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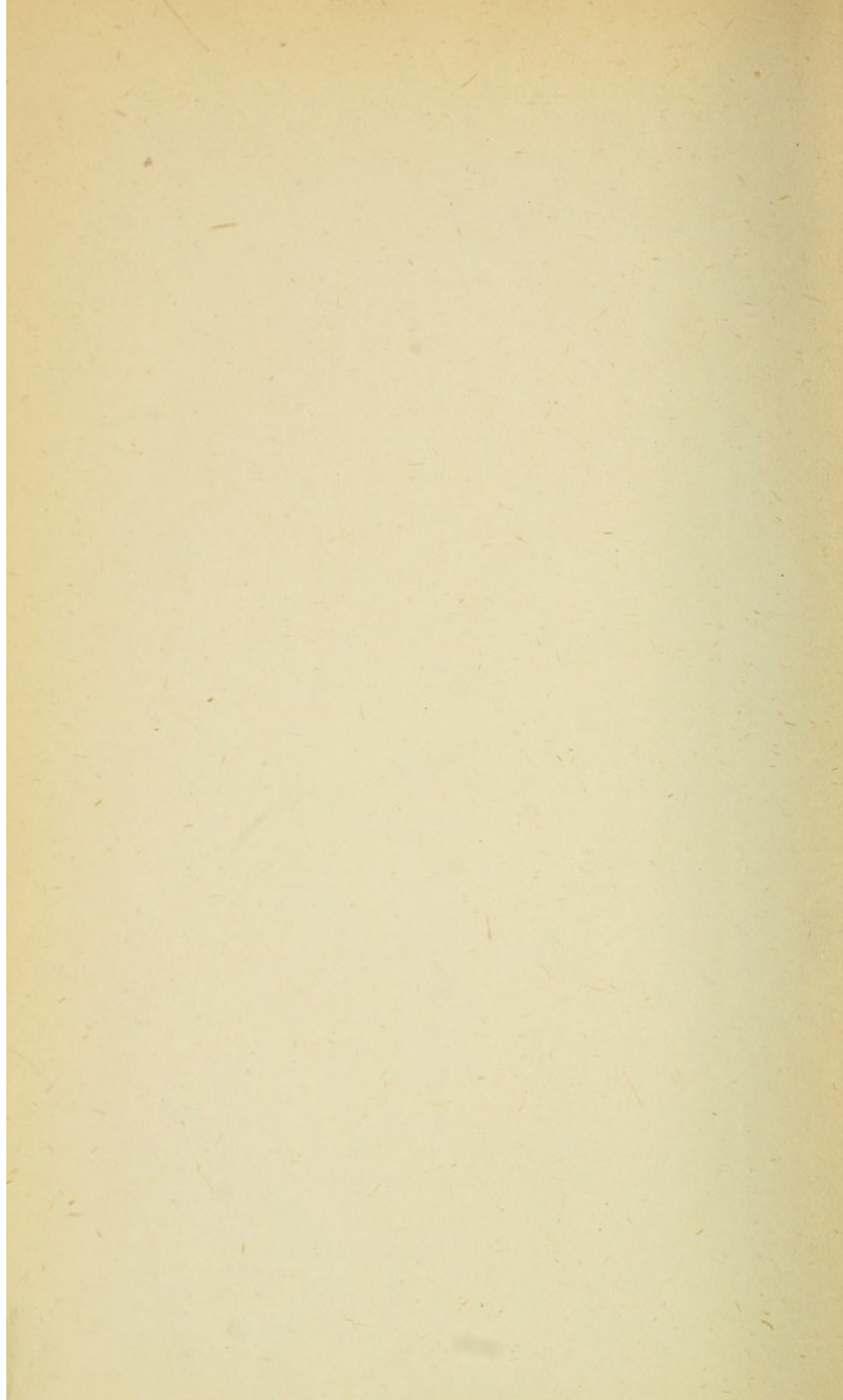
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