowly, it is possibly due to two factors:

1. The immunity has never been entirely sufficient. 2. The immunity has been sufficient for a certain length of time and then later becomes undermined.

Two questions arise. 1. Why was the immunity insufficient? 2. Why has the originally sufficient immunity become undermined?

If the virulence of the infection is overwhelming, or if the invasion of the bacilli is too

massive or a continuous one and development of antibodies slow, or in insufficient amounts, then the disease can not be conquered.

Defensive action on the part of the body begins with the first onslaught of the disease, and its ability to overbalance the effects of the attack determines whether the patient succumbs in childhood, or at a later age, or recovers.

Of equal importance is the condition of the infected body. It is a fact, that some persons are from childhood less resistant than others or less tolerant of certain infections than others. The cause is unknown, but it is a congenital failing. And in these instances it does not need any large number of bacilli; but a quantity which the average body could conquer easily, becomes most dangerous. Furthermore, a body may become less resistant during the first years of its life by sickness or insufficient nutrition or by bad conditions of living.

The noble efforts to abolish such possibilities for infants are therefore fully justified.

2. A weakening of an originally sufficient immunity may be caused by different influences. First, by concurrent diseases. We know that, during an attack of measles, the antibodies against tuberculosis can become lessened, or that they can temporarily disappear. At such times foci, which have been kept entirely under control and which might have been completely conquered under normal circumstances, can become active again. Other illnesses can have a similar effect, for instance pertussis, influenza, etc.

In a similar manner great physical strains of long duration may weaken an otherwise normal body, and also bad nutrition can increase this weakness. Two very dangerous periods are puberty and pregnancy, because the greatest demands are made on the body at these times. Koegel has proven these views by tests

with partial antigens, in showing a lack of partial antibodies during the period of puberty.

Insufficient nutrition and the miserable conditions of habitation in the large cities have to be considered as weakening external influences, also certain occupations, for instance, mining, stonecutting, etc. The same individual in a different occupation might have been able to overcome an infection which took place during childhood, but, under the circumstances mentioned, a continually weakening and damaging influence takes place which decreases his immunity, and finally latent foci blaze forth into dangerous activity. It has been frequently pointed out and statistically proven, that the misery of habitation in large cities has an effect equal to these harmful occupations.

Too severe mental, as well as physical, efforts produce also a damaging effect. Nervous shocks and mental strains have never been

sufficiently appreciated in regard to their harmful influences. The war has taught us their bad effects.

It is difficult to state whether a wound can lead to a disturbance of the immunity. We have to repudiate the opinion, that on the site of the wound itself especially favorable conditions would be created for the growing of tubercle bacilli. It is more probable, that on account of the wound the general resistance of the body and with it its immunity could be diminished. The location of the wound would be immaterial. (Arthur Mayer) Personally I have only seen a tuberculosis develop after a wound, when an inactive and well controlled focus was injured at the same time. In these instances the tuberculosis started to spread again from these places. This has been proven partly by autopsies and partly by radiograms.

There are still cases to be mentioned, in

which the body has overcome the first infection, but in which the immunity has become diminished and therefore an infection from the outside may occur. This infection can only be proven definitely by tuberculosis developed at the site of a wound. For example, a butcher may cut himself in slaughtering a tuberculous animal, or a laboratory worker may infect himself through an external lesion with tuberculous material. In these traumatic cases the tuberculosis remains local, even if the lesions do not heal, and it is immaterial whether the bacilli are of the human or the bovine type.

One school arrived at wrong conclusions from these traumatically infected cases, stating that as they were of bovine origin they pursued a very innocent course. They attempted to prove herewith the relative harmlessness of the bovine bacilli for human beings. They claimed that the bovine strain was "innocuous

for the adult and dangerous only for the child."

This statement is in the main erroneous, as it fails to consider the fact that most all adults have acquired an immunity because of their constant exposure, and not because they were less sensitive to the bovine infection.

The bovine bacillus acts in this case exactly similar to the human bacillus, by which an infection of the adult is the exception.

During the war, infection from the outside became very prevalent. The reason has been recognized in circumstances of warfare, among which are bad nutrition and many other weakening influences, which consumed the old protection.

With the aid of these deductions and proofs we have been able to locate the real origin of tuberculosis and to wage our fight in its greatest stronghold, childhood.

An energetic and well planned campaign here must set for its purpose the eradication of

tuberculosis in the child, before any success can be expected from any other source. Tuberculosis in childhood must be cured. Practically nothing has been done so far. Our method of campaign up to date has been entirely wrong. (Pamphlet written for the laymen: "Tuberculosis in Childhood," Much).

Addition 1. How does it happen, that adults who come from a tuberculosis-free country do not form their own antibodies as well as the child? An analogy is drawn with the comparison of the immunity acquired by the child. Being born immunity free, it resembles the adult who comes from a tuberculosis-free country. Neither have in the beginning any specific immunity. This can be explained in two ways: either the child rapidly forms antibodies in sufficient quantity for its protection; or in that particular adult (and in this respect he differs from the well protected child), there is an invasion by such vast numbers of bacilli,

that through this massive infection the individual is overwhelmed. A child reared under unfavorable hygienic conditions and surroundings would meet the same fate with such a massive infection.

Addition 2. Considering the many possibilities for the invasion of the human body by tubercle bacilli and its equally great ability to destroy them, it is no surprise that, even after finding bacilli in the blood stream, the individual does not develop a miliary tuberculosis. Tubercle bacilli have been found in the blood of persons who were clinically not tubercular; these organisms were usually dead. On the other hand the tuberculous person does destroy all bacilli coming from the outside (thus preventing re-infection) and many from his own foci. It must be considered accidental, if live bacilli are found in the blood stream (without general bacteriemia), as their lives are necessarily short; they succumb very

quickly to the defensive action of the antibodies. Arthur Mayer's excellent article details very valuable information relative to the possibility of large numbers of tubercle bacilli circulating in the bloodstream (even though the bacilli were dead), without serious result to the host. He showed, through investigations with partial antigens, that "human beings, in whose blood the acid-fast rods were found, were incompletely immunized. The fat-acid antibodies and partly the antibodies against neutral-fats, were missing, and the acid-fast rods were nothing but fat-acid containing covers (without nucleus) of the tubercle bacilli, which had not been dissolved because these patients did not have the respective partial antibodies."

THE TREATMENT OF TUBERCULOSIS

INTRODUCTION

ADMITTING that the origin and development of tuberculosis infection is so closely associated with immunity, it must also be expected that the cure of tuberculosis is entirely dependent upon immunity. Research has shown that this deduction is correct. Many wrong and divergent roads were travelled before the direct and correct course was found. But at present the discerning mind can easily bring all efforts of healing into one law: "Tuberculosis of any kind can only be conquered by immune bodies," or expressed differently: "All attempts and efforts to cure tuberculosis have, consciously or subconsciously, as their ulti-

mate purpose the development of antibodies." It is of no consequence, if the method is a specific one and the remedy acts directly upon the antibodies to which it is closely related, or if nonspecific measures are used and the remedy effects only indirectly the means of defense, with which it has in itself no connection chemically or physically. When properly used, chemical, physical, dietetic, or surgical measures all have only the one purpose: to improve the immunity and thereby to conquer the disease.

This unusual simplicity in the study and treatment is a result of the research work of the last years and would have been impossible without the scientific analysis of immunity.

SPECIFIC MEASURES

1. Serum. All attempts to influence tuberculosis with derivates of blood, previously prepared or treated, have been without results,

notwithstanding all that has been written to the contrary. Therefore, it would be of no purpose to mention all the different sera, or the way they are made or used. That might be useful for a library, where a record is kept of all publications, detailing the efficacious as well as the valueless. Besides, there are now existing enough of those statistics with exact enumeration of the literature. (See also Much's work on "Tuberculosis.") It is wrong to expect scientific publications to detail all the miscarried and useless efforts of other investigators, with the hope that at some time some part of these may be found of value; this policy hinders real progress and should be discarded.

Since we have gained a clear conception of immunity, the reason for the failure of a therapy based solely on sera becomes evident. Formerly we considered the negative results of many of our experiments due to the fact, that

the antibodies were not present in the serum in sufficient quantities to be of real value. This theory, while valid under certain conditions, does not in any way explain the real cause. If, while studying the effects of a tubercular serum in vitro against bacilli which are not deteriorated, we could secure a reaction, we would not be justified in immediately concluding that that particular serum would be efficacious as an immunizing serum. And this does not apply alone to tuberculosis, but to all diseases caused by endotoxins. Only when all partial antibodies are present in the serum, it may be called an immunizing serum. If we study the manufacture of most tuberculosis-sera, we will find that in the preparation of none of them all partial antigens are used; there is always one or the other missing. Maybe they are omitted in pre-treating the animals, and maybe that the bacilli, if they are used in their entity, are not entirely disin-

tegrated. In this last case only the formation of a part of the partial antibodies takes place, as has been mentioned before. We can never get a serum which contains all partial antibodies and which therefore would be efficient, unless the bacilli are disintegrated.

It is, therefore, very evident that none of these sera could be of general use, and it is equally evident that they might be of value in some particular case. But all uncertainty can now be discarded through our definite knowledge of the biological laws governing the conditions of immunization. We know now that all sera which do not contain the whole sum of partial antibodies, are one-sided sera. Should the patient happen to furnish the partial antibodies which might be missing in the serum, he would obviously improve, as in that case the partial antibodies in the serum, added to those furnished by the patient himself, would combine to make the total of necessary antibodies.

But if we should secure a serum, which was made by inoculation with disintegrated tubercle bacilli and which would really contain all partial antibodies, (and with the help of the discoveries and the research work of the last years it is not difficult to procure such a serum), even then we would not make much headway in our fight against tuberculosis. We would by no means have a remedy at our disposal, which would promise general success in cases that might still be amenable to treatment, as the antibodies in the blood are not the only factors which are necessary in the fight against tuberculosis.

If we should not wish to give up the treatment with a serum, it should always be used in combination with a vaccine. Cellular immunity is not influenced by a serum alone, and especially not for any length of time. Some scientists have, therefore, partly empirically, partly as a result of logical thought, used not

only an immunizing serum, but they have added immunizing cells in the form of organic extracts (Schroeder, Kaufmann and Koegel, Much and Leschke). However, no success was obtained. The reason may have been that, in using such organic extracts, the cellular immunity was either not carried over, or the immunizing bodies in the cells were not present in sufficient quantities to afford protection.

We might mention here a preparation which is entirely devoid of any biological justification and the use of which has been lately discarded by most specialists, but which still receives mention occasionally: Spengler's I. K. If we attempted to justify the use of this preparation, we would have to turn three biological handsprings.

1. Spengler took it for granted that tuberculosis-immunity was not contained in the blood-serum, but in the red blood-corpuscles. This mentioning of cellular immunity is in it-

self a merit, but it can easily be proven by the animal experiment that the quickly changing red blood-corpuscles should be considered least of all body-cells as carriers of immunity. Much and Leschke examined the blood of highly immunized human beings, which, injected in combination with tubercle bacilli, protected guinea-pigs against a deadly tuberculosis-infection, and which, therefore, contained very many antibodies. This blood was separated in washed red blood-corpuscles and in plasma (which contained also the white blood-cells). The red cells proved to be entirely without effect, but the plasma gave exactly the same protection as the whole blood. The immunizing bodies of the blood are therefore entirely contained in the plasma; the red blood-cells have nothing whatsoever to do with the immunity.

2. Furthermore we are asked to make another extraordinary jump: these purported im-

munizing bodies (red corpuscles), which are entirely negative in their effect on animals, are not used in large quantities, but they are supposed to produce the efficacy in great dilution. Dilutions of over 1: 10,000 are mostly used. Evidently the fundamental laws of active and passive immunization are here badly mixed.

3. The efficacy of this preparation is dependent upon the agglutinating bodies which are supposed to be present in the red blood-cells, but which so far have had a most mystic existence in science.

SHORT DISCUSSION OF SOME SERA

The Maragliano serum. Maragliano believes that, while alive, the tubercle bacilli work chiefly through toxins, and after they are dead, through endotoxins. He tries to produce immunizing bodies against both. He recognizes the toxin in the toxalbumin which is secreted by the growing bacilli in the bouillon

and which he gets by repeated filtration; he gets the endotoxin by washing the residuum on the filter. Very crude ideas! If it were so easy to get the efficacious substances, or if the watery extracts contained all efficacious substances, we would have accomplished a great deal ere this time in the research and treatment of tuberculosis. All the important parts (partial antigens) which are contained in the residuum are omitted by Maragliano.

The treatment is about as follows: For the first twenty days pure serum only is injected, followed by the use of serum in addition to bacillary extract in increasing dosage. In the third part of the treatment, the serum is entirely omitted, bacillary extract only being used.

The fact that Maragliano has given up the pure serum-therapy and combines it with a vaccine-therapy proves the fallacy of his statements. But the vaccine-therapy is also insuffi-

cient, as only a very inconsiderable part of the antigens is used.

A large amount of literature has been devoted to Marmoreck's serum. Marmoreck supposed that the disease is caused alone by the toxins and that these disease-producing toxins should not be looked for in the tuberculins. He sees in tuberculin only a preparation which stimulates the tubercle bacilli to secrete the real poison, after they have invaded the patient's body. According to his theory the tuberculin reaction is not produced by the tuberculin, but by the toxins which the tubercle bacilli secrete, after an injection with tuberculin has been given. This opinion is without foundation and has been proven wrong by me. I instance the following fact: I found that a subject immunized against tuberculosis, but who has never been in contact with living tubercle bacilli, can react to tuberculin. It was Marmoreck's aim to produce his supposed

tuberculosis-toxin outside of the animal body through a so-called leucotoxic serum. He obtained this serum by treating calves with large quantities of leucocytes from guinea-pigs. Then he produced a culture-medium which contained this leucotoxic serum, and an extract of liver tissue. In this way he tried to imitate as closely as possible, outside of the body, the conditions present in the body which are necessary for the secretion of toxins. On the culture medium he grew tubercle bacilli and used very young cultures before they were acid-fast. Horses were treated with the filtered cultures and the serum was given by enema. (20 cc. per diem.)

The literature is non-convincing. Some claim absolutely negative, others favorable results. In a great number of cases a satisfactory influence is admitted, but with the addition that nothing more than an improvement had been achieved.

It must not be denied that in some cases the serum could effect a cure. This might be, when the other partial antibodies are already present, or where they might be formed spontaneously with the assistance of the serum; but where one partial antibody is missing, as is the case in Marmoreck's serum, uniformly satisfactory results are impossible as the serum lacks too great a component factor.

The same can be said of Ruppel's serum (Hoechst) which is made by utilizing cultures and culture filtrates. The proof that it produces all antibody reactions with tuberculin and tubercle bacilli means nothing.

A typhoid serum reacts similarly with typhoid-bacilli, but it is of no consequence. And even if all partial-antibodies were present in the serum, its beneficial effect could not be proven by this fact, as we know that tuberculosis-immunity is principally of a cellular character. The deductions which Ruppel

draws in his attempts to prove the efficacy of his serum are scientifically unsound and show an absolute disregard for the well known and fundamental principles of tuberculosis immunology.

The improvement noted in some of the cases, observed by Lichtenstein, after treating them with normal human serum, is easily explained when it is considered that the adult human serum always contains immunizing antibodies per se. Only in children is the serum free from antibodies. Lichtenstein obviously overlooked this prime factor in his observations.

Attempts have been made to treat by injecting part of an exudate, which had been withdrawn from the same patient. This procedure has some merit, as frequently these exudates contain large amounts of antibodies. But the indiscriminate use of an exudate, without first determining the character and amounts of the anti-bodies, would be unscientific and

would preclude any accurate determination of the value of the method. It is absolutely essential to make a general examination of the exudate and to determine, which partial antibodies are present and in what amounts, not unmindful that some exudates contain no partial antibodies whatsoever.

TREATMENT WITH VACCINES

(a) *Tuberculin.*

The oldest and best known substance for vaccination is tuberculin. Its advent as a specific for tuberculosis was followed by a reactionary condemnation. It has its staunch adherents and it has its equally strong radical disbelievers. To arrive at an unprejudiced viewpoint has been most difficult. But out of this chaos of varied opinions have developed the convincing and unshaken theories which are results of the latest research.

From the diversity of opinion alone it becomes obvious that tuberculin can not be called a general remedy. Why not?

1. Chiefly, because of its chemical composition. Not one of the tuberculins in use is a pure preparation, but they all contain variable partial antigens, even if only in inconsiderable amounts. Besides the three partial antigens which are nonsoluble in water (albumen, fat-acid-lipoid, neutral-fat) it contains a special poison and an aromatic substance. In the old tuberculin there must be added to these purely specific components the nonspecific substances of glycerin-bouillon, which represents the culture medium of the tubercle bacilli.

All these different substances, including the aromatic, are of a strongly reacting quality in man, but differ considerably from each other in regard to the way they react. The reaction to pure tuberculin is based on oversensitiveness to the toxins (harmful), that to partigens con-

tained in the residuum to oversensitiveness to immunizing substances (useful). Now if one uses pure tuberculin, it will be noticed that it has often an unfavorable effect on animals as well as in human beings, because it crosses, weakens or undermines the immunity. The fundamental difference between those of the partial antigens, which are soluble and those which are nonsoluble in water, becomes furthermore evident by the fact, that by treating with the soluble partial antigen (pure tuberculin) the oversensitiveness becomes diminished, but that by treating with the three nonsoluble partial antigens it becomes stronger.

2. The treatment with a mixture of different substances is unscientific and inaccurate. If we try to form an opinion regarding the effect of tuberculin through tuberculin-reactions, we would make the same mistake, as if we were to ascertain the immunity against tuberculosis with dead tubercle bacilli. In one case we

might get a toxin-antitoxin reaction, in another a tubercle bacilli albumin-antialbumin reaction, etc. Therefore we will not be able to get an idea of the complex problem of immunity with the aid of the tuberculins, which are on the market.

Normal animals cannot be immunized against tuberculosis by use of any of the tuberculins on the market. There must either be some substance missing for the purpose of immunization, or it must be present in some combination, which can not be used in the old tuberculin (which consists of a filtrate of cultures of tubercle bacilli grown in bouillon). In the new tuberculin most probably all substances are present, but undoubtedly some of them are in such a combination that they can not be of assistance. As mentioned before, undisintegrated bacillary substances do not produce all antibodies, and least of all those reacting particularly against fats. The normal

body is unable to do the necessary work of disintegrating the bacillary substances contained in the new tuberculin.

The uncertainty in the recognition of the effect of the tuberculins finds also an expression in the uncertainty with which the remedy is used. Two methods, which are fundamentally different, must be analyzed. One begins with small quantities and increases the dosage very slowly. This has for its object the diminution of the sensitiveness of the patient, so that after gradually increasing the amounts the body does not react to doses, which in the beginning would have produced severe reactions. This method is called the immunizing method, which expression would be correct, if the lack of sensitiveness were caused by an immunization against the entire tubercle bacillus and its products. After what has been mentioned, the appearance of non-sensitiveness relates, in this instance, only to the toxic sub-

stances and not to other partial antigens.

In opposition to this must be mentioned the so-called anaphylactisizing method. This does not consider the toxic substance contained in the tuberculins, but the other partial antigens and supposes, that the tuberculin-reaction represents entirely an immune-body reaction. With this supposition it would be absolutely a mistake to try, through tuberculin injections, to destroy the reactive quality of the body or, which would mean the same, its immunity. Therefore this method teaches us, not to diminish or to destroy the oversensitiveness of the body in treating with tuberculin; and it tries to accomplish this by using very small amounts without increasing the same. It would be more accurate to call this method a "reaction-preserving" one.

Let us try to make the matter clear. We must realize two recognized facts: 1. There exist two kinds of oversensitiveness, a harmful

one (toxin) and a useful one (antibody). 2. In the tuberculins, which are on the market, substances are present which can produce oversensitiveness to toxin as well as to antibodies. The following illustration will make it clear:

Tuberculins on the market contain:	Kinds of oversensitiveness
1. Partigen soluble in water (pure tuberculin)	Oversensitiveness to toxin
2. Partigens nonsoluble in water:	
(a) A.....	Oversensitiveness to antibodies
(b) F.....	
(c) N.....	