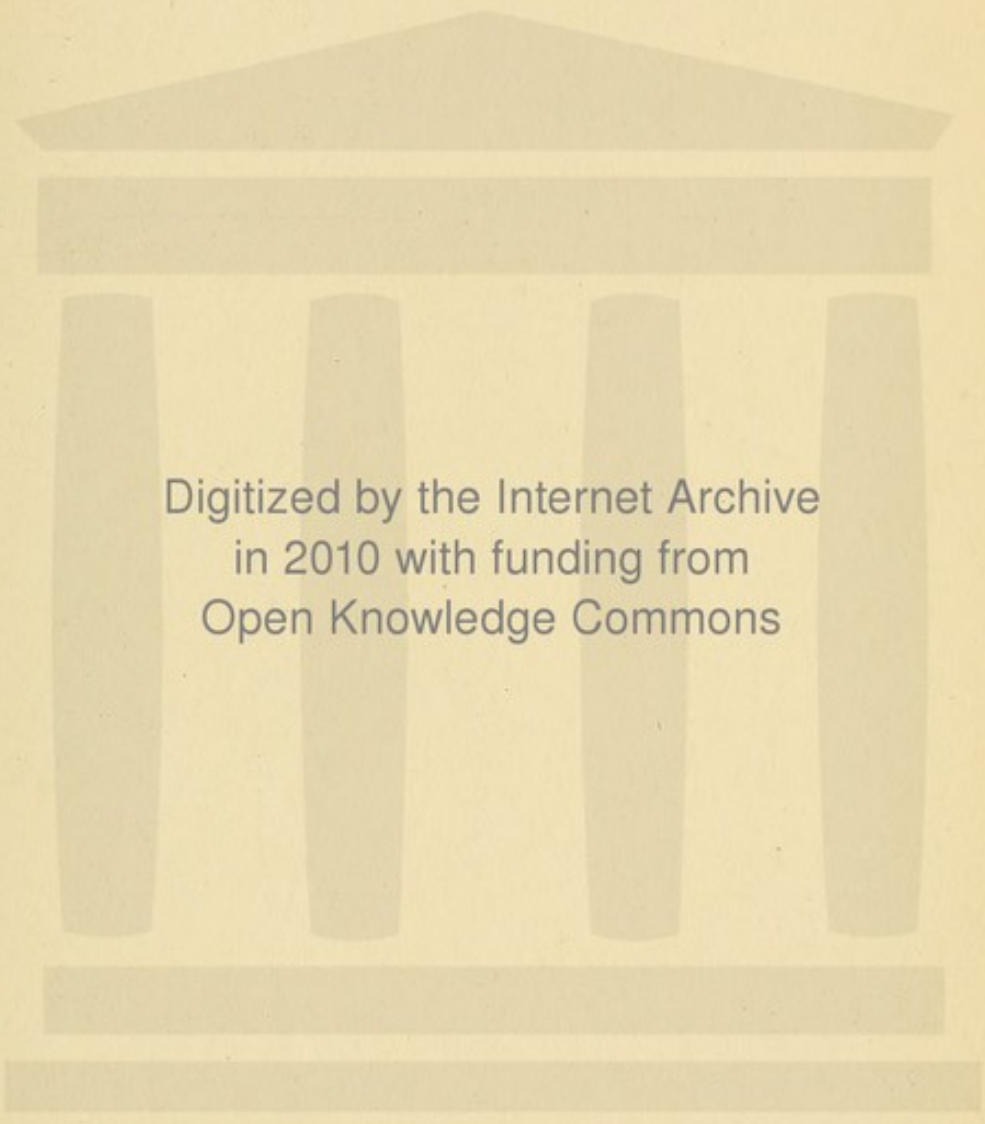
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