The oversensitiveness against pure tuberculin is due to toxin, that against the R. partigens is due to antibody-oversensitiveness. The harmful toxin-oversensitiveness must be destroyed, the useful antibody-oversensitiveness must be conserved. Therefore, the advocates of both methods are right, but only in one respect, because if in one case the tuber-

culin reaction is caused by antibody-oversensitiveness it would be a great mistake to rob the body of this useful oversensitiveness, which is the expression of its immunity. But if in another case the tuberculin-reaction is caused by toxin-oversensitiveness, the attempt to destroy this toxin-oversensitiveness of the body would be justified. We do not gain any knowledge in the different cases in regard to the value of the different reactions, from a reaction with the ordinary tuberculins, as these represent a mixture of antigens, which makes a correct interpretation impossible. Only with a pure tuberculin could these conditions be cleared up. A reaction to pure tuberculin would always indicate toxin-oversensitiveness.

Therefore, we decided to prepare also the pure tuberculin as a partigen. The same uncertainty which we encounter in the proper interpretation of reactions, exists, of course, also in the treatment with the tuberculins, as they

represent a mixture of substances which differ entirely in their effects.

But if anyone insists upon a tuberculin treatment, there should be only one method: Test with pure tuberculin. A reaction shows toxin-oversensitiveness. Treatment with increasing dosages of pure tuberculin, until the toxin-oversensitiveness has disappeared. (This takes place by development of the antituberculin which, however, is not found in the blood, but in the cells.)

No one can also understand the favorable effect, which treatment with tuberculin shows at times, and such cases exist undoubtedly. 1. In these cases partial antibodies against R. partigens are present, but not all of them. If there were a certain antibody missing, for which the antigen in the tuberculin is present, so that it could be used (that means in such a form or combination that it could produce in the infected body the respective partial anti-

body), then it would be possible, that with the tuberculin-treatment the sum of the partial-antibodies could be established. 2. Elimination of toxin-oversensitiveness.

In contrast to these cases we have the vast number of cases, in which tuberculin has no effect. This ineffectiveness explains itself, because not all antigens are present in the tuberculin in such a form that they could be used. If one partial antibody should be missing, for which the respective partial antigen is not present in the proper form in the tuberculin, the injection of this tuberculin would be, to say the least, without value. 2. The toxin-oversensitiveness is not eliminated.

And now we can also explain the cases in which the use of tuberculin has admittedly a bad effect. We know that we can at times harm a patient by injecting certain antigens, if the respective antibodies which correspond to these antigens are already present. We

explain this fact through oversensitiveness and absorption of antibodies. 2. Through simultaneous injection of toxin-partigen and R. partigens the immunity becomes undermined and the body harmed.

(b) TREATMENT WITH PARTIGENS

With these deductions we can now discuss the rational treatment with partigens.

We are able to analyze the condition of immunity, with the aid of the four partigens, by injecting intracutaneously and in carefully using graduated dilutions. We are able to increase the antibody-oversensitiveness through the injection with the 3–R. partigens. With all three, because sickness itself indicates always, that the antibodies present, even if one or the other should be very strong, are not sufficient. The partigen L. (Tuberculinum purum) we omit entirely, as it undermines, in combination with the R. partigens, the forma-

tion of antibodies. In the majority of cases one can accomplish, by following these rules, the desired effect: the antibodies are increased, and the toxin-oversensitiveness becomes eo ipso diminished or weakened to such an extent, that it becomes harmless.

If one does not get the desired result with this method (and these are the cases in which the treatment with partigens has been ineffective), the treatment with R. partigens has to be interrupted, as the toxin-oversensitiveness is evidently the disturbing element. We try to overcome this toxin-oversensitiveness by testing and treating with the L. partigen (pure tuberculin) alone, using it, until the oversensitiveness has entirely disappeared. After this has been accomplished we again use the R. partigens, to improve the antibody-oversensitiveness, i. e., to increase the strength of defense.

In this way we are able to gain control in

each case, which does not present too advanced anatomical destruction.

It is only possible to individualize, if we have to deal with measurable values. Good clinical results are followed always by an increase of the R. partial antibodies, which proves definitely the correct foundation of our theories. There can be no cure without improvement of the processes of immunity. This is a statement which represents a fact and becomes a law.

All forms of tuberculosis are adaptable to this treatment, unless there is an entire absence of antibodies, as is encountered in miliary tuberculosis and in the late stages of phthisis. Very remarkable are the results in renal and peritoneal tuberculosis.

But in some cases it is possible to acquire a still more controlling management. If everything is dependent upon increasing the immunity, all other means which are at our

disposal may be examined in regard to their effectiveness. We are able to bring into play and to measure with respect to their curative value the vast amount of

NON-SPECIFIC MEASURES

For this purpose we ascertain the condition of immunity with the partigens and we try to find out, if we can improve the same with the help of non-specific treatment (sun, mountain air, or sea climate, X-ray, hygienic-dietetic measures, chemo-therapy, orthopedics, surgery, pneumothorax-therapy, etc.).

The following table shows how the condition of immunity may be influenced by heliotherapy alone:

INTRACUTANEOUS TEST

1. May 27	2. June 22	3. July 25
A. 0	A. 1: 10 Mill.	A. 1: 1000 Mill.
F. 1: 100,000	F. 1: 1 Mill.	F. 1: 10 Mill.
N. 1: 10,000	N. 1: 1 Mill.	N. 1: 1 Mill.

In this way it is possible to follow and ascertain almost mathematically the process of changing light-energies or other kind of energies into energies of immunity. Not only the strength of the Roentgen-Ray, but also its therapeutic effect in its relation to immunity can be measured, thereby establishing a proper dosage for treatment with the X-Ray.

We are therefore in possession of an exact biologic control in the entire specific and non-specific treatment of tuberculosis.

(c) *Friedmann's Treatment*

A method, which differs from the usual ones, has been published by Friedmann. He uses living tubercle bacilli, after first destroying their dangerous qualities by special methods. In doing so he avoids the toxic effect and he benefits from the old experience gained by animal experiments that it is easiest to produce an immunity artificially with living tubercle bacilli.

In the animal experiment the Friedmann tubercle bacilli, weakened in their virulence, protect evidently little or not at all. Tests which followed, resulted either in an over- or an under-estimation. In comparison with the partigens the method is a step backwards, as the extremely delicate composition of tuberculosis-immunity is not considered at all.

(d) *Prophylactic vaccination*

A prophylactic vaccination has not been tested in man, but is used in the fight against bovine tuberculosis. The discoverer, Behring, called his method "Bovovaccination."

Behring uses a culture of human tubercle bacilli, which is not virulent for cattle, and this attenuation in regard to its virulence has not been produced artificially, by the efforts of man, but by nature itself. Through its prolonged stay in the human body this culture has evidently lost its danger to cattle and can be used in its natural condition.

As human beings can become infected from cattle, a fight against bovine tuberculosis represents at the same time an important step in the fight against human tuberculosis. The vaccination protects only for one year and is therefore of no value "in praxi."

After Behring had shown the possibility of cattle-immunization, others have published methods for prophylactic vaccination for cattle. Especially for instance, Koch (Tauruman), Klimmer and others. The theory is the same, the results are not any better.

Also Deycke and Much have lately immunized cattle and pigs with tubercle bacilli, disintegrated by acids. The results justify further experimental work in this direction, especially because they succeeded for the first time in producing tuberculosis-immunity through non-living bacilli.

The question is open, if it would not be advisable to attempt also a prophylactic vaccina-

tion for man. Two facts give encouragement: 1. The extremely lasting immunity, which has been found to exist in human beings, after they have overcome even a light infection. 2. The possibility to create immunity in animals through harmless non-living material.

The opinion has been expressed, that the introduction of a prophylactic vaccination would fail on account of the difficulty of reliable statistics, by which success or failure could be judged, even admitting that we might possess a substance entirely harmless and unquestionably efficacious. (As the one introduced by Deycke-Much.) The proof of its usefulness would of course have to be furnished by statistics, and these could only be established after a very long period of observation, on account of the chronic course of the disease. Statistics have ruined many a possibility.

Notwithstanding, we should not lose sight of the task of prophylactic vaccination for the

human race. One must not count on immediate or miraculous results. Also the goal may not be reached by one single person. But the benefits to mankind and service to civilization by its realization would be immeasurable. Hygienic measures alone will never achieve it.

II

SPECIAL PART

I

DIAGNOSIS

NECESSITY FOR THE FIGHT AGAINST TUBERCULOSIS IN CHILDREN

TUBERCULOSIS, or the white plague, is one of the world's greatest scourges; for this reason there devolves the noble and important duty upon the medical men of the world to fight its origin.

Tuberculosis of the adult develops from an infection in childhood; consequently any attempt at its eradication must begin by providing effective treatment in childhood, as at that period the disease is easily curable and the resulting immunity insures a lasting protection for the balance of that individual's life.

There does not exist a graver mistake, than

to consider chiefly or only the tuberculosis of the adult. This would mean that we permit the development of a serious sickness. We would wait until the outcome of the fight is turning against the human being, instead of attempting to prevent entirely this unfortunate condition. Instead of the clear and safe way, we would choose the dark and dangerous path, often so disastrous.

The course of tuberculosis has been compared with that of syphilis. And justly so. But no syphilis-specialist would think of allowing the first and second stages of the disease to develop unopposed and to wait with his treatment for the appearance of the destructive processes, although that is exactly what occurs in tuberculosis. The first and second stages pass by very frequently unrecognized or untreated, and the so often fatal third stage develops. The reason for this fact lies in one of the worst and most incredible errors in medi-

cine. This will be discussed later with "prognosis."

SOME OBSTACLES

On account of the widespread hue and cry of the dangers and incurability of tuberculosis (a propaganda, offering only terror without hope of cure) the word "tuberculosis" usually instills only despair and hopelessness. This spirit is so prevalent, that many physicians avoid or delay their diagnosis, thus catering to the emotions of the parents, but sacrificing invaluable time. The author has always found that the most foolish parents can be brought to reason by telling them the blunt truth. But one has to mention two facts: First, the possible fate of those children who are left unattended, and, second, that it is usually easy and comparatively simple to cure tuberculosis in children.

The second obstacle lies frequently with the

physician himself, who, after determining the pathology of enlarged bronchial glands, hesitates to pronounce them tuberculous and to treat them as such, fearing to cause unnecessary excitement. Such a policy on the part of physicians jeopardizes one of the most important problems of public health.

For the physician, to whom parents bring their children with the suspicion of tuberculosis, and who wish to help and to work in accordance with the findings of recent science and research, this little book has been written. It represents the result of the experience of many years.

TUBERCULOSIS OF THE BRONCHIAL GLANDS

The most frequent form of tuberculosis in children is that of the glands, especially tuberculosis of the mediastinal glands. This book has been written chiefly with this form of

tuberculosis for consideration, as in the majority of cases the bronchial glands represent the first site of invasion and localization for the bacilli.

It must be our main effort to find the enlargement of these glands, to ascertain their tuberculous nature and to differentiate the same from other pathological conditions.

(a) *General Complaints*

Complaints of rather general character induce the parents to take their children to the physician. Exhaustion, after light physical or mental efforts, emaciation, digestive disturbances, inclination to catarrhs, shortness of breath, palpitations, pallid appearance, feeling of weakness, lack of appetite, irritability, frequently profuse perspiration. Most important is the statement, that the child's nature has changed, mentally as well as physically; talented children retrograde, or do not advance in school, tractable ones become stubborn, gay

ones whiny, lazy and ill-tempered. Undoubtedly the tuberculosis-toxin influences greatly the state of mind and character. We often find a change towards maliciousness. All these changes and disturbances will disappear, after the disease has been cured; they continue only too frequently, if it is not properly treated.

(b) *Fever*

A characteristic statement is, that the child seems to be quite lively and fresh in the morning, then gradually becomes more and more lackadaisical, until it is most irritable and impossible in the evening. The reason for this is the fever. If the child's temperature is taken at regular intervals, a difference of 1° or more may be found between morning and evening temperature. This is very characteristic. It is advisable to take the temperature for several days, as fever-free intervals may occur.

(c) *Previous History*

Past illnesses should be considered, and an association with tubercular parents or nurses, should be investigated; but on the other hand an anamnesis without positive information should not mislead us, as a possibility of infection exists everywhere!

The three most important acute infections, which may blaze a trail for a tuberculous infection are, measles, whooping-cough, and influenza. The reason is that during and immediately following these infections, the antibodies against tuberculosis disappear or are greatly diminished. This is easily proven by intracutaneous injections with the partigens. Practically everyone comes in contact with tubercle bacilli in his early life and produces antibodies. The tubercle bacilli attack with four different forces (partigens). Against each one of these, specific antibodies (partial antibodies) are formed. The harm to the

child can easily be understood, if all or only some of them are missing. The bacilli are not kept any longer under control and they overpower the system, or new bacilli, which invade the body from the outside, find no further resistance.

Another complication has to be added to the effects of influenza; the frequent swelling of the bronchial glands. It is an easy matter for bacilli to reactivate themselves again in the diseased glands, or to find suitable conditions for their growth. Very often an outbreak of active tuberculosis occurs as an after-effect of influenza.

Other acute infections (pneumonia, etc.), unsanitary surroundings, bad hygienic conditions, etc., all are predisposing factors and should receive careful consideration.

Besides all this, we should never forget to ask if the patients have suffered from a previous attack of pleurisy.

(d) *Cough*

At times the cough may be entirely absent. Five possibilities might be distinguished in regard to cough:

1. It may be absent. This does happen especially in older children, when the disease loses its activity and becomes latent. An absence of cough is never proof against tuberculosis of the bronchial glands. Also in an affection of the peri-bronchial glands cough might be missing entirely.

2. Catarrhal cough. This might be very light. The cause is an inflammation of the mucous membranes, producing a secretion or irritation of the bronchi. The catarrhal conditions to which the children are inclined, as the parents tell us, might be of a pure tuberculosis nature, presenting themselves in a series of attacks with free intervals. Or, which is a rare occurrence, a bronchitis might

develop in the tissues which have become less resistant.

3. Attacks of coughing similar to whooping-cough. The cause for this is the pressure of the glands on the vagus.

4. A peculiar metallic sounding cough which is very typical and characteristic, but occurs only up to about the second year. The cause is a stenosis of the bronchial tubes through swollen glands.

5. Difficulty in breathing and a rattling sound during expiration. This is also usually found only up to the second year, it is rarer than No. 4, but has the same diagnostic value. The cause is pressure on the bronchi or on the trachea from swollen glands.

Differentiation: Cough 4 and 5 occur also in acute bronchitis and influenza. They are caused by pressure from the glands and disappear early, also from the enlargement of the thymus. The X-ray or fluoroscopic examina-

tion clears up any doubt very easily. Both are rare.

(e) *Bronchitis and Asthma*

On account of their close relation to the discussion above, it might be advisable to add a few words in regard to bronchitis and asthma.

Irritations of the bronchi (See No. 2) of a purely tuberculous nature are more frequent than is generally known. These inflammations of the bronchial tubes may involve the whole bronchial system and are often pronounced non-tuberculous. In a one-sided bronchitis, tuberculosis suggests itself.

A genuine asthma might also occur. One can not state very well, that this might be a "tuberculous" asthma. An irritating cough which is produced by pressure on the vagus, is also not "tuberculous" in the real sense of the word, but it is a consequence of tuberculosis. The same is the case in asthma. The cause may be a local irritation, or an effect of toxins.

This complication is rare, but it must be considered, and the author has seen most serious cases. Bronchitis and asthma lasting for years had brought the children to the verge of exhaustion and emaciation. Their illness, diagnosed as children's bronchitis, had been treated with mountain or sea-air. At times improvement took place, while in the mountains or at the sea, but afterwards vicious relapses occurred. A thorough specific treatment with partigens and X-rays cured these cases; the best proof of their tuberculous nature! Of course not every bronchitis of this kind is of tuberculous origin, but it is a great deal more frequent than is generally thought. If sea or mountain air cures it, it is more a proof for than against it, as many a tuberculosis heals in sea or mountain air.

(f) *d'Espines' Whisper-sign*

The same importance which has to be given in the first years of life to the metallic cough

and the rattling expiration in regard to diagnosis, has to be attributed later on to the valuable whisper-sign (d'Espines). It is the principal diagnostic sign besides the Roentgen-ray. We let the patient pronounce the number 33 as distinctly as possible, while we auscultate the vertebral processes successively from above downwards. This is done best with the ear, while the other ear is closed. We hear the number plainly in the healthy children down to the 7th cervical vertebra. Here the lungs begin. In swelling of the bronchial glands the voice with the characteristic tracheal sound can be heard still further downwards to the fifth thoracic vertebra. Cause: The swollen glands, which are situated here and surround the trachea and the large bronchi, extend to the vertebral column and conduct the sound. (To differentiate other swellings, see chapter which treats of X-rays.) The number 33 may be whispered or pronounced loudly and

distinctly. In later years the normal limits are found somewhat more downwards, which one should know. Under normal conditions the voice is heard:

Up to the 7th year—down to the 7th cervical vertebra.

From the 7th to the 8th year—down to the 1st thoracic vertebra.

From the 8th to the 12th year—down to the 2nd thoracic vertebra.

From the 15th year—down to the 3rd thoracic vertebra.

A further extension downwards is abnormal.

(g) *Percussion of the Vertebral Column*

Anything else which might be heard during auscultation is very uncertain. Just as unreliable is the percussion. Even definite enlargements cause none or scarcely any dullness. The reason for this is, that the glands are surrounded everywhere by air-containing tissues. Only one kind of percussion might be of value, and even this is much disputed, and that is the percussion of the vertebral processes. The fact that a man like Koranyi

thinks well of it, proves that it must have some merit. In the region of the 5th and 6th thoracic vertebræ a dullness is found on percussion. But it would be better to watch, in percussing the vertebral column slowly from above downwards, if one gets suddenly a distinct difference in the sound. I found that I got satisfactory results with this method, but we must always keep in mind, that auscultation and percussion are more a matter of personal ability than of practice. Anyone endowed with a keen sense of touch will obtain excellent results with percussion, which he could not possibly communicate to another, whose senses are not so acute, even if the latter should have a great deal more experience. Therefore only the most simple methods of examination should be considered for the general practitioner. With an acute sense of touch one can feel a good many things by mere palpation of the breathing thorax of a child, but this can not be taught.

(h) *X-ray Method*

The most important aid for diagnosis is the radiograph or Roentgen-ray. It should really be the principal method and never omitted in a suspicious case. The thorax of a child permits penetration by X-rays far easier than that of the adult, and especially the region of the glands (which comes chiefly in question) can easily be examined with Roentgen-rays. The man of the greatest experience would not want to omit the X-ray examination in any case, because it is the only way to form an opinion of the extension of the involvement, and besides, it offers the soundest foundation for an efficient method of treatment. There are also a good many cases in which doubts exist even in the mind of the most experienced, and where only the X-ray picture affords certainty. It should, therefore, be a demand of greatest importance from the standpoint of social welfare, as well as of science, to employ X-rays and to

render the use of the same available to the poorest patient. And fluoroscopic examination alone ought never to be sufficient. At the same time, without an X-ray picture the examination is of no value. Most of our pictures have been taken by Dr. Kantz, and we arrived at the following conclusions in the interpretation. Dr. Kantz states: Gradually the demand for Roentgen examination in pulmonary tuberculosis (or if the same is suspected) of the adult has become more and more general. But of still greater necessity and importance is the X-ray in pulmonary tuberculosis of children. We know that in about 90 per cent. of the cases in childhood the tuberculous focus is located in the glands of the hilus. Therefore, the clinical examination of tuberculosis of children is more difficult than that of the adult, which on the other hand attacks other parts of the lungs. Even if the question, where the first focus in a tuberculous infection is usually

found, if in the lung-tissue or the glands, is still an undecided one, we know that we are able to diagnose the same, in the great majority of cases, first in the tuberculous hilus-glands. Fluoroscopy, as well as X-ray photography, (which must both be made at the same time) reveals changes in the glands (lymphogland-tracheo-bronchiales sup. et inf. and broncho-pulmonary glands). The difficulties for the experienced observer, as well as for anyone else, have been pointed out a good many times. It must be especially emphasized for the X-ray specialist, that his findings should only be interpreted in combination with the clinical examination. Also in childhood the differentiation of a normal hilus-shadow from that of a tuberculous one is sometimes impossible, even if (with the exception of the inhabitants of industrial towns) anthracotic or other indurations of the hilus-glands, due to the inhalation of dust, are extremely rare occurrences. One

must not forget that, after diseases of the upper air-passages and of the lungs (whooping-cough, broncho-pneumonia, influenza, measles, etc.), swellings of the glands might persist for a long time. Also general hyperlastic conditions like lymphatism have to be considered.