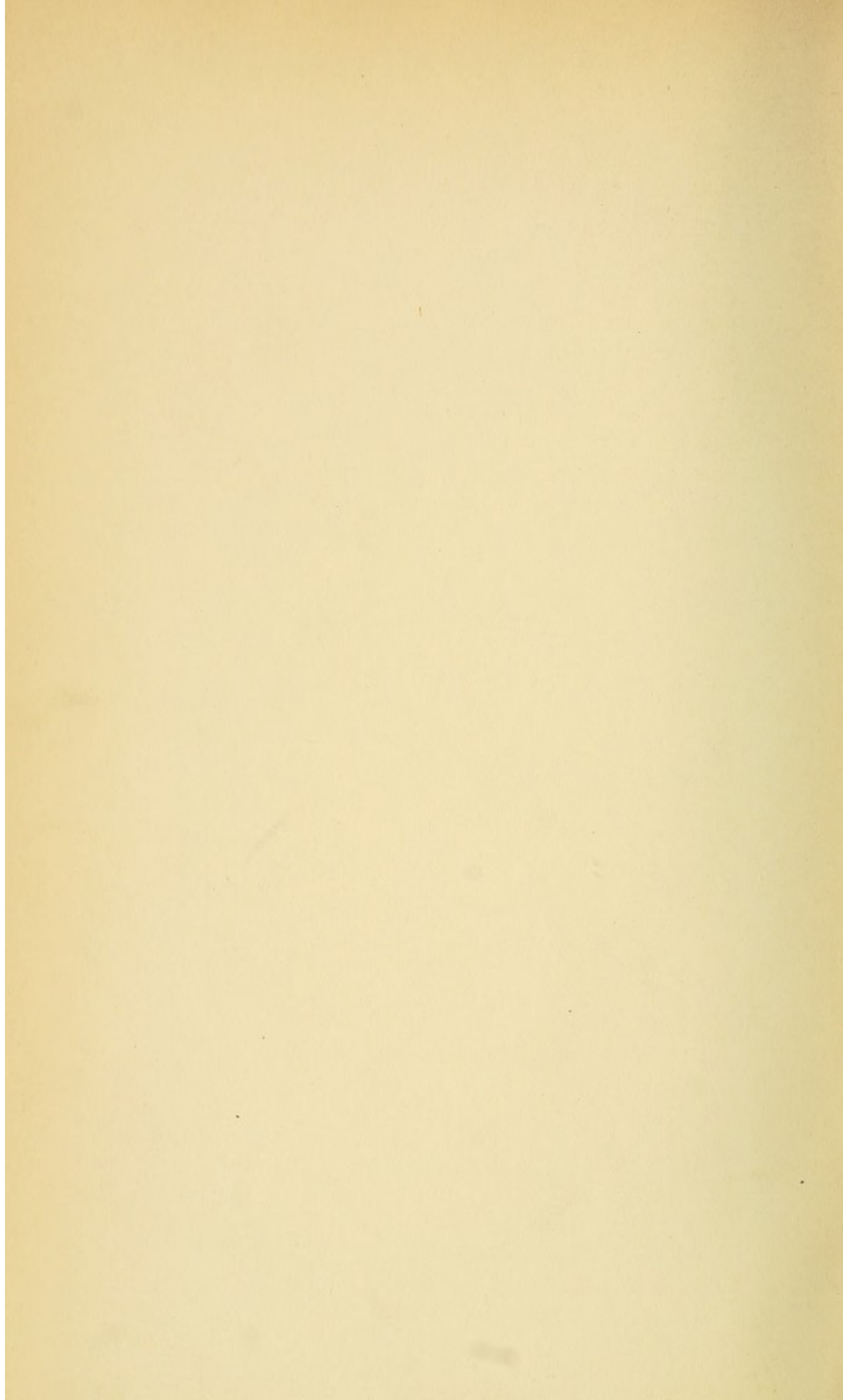
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THE TREATMENT
OF
PHTHISIS