On the other hand, large swellings of the glands confirm the diagnosis of tuberculosis, especially if the enlargement reaches a size in excess of 8 c. m., and if they extend towards the lung and the mediastinum. The same may be said of the enlargement of the upper tracheo-bronchial glands. From these we have to differentiate hyperlastic conditions of the thymus and lympho-sarcomata, which do occur once in a while in childhood and which originate from the mediastinal organs. (This can only be done by a simultaneous screen-examination.)

But in the great majority of cases the swelling of the glands is far less marked. Only a

vast experience would justify anyone in pronouncing these tuberculous. The Roentgen-picture reveals a distinctly spotted hilus-diagram, partly confluent, partly sharply defined from each other, with more or less developed extension towards the lungs and with a great variation of the intensity of the shadow. With perfect Roentgen-technique it is frequently possible to differentiate in the glands parenchymatous swelling from caseous degeneration and calcification, according to the stage of the development of the disease. It is not a rare occurrence to find that all three conditions exist at the same time. But frequently intense shadows of the glands justify the belief of a healing of a part of the glands, and yet the X-ray might suggest that in the surrounding glands some new tuberculous processes are developing. Therefore, the utmost caution is advisable in the interpretation of less definite shadows in the hilus-region.

The most careful inspection of the rest of the lungs may occasionally reveal further indication of a tuberculous process. Striated or lamellated shadows which follow the contour of one lobe might be of special importance. Usually these begin near or at the hilus and radiate towards the periphery. Frequently a triangular area of the lung-tissue corresponds with these interlobular striated shadows, and in this area can be recognized a more definite striation and cloudiness or also localized shadows, which might in rare cases, be interpreted as cavities.

Advanced or extensive tuberculous processes in the lungs of children are usually easily photographed and interpreted. As they present the same characteristic shadows as in adults, (peribronchitis, caseous pneumonia, miliary tuberculosis, involvement of the pleura, etc.) a special discussion is not necessary. The differentiation of other diseases

of the lungs follows the same rules as in the adult. Influenza and central pneumonia should be mentioned especially. Influenza, which has only recently become the object of more intense study in the Roentgen-picture, may suggest a tuberculous focus on account of broncho-pneumonic infiltrations which may be confluent or disseminated. Only by repeated Roentgen-ray examinations, are we able to demonstrate the slow absorption of such broncho-pneumonias, which can be recognized clinically by the longer duration of fever. Frequently it is difficult to differentiate a central pneumonia, on account of the localization, from a tuberculous swelling of the hilus-glands; again in this instance repeated control-examinations are absolutely necessary.

Mistakes and disappointments do of course occur occasionally. They should be lessened or avoided through the most minute attention

to all possible sources of error. We have discussed the difficulties in the diagnosis of the diseases of the hilus; it should be mentioned that of course catarrhal inflammation, which has not yet led to more definite pathologic changes in the lung-tissue, can not be recognized by X-ray examination. Also smaller peribronchial localized foci (especially if in small numbers) may escape detection by Roentgen-rays. This is so much more likely in children, as in their small thorax the rays are not absorbed to the same extent as in the large thorax of the adult.

In conclusion it may be said, that the importance of the X-ray can not be overestimated. Many cases which do not offer certain symptoms clinically, can only be diagnosed with the aid of Roentgen-rays. In many others the clinical findings are supported or completed.

It is, however, most important that the

method of procedure be strictly "lege artis" and that any personal addition or any personal interpretation of the physician is eliminated. After it has been decided to treat each and every active tuberculosis of the bronchial glands, personal differences of opinion in regard to special cases will no longer prevail. Thus, only through the possibility of recognizing the plain facts, has it been possible to reach a foundation for the treatment of tuberculosis of children individually and generally, which holds out a promise of certain success.

CONCLUSIONS

There are, therefore, a good many methods at our disposal for investigation of these cases. To repeat: Watchfulness, after a previous attack of influenza! Also after other infections! The tuberculin-test has to be positive! (With the exception of the lethal forms,—See later). But also in this instance one has

to be guarded. For example, take the following case: A definitely recognized swelling of the bronchial glands. Negative tuberculin-reaction. Previous attack of influenza! With this complex, a diagnosis of tuberculosis is justifiable: The swelling is caused by tuberculosis (or by tuberculosis and influenza). Tuberculin-reaction may be negative on account of influenza. If a second test is made later, the reaction will be positive. Another example: Swelling of the glands. Tuberculin-reaction positive, but otherwise no evidence of tuberculosis. Previous history of a recent attack of influenza. Swelling of glands caused by influenza; tuberculin-reaction positive, on account of former arrested infection with tubercle bacilli. Not every attack of influenza causes a negative reaction, and a positive tuberculin-reaction justifies, by no means, a conclusion of an active tuberculosis, but proves only that at some time previous an in-

fection with tubercle bacilli has taken place. (See biological diagnosis.) Also in these instances the X-ray and the repeated examination will clear up matters.

And one more point must be mentioned. As in tuberculosis of the adult, every case must be examined several times, before a final opinion should be given. At least one thorough clinical and biological examination and one Roentgen examination, followed by a second clinical examination, should be made.

PALPABLE GLANDS

After this first and principal site of localization has been recognized, which in the majority of cases is the bronchial glands, one has to look for further evidences or developments of the disease. The swelling of palpable peripheral glands has to be mentioned. It is a result, just as in bone-tuberculosis, of a

dissemination of living bacilli. The examining physician should, therefore, look immediately for palpable lymphatic glands. First, for swollen glands of the neck. Slow progress and large development are the surest characteristics of a tuberculous nature. The swelling of the supra-clavicular glands is always pathognomonic for tuberculosis. It also shows that the disease originated in the lungs. Swollen thoracic glands are just as decisive. It is easy to differentiate lymphogranulomatous syphilitic swellings, etc.

When considering glandular enlargement, it is best to consider three kinds of swelling, and this is of importance for the treatment: 1. Swelling without disintegration. Often due to a quick flare-up, soft. 2. Disintegrating glands. Slow development. Induration. 3. Shrinking glands. Formation of connective tissue. Calcification. Harden-

ing. Often transitional conditions from one to the other form. In all forms possible suppuration may take place.

BONES AND JOINTS

Changes in bones and joints will be mentioned briefly here on account of discussion later on. They rarely represent the first foci of infection. (Primary lesion.) How do they develop? There are two possibilities.

1. Through a trauma or other injury a lesion of tissue. Dissemination of tubercle bacilli from the bronchial glands into the "locus minoris resistentiae." 2. Trauma. Deposition of bacilli which are circulating in the blood-current. Living bacilli are not alone found in the blood of patients with an advanced, but also with a light infection, and also in the blood of clinically healthy beings. They come from some foci or from the outside and are rendered harmless in the majority of

cases by the defensive forces of the body. (See first "General Part.") In a damaged tissue these forces of defense are defective, and therefore the bacilli are able to settle there. The previous damage to bones and joints may of course be due to other causes, but in any case it is a necessary supposition.

The changes in the bones are found in the periosteum and within the bone cortex. The club-fingers are very characteristic (spina ventosa). Diagnosis can readily be made by the consideration of structural, postural, medical, surgical and Roentgen changes.

TUBERCULIDS OF THE SKIN

This subject is far too little known and considered. The tuberculids of the skin are always an expression of active tuberculosis. They originate through partigens which become free in the changing conditions of combat between body and bacilli, and they are a

symptom of oversensitiveness. As mentioned before, two kinds of oversensitiveness exist: one is the expression of immunity, or in other words, of the presence of immune bodies (antibodies)—antibody-oversensitiveness; the other is caused by toxins—toxin-oversensitiveness. The toxin of the tubercle bacilli is represented in the pure tuberculin. The fundamental differences between this and the other partigens lie in the fact, that it kills tuberculous animals if injected under the skin; the three other partigens do not have any such effect. It has not been clearly demonstrated by which of the partigens the tuberculids of the skin are caused. There is much research work to be done here by the dermatologists. In any case, it is not the general impression that all tuberculids of the skin are produced by the action of pure tuberculin, because there exist different forms of tuberculids, which can be sharply distinguished from each other. In

the same manner there exists a difference anatomically between the nodules at the sites of reaction, which are produced by injection with the different pure partigens. The real tuberculids may be subdivided into manifold groups, which however is entirely immaterial for our purpose. There may be very small papules, which are usually overlooked and which are of the size of the head of a pin; there are scaling papules, disintegrating papules, which can grow larger and form extensive ulcerations and which are rare. One has to look for tuberculids especially in the first years of life, when they are of frequent occurrence.

We used to consider also the erythema induratum a pure symptom of over-sensitiveness (spontaneous tuberculin reaction). This was a mistake. Doutrelepont demonstrated in these same lesions living bacilli in the form of Much's granula. Therefore, it is not a product of toxin or partigen, but of the bacil-

lus itself. It consists of painless skin-eruptions, from the size of the head of a pin to that of a pea. The skin over them is sometimes of a bluish discoloration. Occasionally they discharge like a furuncle, and their places of predilection are the lower limbs. This is pathognomonic.

The lichen scrophulosorum belongs to this category. It consists of groups of very minute eruptions, mostly on the lateral areas of the body.

Lastly, the erythema nodosum may be mentioned, which differs from all the others, especially by its quick disappearance.

PHLYCTENULAR CONJUNCTIVITIS

The phlyctenulae might be mentioned here. Many authors do not include in tuberculosis the phlyctenulae and the eruption-like inflammation of the conjunctiva, nor all so-called scrofular symptoms, but they consider these

an inflammatory affection (neurosis) of the vegetative nervous system. Some claim that both are a result of spontaneous dissemination of toxins and oversensitiveness (tuberculids of the conjunctiva!). Evidently both are wrong, because Stargard demonstrated Much's granula in the phlyctenulae. With this fact the conception of spontaneous tuberculin-reaction would be definitely eliminated. We have to deal with a dissemination of bacilli, anyhow as far as phlyctenulae are concerned. At the same time of course a strong toxin-oversensitiveness might play a special rôle and might be of importance in the development of this affection. The picture of phlyctenular conjunctivitis consists of very minute white nodules which might reach the size of a pin-head, and their surrounding tissue appears more or less inflamed.

Even if Stargard's findings should not represent a general rule, tuberculosis has un-

doubtedly a very close relation to phlyctenular conjunctivitis.

Phlyctenulae are only found in tuberculous individuals and are, therefore, a most valuable symptom.

INVOLVEMENT OF THE LUNGS

It is a question of discussion for the scientists, whether the first place of infection lies in the lungs or in the glands. The glands might be the second focus of localization of the bacilli. (2d stage) It would be wiser to consider both possibilities as the first stage. Some are inclined to regard the later developing pulmonary foci as flare-ups of the first localization in the lung, and the glands are scarcely taken into consideration. The author, however, has seen and Roentgen-rayed hundreds of cases with X-ray specialists and usually concluded, that the pulmonary tuberculosis originated secondarily from the glands.

It makes no difference, if the conception of hilus-tuberculosis is accepted or not, the Roentgen-rays prove that the first mentioned belief is a rather forced one, and the physician should under all circumstances look, especially in children, to the hilus-region for trouble, much more than to the apices. If the principal attention is paid, during examination of a child, to the apices, the examiner proves that he has not had much experience in the study of children with the X-ray. Tuberculosis of the apices is the exception in childhood. Of course at times a slight dullness on percussion is found as a result of a more pronounced swelling of the glands on one side. Beware of errors! The so-called infra-clavicular triangle deserves special attention. The usual extension takes place first towards the middle, from there up-and-downwards. One has to watch especially for changes in breath sounds below the clavicle close to the sternum and in

the interscapular space (rough, sharp, very rarely crepitant) especially for increased rough sounds.

The well developed pulmonary tuberculosis offers no difficulties in the diagnosis. It is easy, through clinical observation and with the help of the X-ray, to guard against the possibility of mistaking bronchiectatic processes, a lingering broncho-pneumonia, a central pneumonia or an influenza-bronchitis. Fever, duration, etc, are decisive.

Incipient inflammatory processes can of course not always be recognized through Roentgen-pictures, and their diagnosis is of the greatest importance. Some physicians may still doubt the necessity of treating each and every tuberculosis of the bronchial glands, but all will admit that involvement of the lungs demands treatment under all circumstances!

Hemoptysis is not a necessary symptom. Also the search for bacilli should not repre-

sent the most important part of the examination. First, because a great many patients have no expectoration at all; second, frequently no bacilli, not even the granular form, are found; third, one can diagnose the disease without them.

PLEURISY

Very important is the inquiry of and the examination for a serous pleurisy. It is almost always of a tuberculous nature. This must never be overlooked! Its presence can be proven by Roentgen-ray examination which usually shows at the same time active tuberculosis of the glands. In my cases I have not been able to convince myself, that the pleurisy has been the first symptom of the disease. This may be an accident, but it appears to me to be of importance. It is claimed that the fact of an acute pleurisy indicates the initial beginning of the disease, if appearing in well

developed and healthy children. But this deduction mistakes a symptom for a cause, as those children invariably are suffering from an active tuberculosis of the bronchial glands, as the X-ray always shows!

APPEARANCE. SYMPATHICUS

This leads once more to the discussion of the appearance of children. The consumptive expression (habitus phthisicus) creates, naturally, suspicion. But it must especially be mentioned that some children evidence every indication of good health, presenting blooming appearance while they are already suffering from a severe tubercular infection of the bronchial glands.

In contrast to them we meet with children, who are considered tuberculous (scrophulous) on account of their unhealthy appearance, and who are treated as such, but who are not suffering from anything but a debility or overirri-

tability of the vegetative nervous system. Deycke separates these children correctly into two groups: the weak ones, (presenting bloated, thickened upper lips, mentally backward): the irritable ones, (thin, excitable, mentally over-developed). Both have in common: enlargement of the tonsils, adenoids, and other catarrhal condition. Both groups, previously considered and called scrophulous [1] have nothing to do per se with tuberculosis. But both are frequently complicated with tuberculosis.

One has to be especially careful with such children, as it is most important, so far as the treatment is concerned, if one has to deal with a neurosis and tuberculosis.

[1] Two diseases were confused under the name of scrofulosis: 1. Diseases of the n. sympathicus. (The expression "exudative diathesis" is an "asylum ignorantiae.") 2. Tuberculosis of the bones and joints: this is a pure form of tuberculosis, due to dissemination or invasion of bacilli.

At last the dilatation of veins might be mentioned, which may be found at times on the chest and on the neck, as a result of the swelling of the bronchial glands. This is an uncertain symptom.

BIOLOGICAL DIAGNOSIS

We have dealt with the clinical, the radiological and the bacteriological tests. There remains for discussion, the biological test. This is a very important one. We use for the same the tuberculin, but could of course also use the partigens.

Technique: Tuberculin is used as an ointment (old tuberculin and lanol. anhydr. aa). A piece of the size of a pea is rubbed into the skin below the proc. ensiformis. After one or two days, small nodules appear, if the reaction is positive.

Or von Pirquet's skin test. Three little holes are drilled into cutaneous tissue. Two

are covered with old tuberculin, the middle one with a solution of normal salt containing some carbolic acid. Appearance of redness and swelling after a day, if the reaction is positive; but also belated reactions occur, therefore, one ought to watch for about seven days.

What does the test prove? Biologically, only that the positively reacting child has at some time been infected with tubercle bacilli. It is impossible to state when this has happened, or what has become of this infection. The reaction is an expression of defense which continues to exist, even after the infection itself has been overcome possibly long ago. But a positive reaction in the first year of life, and also in the second year, is an absolute proof of an active tuberculosis. In the later years it demonstrates only that at some time an encounter has taken place between the body and the bacilli. If the fight is still on, this has to be determined by clinical examination.

A negative reaction on the other hand proves that the patient has never been infected with tubercle bacilli. Therefore, when we see swelling of glands with a negative reaction, tuberculosis can be excluded. But there are important exceptions to this rule! They are conditions of exhaustion, during which the body is deprived of all antibodies, for instance:

1. Intercurrent diseases (See measles, etc.).
2. General debility.
3. Tuberculous cachexia (miliary tuberculosis, meningitis, final breakdown before death).

One can artificially produce a negative reaction by previous treatment with tuberculin. This is the second fundamental difference between the toxin-partigen (pure tuberculin) and the R. partigens: the oversensitiveness against pure tuberculin can be entirely de-

stroyed by tuberculin treatment, the one against the other partigens can only be increased.

These facts must be continuously borne in mind.

An absolutely convincing proof is the focal reaction, which results from injecting tuberculin subcutaneously. This is a rather dangerous method, as one might produce an exacerbation, which in turn might result in a renewed activity of the tuberculous process.

INTESTINAL TRACT

Primary infection of the intestinal tract is rare. Also those bacilli which enter through the intestines seem to lodge in the bronchial glands. The diagnosis of an incipient tuberculosis of the mesenteric glands is difficult; by the time these glands can be demonstrated (by X-rays or palpation) it is usually too late.

The ulcerative form of intestinal tuberculosis can only very rarely be recognized as a primary lesion. On the other hand peritoneal infections are very common. Not found in early infancy (differentiation from digestive troubles!), but later on. The diagnosis is easy: meteroism, splashing, ascites, fever. The result of treatment is very favorable.

THE INCURABLE FORMS. (MILIARY TUBERCULOSIS, MENINGITIS)

We refer to the malignant forms of children's tuberculosis here only as a sort of appendix, as the intention of this publication is to help in the fight against tuberculosis as a plague of the people. For this purpose two methods may be followed: prevention and treatment. This book deals only with one of them, the treatment, because a successful fight at large is not possible, unless the individual cases are properly taken care of by us. Those

who can only speak of prevention talk, but do not help to solve the great problem.

The malignant forms are meningitis and miliary tuberculosis, and are incurable.

Incipient meningitis is difficult to diagnose. At times only general symptoms appear, which are noticed by the parents but which the physician is inclined to treat lightly. Vomiting, fever, perhaps constipation. Fatigue with irritability. Change of character. The disease is sometimes easier recognized intuitively than by its symptoms. The well known signs are frequently absent or hard to establish, until the disease is fairly well advanced. The sickness is the most common cause of death for the tuberculous child up to the fifth year, and can also attack apparently healthy looking children. Usually it is complicated by miliary tuberculosis.

The miliary tuberculosis generally begins suddenly, accompanied by high fever, and

leads quickly to an "exitus lethalis." Also robust looking children are a prey to the disease. Pathognomonic symptoms are not known. The negative tuberculin-reaction might offer some hint in regard to the diagnosis, but the modern Roentgen-examination assures the same. It is remarkable that this method is so frequently overlooked in a form of sickness, which can be so definitely diagnosed with its help. Differentiation from typhus and pneumonia can be early and definitely shown.

For us the only question of importance here is: How do these diseases develop, which appear comparatively so often? Most probably through invasion of bacilli into the blood-current. Some claim that a large number of bacilli get into the blood-stream suddenly, others, that only a few enter and that they develop rapidly in the blood. Both are right to a certain degree. Undoubtedly bacilli invade the blood-current frequently also in larger

quantities, without producing meningitis or miliary tuberculosis. There has to be a certain disposition present, and that is the absence of antibodies. We know that the sensitiveness to tuberculin has disappeared and we considered this as a result of the meningitis. But, on the contrary, this fact represents the cause, not the result. If we test patients suffering from meningitis, during the time of still doubtful diagnosis, with partigens, we always find an absence or a decrease of antibodies.[1]

Therefore, if for any reason the immunity decreases or disappears, the migration of bacilli into the blood-current, in large or small quantities, may result in miliary tuberculosis,

[1] The author was frequently able to diagnose a miliary tuberculosis in his military hospital for tuberculosis, while the patients were still free from fever and tolerably well, and before one was really justified in thinking of such a complication. Repeated tests had shown an entire absence of antibodies, and the diagnosis was based on this fact.

an invasion which otherwise might have been overcome.