BY

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CONSULTING PHYSICIAN TO THE MANCHESTER HOSPITAL FOR CONSUMPTION AND
DISEASES OF THE CHEST AND THROAT; EXAMINER IN SANITARY SCIENCE
AT CAMBRIDGE AND VICTORIA UNIVERSITIES

LONDON
SMITH, ELDER, & CO., 15 WATERLOO PLACE
1896

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PREFACE

THE present work is based upon experience gained partly in private practice, and partly during long and constant work at the 'Manchester Hospital for Consumption and Diseases of the Throat.'

No attempt has been made to give a complete historical account of the various means that have been employed in times past for the treatment of Phthisis.

I have thought it best to confine my observations chiefly to my own experience; and the fact that some methods of treatment have been left unnoticed, although they have been considered worthy of trial by others, must not be ascribed to any want of appreciation of other physicians, nor to any distrust in their judgment. It must be set down to my desire to record for the most part only such methods as have been used under my own eyes. Owing to the kindness of my colleagues at the hospital, Drs. Thomas Harris, Hodgkinson, and Moritz, I have indeed been able to give their valuable

experience on several points, as well as my own ; but even in these instances I have, owing to our friendly relations, often been able to personally watch their results.

I am glad to note that, for the most part, the conclusions to which I have been led are in accord with those reached by the men who are best entitled to speak on this subject ; and I have refrained from quoting their opinions in support of my own, solely because I think that each observer should let his results stand upon their own merits, for by this means he will help to build up medical science upon a sure foundation.

The subject of the treatment of Phthisis is indeed considered, with more or less completeness, in all the text-books and in works devoted to diseases of the lungs, and pulmonary consumption in particular ; but I am not acquainted with any special treatise on this subject in the English language ; and yet its importance would surely justify such a production. It has been calculated that there are about 150,000 persons admittedly the subjects of phthisis in England and Wales, and it is highly probable that there are many others who are really subjects of the disease, though it has not fully declared itself. Although tuberculosis is so serious an affection, it is certain that many of

these persons could be successfully treated if they were kept under proper supervision, and if their medical attendants could be imbued with the necessary degree of confidence in the means that can nowadays be applied for their relief.

But many of these medical men themselves need encouragement in their anxious and often tedious work of treating phthisical patients. They have been so frequently disappointed in their hope of a specific against phthisis, that many of them have become utterly discouraged, and have given up the attempt to cure. Convinced of their powerlessness in this direction, they have limited themselves to the treatment of symptoms; and even this effort is carried out with little confidence or perseverance. Dr. Léon-Petit remarks of such an attendant (*'Le Phtisique et son Traitement Hygiénique,'* p. 38. Félix Alcan, Paris, 1895): 'Il n'a plus ni la patience ni la foi nécessaires au long et minutieux traitement du phtisique. Après quelques essais hâtifs faits sur des mourants, il condamne avant d'avoir jugé, et se renferme dans son nihilisme accepté du public. Et les phtisiques meurent en attendant l'avènement du spécifique de la phtisie.'

The present work has been written in the hope that its contents will increase the courage of the

physician in face of this terrible malady, and will also provide him with arms with which he may successfully combat it.

I wish to offer my warmest thanks to the friends who have helped me, and especially to Mr. W. J. SHARPE, who has so kindly and efficiently corrected the proof sheets.

BOURNEMOUTH :

February 1896.