Two facts are now easily explained: 1. The frequency with which certain infections (measles, scarlet fever) are followed by miliary tuberculosis, is due to the fact that, under their influence, the antibodies very readily disappear. 2. The alarming prevalence of this complication during childhood in contrast to the advanced age. The immunity of children is never as strong as that of the adults and it is much more unstable and less resistant, because the intercourse between child and bacilli has been only of short duration.

Of course in each case a first focus, from which the invasion takes place, even if a small one, has to be present. If this were entirely eliminated a miliary tuberculosis would have been impossible. These terrible diseases are incurable, but they can be avoided. If nothing else, they alone should be sufficient to de-

mand, that every "primary lesion," representing the first tuberculous focus in the body, should be treated. It should not be allowed to remain as a smouldering focus for a general infection! Let us try to cure the tuberculosis of the bronchial glands! It is heartrending to see robust looking children perish of miliary tuberculosis or meningitis.

A similar statement can be made in regard to caseous pneumonia. A disappearance of antibodies is usually responsible for this disease, and if we would pay the utmost attention to tuberculosis of the bronchial glands, caseous pneumonia would also disappear or decrease considerably in its frequency. Anyway it has become evident to us, that pulmonary tuberculosis in children is a great deal more dangerous, than in the adult.

II

PROGNOSIS

PROGNOSIS. One of the saddest chapters of human ignorance.

Statistics show, that the prognosis of tuberculosis for the first year of life is very unfavorable. Proof: Most children die within a short period. Reason: The antibodies can not be effectively formed in an early and severe infection.

One states further: the prognosis in later developing tuberculosis continues to improve, until it becomes favorable. Proof: the rate of mortality in children, affected with tuberculosis, becomes less in proportion to their advancing age. This prognosis is only correct for the momentary danger of life, not for the disease itself!

One also feels more satisfied, because the

symptoms of tuberculosis of the bronchial glands disappear gradually, and therefore the disease seems to heal. But: in the first place we have to deal in the majority of cases with a quiescent or latent, and not with a healed, tuberculosis, and second, even if the tuberculosis of the bronchial glands were healed, it would not mean that the tuberculosis had been eliminated. We know that the later attacks are nearly always relapses, due to exacerbation. Wherever relapses occur, a previous cure has been out of the question.

One compares tuberculosis with syphilis, but no one would be illogical enough to claim, in regard to a syphilitic infection, the prognosis of the first and secondary stages is good, because none die of the same.

It would not be so bad, if this mistake would end with the prognosis. But this wrong prognosis is followed so often by a wrong treatment.

We can only state: As long as a relapse is possible, even if it should not occur until years later, a good prognosis is out of the question, even though, temporarily, no symptoms of the disease are present.

We know: a symptom-free, but uncured tuberculosis of the bronchial glands may lead later to a fatal phthisis, just as a symptom-free but uncured syphilis may cause aortitis, tabes and paralysis. Furthermore, we know that debilitating influences of any kind might be sufficient, indirectly to produce the most serious forms of tuberculosis without an apparent origin. This is true also of intercurrent diseases and of puberty, pregnancy, bad nutrition, bad habitation, or poverty, etc.

Therefore, it would also be incorrect, if one were to claim that the prognosis of a relapse is more serious than the prognosis of the first infection. That is only true as far as the momentary danger of life is concerned, and not

the disease! A first infection, which is not entirely healed, represents always a grave danger. We can only speak of a cured tuberculosis of the bronchial glands, if there does not occur a flare-up after several decades!

It is important to consider the ultimate, not the present moment, and then we shall be able to save many valuable lives. And only from this logically true viewpoint and position follows the correct attitude towards the treatment.

III

TREATMENT

Principles. For those who have followed the presentation of these facts and deductions, two logical and irresistible principles regarding the treatment must be the result:

1. Any established tuberculosis of the bronchial glands must be treated.

2. Treatment of any glandular tuberculosis is necessary to prevent the disease spreading to any other regions or organs.

A successful fight against tuberculosis of children is only possible if prophylaxis in general, and treatment of the individual are properly combined. This book limits itself to the special treatment, as that appears to be the task of the general practitioner.

The author is describing his own method of procedure, which does not mean that he expects the same to be accepted as the only method of treatment. With it he has achieved the best results, and it lays a foundation to which other methods could easily be adapted.

Immunity and Cure. This chapter must be headed by the statement that each and every attempt to heal tuberculosis has as its ultimate purpose the improvement of immunity. *There can be no cure without immunity.*

Cure and immunity have the closest relationship to each other, and tuberculosis can only be treated successfully, if the condition of immunity is improved. We do not depend upon a certain quantity of antibodies, which would be exactly ascertained by the analysis of immunity with the help of the partigens. Even if an individual should possess an abundance of antibodies, the fact that he is sick shows that these are not present in sufficient quantities! The defense depends upon the attack. A weak attack needs only a small amount of defensive forces, a severe one needs many. Therefore, a person with few antibodies might be better off than one with a large quantity. It is impossible to measure the attack directly. We can never judge alone from the antibodies present, how the fight is going to end for the patient. We must not be idle, even if an abundance of defensive forces are ready for use! The course of the disease itself, not the

number of antibodies, will decide whether treatment is necessary. If an individual is sick, his forces of defense must be increased, no matter how strong they appear to be!

The improvement of immunity can be accomplished in different ways. It is not necessary to use only specific means, all nonspecific means should also be employed, as long as they help the immunity! As we are able to measure exactly the respective increase in immunity (immunity-analysis) we can form an opinion in regard to the efficacy or usefulness of all remedies, and we shall be able to choose the most effective ones.

This would be difficult to carry out for the general practitioner, and therefore it is advisable for him to use the means which have been proven the best.

Tuberculosis of the Bronchial Glands. The most important place in the treatment of tuberculosis of the bronchial glands is occu-

pied by specific treatment and Roentgen-rays. The first one acts directly upon the immunity, it is copied from nature and represents, therefore, the ideal natural method, the second one acts directly upon the glands and indirectly upon the immunity. It might be possible to get along with either one; however, that would mean not only a slower procedure, but one might get many disappointments which occur rather rarely with specific treatment alone, and still less frequently, when X-rays are used in combination.

Specific Treatment. The author uses, of course, only the partigens. M. Tb. R. is sufficient. For the first three to four weeks, injections three times weekly, afterwards only twice. Duration: about twelve weeks. The following mode of procedure may be used:

1. Injection 0.1 cc. M. Tb. R. No. 9 (1: 100 milliards)
2. " 0.2 " " " " "
3. " 0.4 " " " " "

4.	Injection	0.8	cc.	M.	Tb.	R.	No.	9	(1: 100 milliards)
5.	"	1.0	"	"	"	"	"		
6.	"	0.2	"	"	"	"	"	8	(1: 10 milliards)
7.	"	0.4	"	"	"	"	"		
8.	"	0.8	"	"	"	"	"		
9.	"	1.0	"	"	"	"	"	Etc.	

Much better, but not so convenient for use, would be the proper mixture of the partial antigens. The details are given by Kalle in their "Directions for Use." The chief point is, that all three partigens (A. F. N.) are given, even if one or the other of the partial antibodies should be present in ample strength. The disease itself shows, that this strength is not sufficient. For the strongest attack the strongest possible defense![1]

The principles of this biological procedure, with the keen insight which it permits, are well

[1] In tuberculosis of the glands, experience recommends for the beginning of the treatment the following mixture: A. 1: 100 milliards. F. 1: 100 millions. N. 1: 10 millions. Five successive increasing injections, afterwards stronger solutions: A. 1: 10 milliards. F. 1: 10 millions. N. 1: 1 million, etc.

known or may be read (Pathological Biology, Third Edition, Kabitszch, 1920). The greater the dilution, the better.

It might be advisable to add a few words regarding the preparation and the use of the partial-antigens, or partigens. They are prepared from tubercle bacilli in the following manner: The cultures are carefully broken up with a physiological salt solution which contains ½ per cent lactic acid and this solution is put in an incubator at a degree of 65° C. until the acid-fastness of the bacilli has entirely disappeared and until it is no longer possible to stain even Much's granula (after the method of Gram-Much). This disintegrated substance, which is called MTb., is filtered, the water-soluble part, which contains the toxin of the tubercle bacilli and represents the pure tuberculin, is called L. The residuum, non-soluble in water, is called M. Tb. R. This again is treated with alcohol and ether and

represents the three partial-antigens; first, the fat-acid-lipoids, which are soluble in alcohol, called F.; second, the neutral fats, high molecular fats or wax alcohol, soluble in ether, called N.: third, an entirely non-soluble residuum, a high molecular albuminous substance, which contains a large amount of phosphorus and belongs most probably to the group of nucleo-proteids and is called A.

Of these partigens only the M. Tb. R. and the special partial antigens, A. F. and N., come into consideration for treatment. The pure tuberculin L. is not used at all, or only in exceptional cases. The following original solutions have been put on the market: M. Tb. R. and A. 1: 100,000, F. 1: 10,000, and N. 1: 1000. The further dilutions can be made from these original dilutions, but any wished dilution can be ordered from the chemical works of Kalle & Company, Biebrich-on-Rhine. All dilutions can be kept for a long

time. To simplify matters the dilutions of 1: 1000 are called No. 1 and the other dilutions are called accordingly No. 2, No. 3, etc. The following dilutions are commonly used: M. Tb. R. and A. Nos. 3 to 9, F. Nos. 2 to 8, N. Nos. 1 to 8.

Before any treatment is started, intracutaneous injections with the different partial-antigens are made, and from the skin reactions it is possible to ascertain the immunity titre of the respective individual. According to these skin reactions, which result in from two days to two weeks after the injections have been made, the treatment with the respective partial-antigens is begun. For instance, if the first intracutaneous injections, which are made for the purpose of giving a picture of the present state of immunity of the patient, should show that fat-acid antibodies are present and the antibodies against the albuminous group, or neutral fat group, are missing, then the pa-

tients are treated chiefly with the albuminous antigen A. and the neutral fat antigen N., etc.