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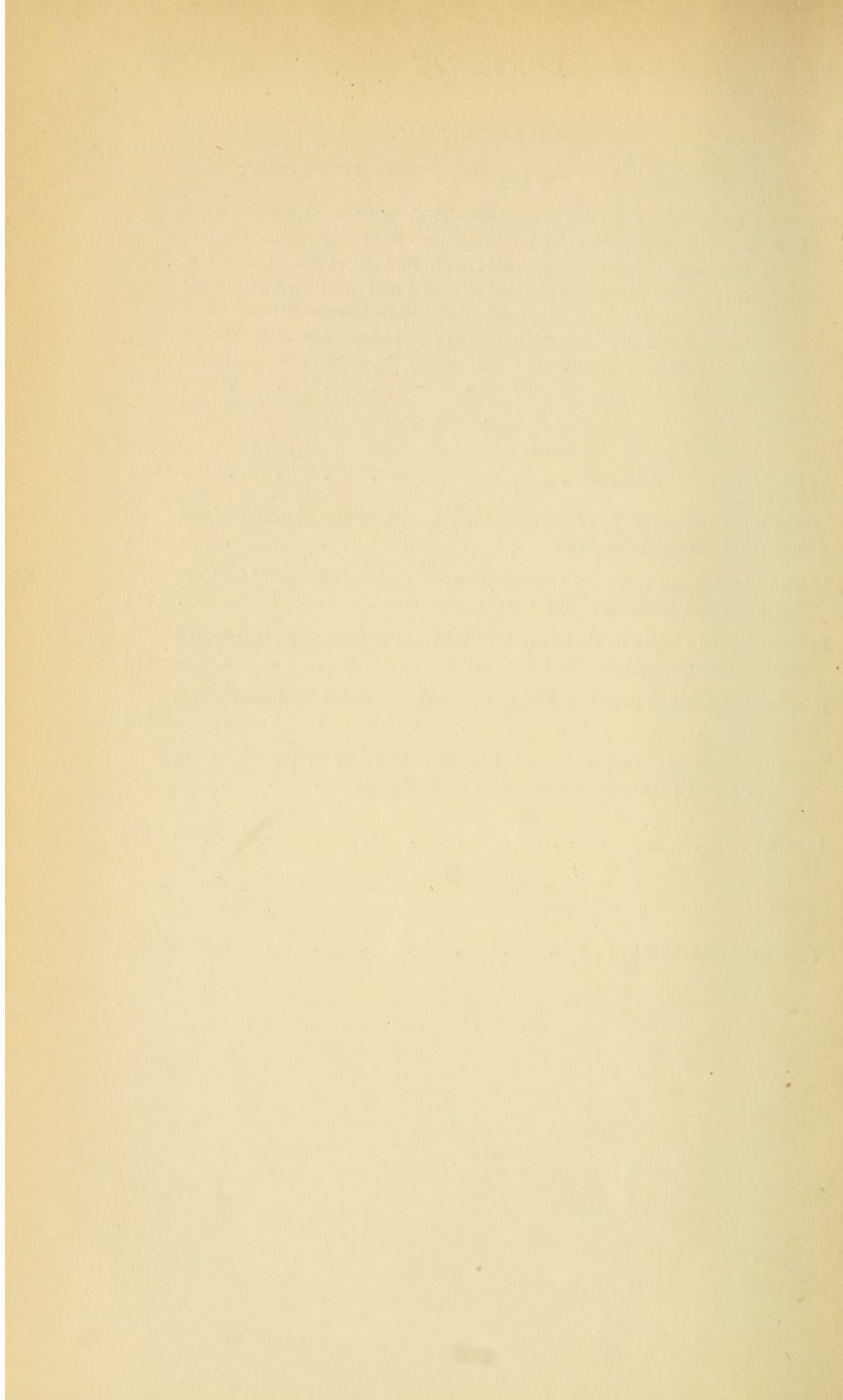
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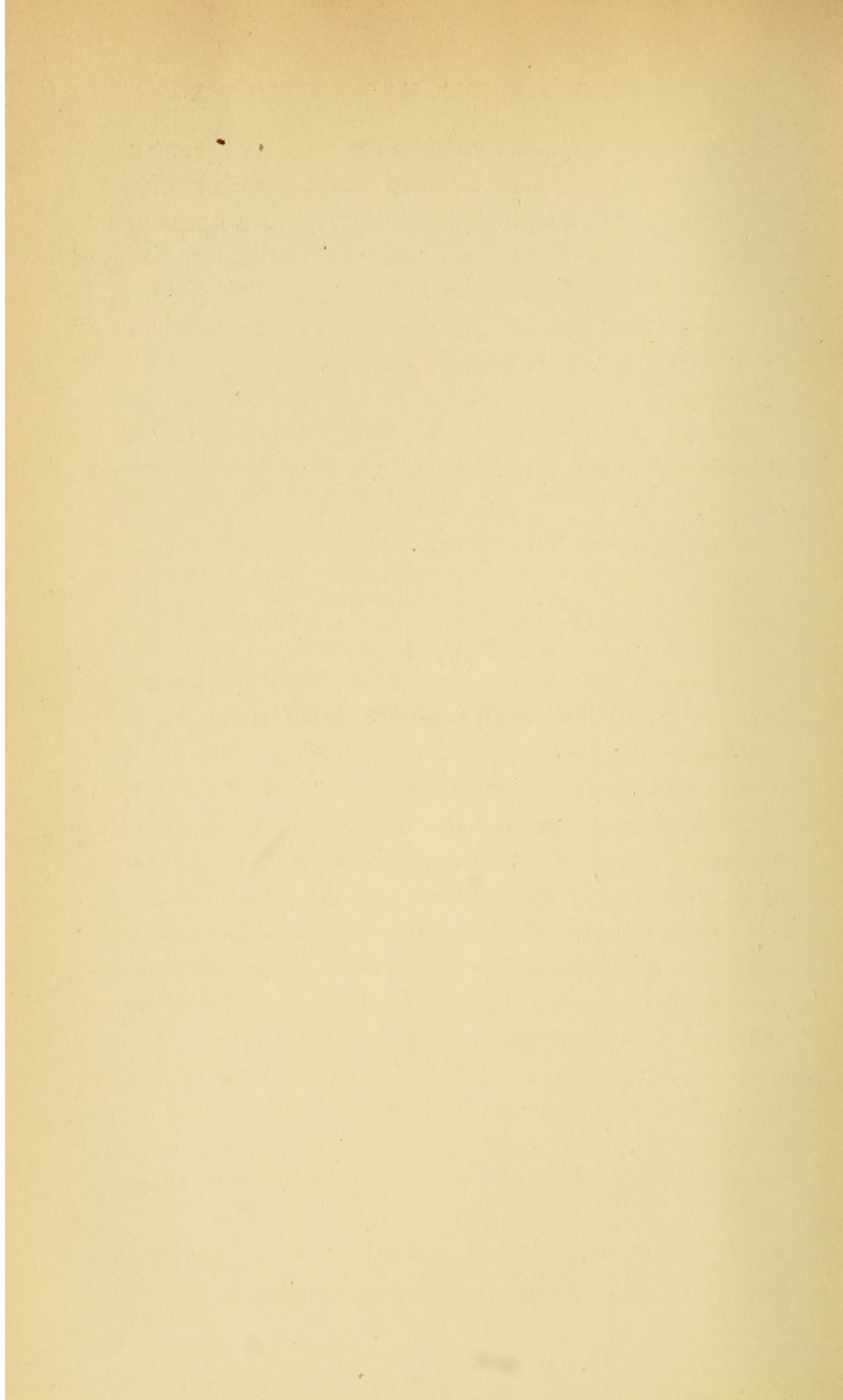
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PART I
INTRODUCTORY AND GENERAL