To ascertain a good picture of the state of the immunity of the patient usually thirteen intracutaneous injections are made, the first one with ordinary carbolic acid-chloride of sodium solution, which is only used for control. Then the partial-antigens are used, of A. Nos. 8 to 5, of F. Nos. 5 to 2, and of N. Nos. 4 to 1. These solutions have been proven, by experiments in a great many cases, to be usually sufficient. Of each solution a very small amount is injected intracutaneously, enough to produce a papula of about the size of ¾ to 1 centimeter in diameter. According to the sensitiveness of the patient, more or less definite papules or nodules, surrounded by an inflammatory area, develop after the second or third day, and from these skin reactions the condition of the status of immunity of the patient can be determined.

If anyone should insist upon using tuberculin instead of the partigens, he should prefer the method of increasing the doses gradually, through which the tuberculin-oversensitiveness becomes lessened. We know that two methods exist: the one tries to preserve the sensitiveness to tuberculin, the other tries to diminish it. Both are right, even if they appear to be sharply opposed to each other, because the tuberculins on the market represent a mixture which contains the toxin-partigen (pure tuberculin) and the R. partigens (A. F. N.). Toxin-oversensitiveness is harmful, the R. partigen-oversensitiveness is useful. To lessen tuberculin-oversensitiveness, one desires to remove the harmful toxin-oversensitiveness; if one wishes to increase it, one has the antibodies in mind against the R. partigens. But as in the tuberculins, which are on the market, the toxins substances are prevalent, it would be better to use the method

with which the tuberculin-sensitiveness becomes diminished. The author, however, advises against any tuberculin-treatment.

Friedmann's preparation has been discussed in Part I. (General)

If anyone has acquired a vast experience with another specific method of treatment and obtains satisfactory results, it might be advisable for him to stay with the same, as it is of great importance in regard to any method that one masters it, and experience is the best teacher.

Treatment with X-rays. The X-ray treatment applies in the majority of cases to hilus-glands. Of course, only hard rays should be used, filtered through at least 3-5 mm. Al., ½ mm. Zinc or Copper, since the position of the hilus, also other organs in the thorax of the child, is such, that they can only be reached by deeply penetrating rays. In accordance with the extension of the disease, several fields

on the chest, the back and, if necessary, on the lateral areas of the thorax, should be chosen as an entrance for the rays. For accurate adjustment, (which should never be left to anyone who is not thoroughly familiar with the technique), a previous clinical and radiological examination is a "conditio sine qua non." Generally one might get along with two fields from the front and two fields from the back. Experience has shown that it proves more efficacious to X-ray the single fields with interruptions, than to treat at one time all the fields, and to repeat this treatment after several weeks. First, one can avoid the disagreeable after-effect of the X-ray, and also the unfavorable influence upon the general condition by a possible overdose of X-ray energy; and furthermore the repeated stimulation by the rays in shorter intervals, seems to have a more beneficial result, than the total amount of X-rays applied in one sitting, on account of the pro-

longed effect of the rays upon the diseased tissue. The intervals between the different sittings vary between three to eight days, so that one series of treatment is usually finished in two to four weeks. It is generally sufficient to repeat these series three or four times, in obstinate cases the whole treatment with X-rays must be repeated after some time. As a general rule, it might be advisable to combine with the X-ray treatment of the hilus-glands, also that of the more or less involved palpable other glands. The treatment should be applied in a similar manner, as nearly the same assumption prevails for their infection.

If, besides the pulmonary glands, other palpable glands are swollen, the X-ray treatment has to be governed according to the character of the swelling. (See under Glands.) The soft glands are well adapted to the treatment; on the other hand, it is more difficult to get good results in harder glands, if one begins

early with X-ray treatment. It is advisable to try first to produce a softening of the glands, which may be accomplished by treatment with partigens, ichthyol, etc. Afterwards, treatment with Roentgen-rays.

The dosage corresponds with the biological principles of X-ray treatment. A specific effect upon the tuberculous tissue as such can not be assumed; and the aim is, rather, to produce through a strong hyperaemia a stimulation upon the lymphatic apparatus, so as to increase physiologically present absorption. Therefore, dosages of medium strength are indicated, that means 1/2 to 1/3 of the erythema dose. This amount should not be exceeded, as more severe symptoms of disintegration must be avoided, because it might lead to a serious damage to the general condition and perhaps to a general tuberculosis, through a sudden flooding of the system with partigens which have been set free. It is an open ques-

tion, if the stimulation for the forming of connective tissue (through which the tuberculosis granulation-tissue becomes gradually replaced) is to be considered a direct effect of the Roentgen-rays. Of course we have to attribute other vital influences of a direct character (which however are still unknown to us) to the X-rays and their powerful energy.

The method has to be brought within the reach of everyone, as it represents one of the chief factors of the treatment, especially in cases in which unfavorable conditions as climate, nutrition, bad social environment, do not allow the full development of the help of nature!

The application of the X-ray treatment should be after all in the hands of the specialist. The general practitioner must realize when he has to transfer his patient. One more hint to the practitioner and to the specialist: it is a mistake to X-ray a tuberculosis of

the bones or joints, etc., without looking for infected bronchial glands which might cause a relapse after the other lesion has healed. Very often an existing tuberculosis of the bronchial glands is the primary focus, from which this relapse in the bones might develop.

Salt-Baths. Massage. Besides the specific treatment and X-rays, the author recommends in all cases general proceedings which have as their final purpose an improvement of immunity. They strengthen also the non-specific forces of defense. To this category belong especially salt-baths and massage. It is surprising how quickly children recuperate with the help of the same. Both work as a skin-stimulation, invigorate the metabolism, increase the appetite and improve the blood-picture. They represent, at the same time, the best treatment for a neurosis of the vegetative nervous system.

Baths three times weekly, massage the same

way, but if possible daily. Baths: 2½–5 Kg. sea-salt, (in accordance with age) temperature about 37°C., duration ¼–½ hour. Massage, general (rubbing only). If sympathicus-involvement present, also massage of the n. sympathicus.

Calcium. The author gives calcium internally in all his cases: tabl. of calc. lact., or Kalzan, or calc. glycerin. phosph. 0.1, alternating increasing and decreasing doses. This method augments the effect of the drug considerably. In serious cases calcium and iodine. The combination with iodine increases also indirectly the efficacy of the X-rays.

Artificial Sunlight. Artificial sunlight is given only exceptionally in cases of definite debility, and then the whole body should be exposed.

Nutrition. Regulated nutrition. No overfeeding. Milk, fats, green vegetables. Only with proper nourishment a satisfactory

strengthening and improvement of the condition of immunity is possible, which means everything.

Rest-cure. Proper change between rest and exercise is necessary. Rest for two hours after meals. Longer rest-cures are not indicated in pure cases of tuberculosis of the bronchial glands. In easily excitable children, one might harm more than help by enforcing rest too severely. Individualizing is necessary also in regard to rest-cures, especially if a complication of neurosis of the sympathicus is present.

If the child should have fever, absolute rest in bed is indicated.

Home-Sanatorium. It is possible to treat the children at home. The more advanced cases should be taken to a sanatorium, where regulated breathing-gymnastics might be added. Duration, at least five weeks. Also for lighter cases the sanatorium is very advis-

able; first, because the duration of the treatment would be considerably shortened, and second, because the children would naturally be under closer observation, and the treatment would be carried out more thoroughly.

Climate. Sea or mountain-air are not necessary requirements. It would be a bad proposition if health could only be regained at the sea or in the mountains. If it can easily be added, so much the better, but under no circumstances without specific treatment or Roentgen-rays. Climate is to be considered only as a factor of support for the treatment, never as a remedy.

Often the climatic treatment must be blamed for deceptive conclusions, which of course are not the fault of the climate, but of ourselves in drawing wrong conclusions. It is natural, that badly cared for children of the large cities improve with good care and under favorable climatic conditions. This improve-

ment is unfortunately often mistaken for a cure, and many parents think they have done their duty if they send their sick children for a certain length of time into the country or to the sea-shore. We must oppose both errors energetically.

SYMPTOMATIC TREATMENT

Loss of Appetite. This is a common occurrence. Best to advise only massage, salt-baths, exercise. Exceptionally (to hasten recovery) herb-extracts or caps. with Ichthyol or ol. juniperi.

Anemia. Massage, exercise, etc., heliotherapy, arsenic-containing mineral waters.

Cough. Hydrotherapy, tepid compresses to the chest. May be liquor ammoniæ anisatus and ammon. chlorat. with syrup of althæa.

Fever. Compresses with cold water, bed, specific treatment.

Pains in Chest. Ichthyol 20.0 Euceria 30.0 (ichthyol-ointment compresses).

Diarrhoea. Carbon-prep., bol. alb., also Tannalbin.

Night-sweats. Calcium, sponging with different alcoholic preparations.

Pulmonary tuberculosis. If the lungs are involved, the same treatment ought to be used in light cases as outlined above. In more advanced conditions sanatorium with the same treatment. If very acute and severe symptoms are present, one ought to wait with any specific treatment, until a certain amelioration of acute symptoms has taken place, before using Roentgen-rays!

In one sided cases, pneumothorax, if indicated. Specialist!

If tuberculous bronchitis with asthma, mountain-air or sea-air, if possible; but always in combination with the described methods of treatment!

Other forms. Tuberculosis of the peritoneum and the kidneys represents a most suitable field for the specific treatment. Also in bone and joint tuberculosis the conservative treatment is gaining more and more followers. Let us once more be reminded, not to overlook the tuberculosis of the bronchial glands! Most impressive are two cases observed by the author, in which for several years, on account of fungus and bone-tuberculosis, a perfectly correct local treatment had been used without any success. As soon as the existing tuberculosis of the bronchial glands, which represented the primary focus, was treated at the same time, a cure resulted.

Tuberculosis of the eye, tubercles of the brain, lupus are best referred to the respective specialists.

The specific treatment, and this fact must once more be emphasized, should only be commenced if at least one of the antibodies is pres-

ent, never if all antibodies are missing. It is evident, why it would be foolish to try to use it in miliary tuberculosis or meningitis.

After proper training, the general practitioner should be able to recognize also the early cases of tuberculosis in childhood and to take care of them intelligently and successfully. In return for this he will be the recipient of a world's blessing. He is facing one of the noblest tasks of his profession.

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