CHAPTER I

CURABILITY OF PHTHISIS

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THE title of the present chapter is not intended to imply any doubt as to the possibility of recovery from phthisis. At the present day such a doubt could hardly arise. It is rather intended to cover an inquiry as to the extent to which the disease has been found to be either amenable to treatment, or capable of being dealt with by the natural forces of the organism.

There are still to be found not a few medical men who take a decidedly gloomy view of the prospects of cure in this most serious malady. It may be of some service to call attention to the now numerous proofs that exist, as to the recovery from phthisis in nearly all stages of the disease. It is well known that hope is not only a prominent accompaniment of consumption, but that it is also an important aid towards cure.

It is remarkable how greatly medical opinion has varied on this point during the course of the ages.

Thus, except under certain unfavourable conditions, the old writers do not seem to have despaired of the cure of consumption. Certainly Sydenham, the father of English medicine, did not; for he speaks of the cure of phthisis by riding in enthusiastic terms. 'Indeed,' he says, 'deadly as phthisis is, killing two thirds of those who die of chronic diseases, it has a specific in riding, as truly as ague has in bark, or the venereal disease in mercury; provided only that the journeys are long enough, and the beds at night are well aired.'¹ Boerhaave also admits that a case of phthisis, even in the third stage, in which a vomica has suddenly burst, may yet be cured. Stahl, however, writing about the same date, allows that 'the observation of the public is commonly true, that when consumptives begin to consult medical men, they straightway deliberate as to what things are needful for the funeral.'²

Heberden, a little later, says: 'Remedies of all kinds are tried, whatsoever could be thought out by reason or rashness or despair or superstition, nevertheless we shall scarcely succeed in the complete cure of phthisis of the lungs.'³

In thus putting the matter, Dr. Latham apparently concurs, for he says: 'We cannot say that consumption is curable; but we can say (and truly) that there are cases of *imputed* consumption, which puts on such an aspect of the *real* disease that they are with difficulty

¹ Syd. Soc. vol. ii. p. 107.

² 'Unde etiam ipsius vulgi observatio est communiter vera, quod quando phthisici medicos consulere incipiunt, de iis, quæ procurando funeri necessaria sunt, deliberandum veniat.'—*Script. Class.* xvi. 43.

³ 'Omnis generis remedia tentata sint, quæ vel ratio, vel temeritas, vel spes, vel desperatio, vel superstitio potuerint excogitare, tamen parum profecimus in sananda vera pulmonis phthisi.'—*Script. Class.* x. 189.

distinguished from it, yet have not its essence. These are all within the possibility of cure.' ¹

A simple way of disposing of the question, seeing that if the patient recovers, it is sufficient to say that his case was not one of consumption.

It would seem as if there had been a growing disposition towards a gloomy prognosis, for in the French 'Dict. des Sciences Médicales,' published in 1820, some hope of cure, even in the third stage, is allowed. In this view we may perhaps see the influence of Laennec, who records several cures.² But in the 'Dict. de Médecine' of 1835 we find the following pessimistic statement: 'C'est une opinion généralement accréditée dans le monde, que la phthisie est incurable. Beaucoup de médecins la partagent peut-être, et il faut en convenir, les exemples de guérison de cette funeste maladie sont tellement rares, que le praticien le plus répandu, dans le cours d'un long exercice de son art, n'en peut pas observer un seul exemple incontestable.' ³

Fifty years ago, in fact, the dictum of Sir Thomas Watson that 'tubercular disease, when established, is beyond our power,' was currently accepted as the truth.⁴ Since then, however, a great change has come over medical opinion. Thus Niemeyer remarks: 'Many a patient gets well who would formerly have been assumed to be the victim of tubercular, and therefore incurable, disease.' ⁵

Dr. Pollock shows ⁶ that many cases that were given

¹ *Latham's Works*, Syd. Soc. p. 159.

² *Auscult. Med.* 2nd edit. vol. i. p. 580 *et seq.*

³ Art. 'Phthisie.'

⁴ *Practice of Physic*, ii. 201.

⁵ *Lectures on Consumption*, p. 65.

⁶ *Elements of Prognosis in Consumption*, p. 68.

up by doctors, but outlived the prediction to arrive at old age, were undoubtedly recoveries from phthisis. Many more were instances of an early invasion of the disease, with subsidence of, and long toleration of, the deposit; and again (p. 17), 'the best authorities lean to the opinion that tubercle is capable of removal by absorption.'

Dr. Walshe gives,¹ as the result of treatment, in 211 cases, that 4·26 per cent. were cured—i.e. that all *symptoms* had disappeared, and the physical signs showed that no active changes existed in the lungs; or, if no account is taken of slight activity of some of the physical signs, a proportion was obtained of 7·58 per cent. of cases in which all symptoms had disappeared, the physical signs alone indicating the absence of health. Nine of the patients in the second category had reached either the second or third stages when admitted.

These results accord very closely with those obtained in private practice by Dr. C. T. Williams: 'A cure was effected in 4·6 per cent. of the cases; great improvement in 38 per cent.; the disease was stationary in 13·4 per cent.; but in 43·5 per cent. there was more or less increase.'²

Austin Flint, in his work on phthisis, gives very similar evidence. Out of 670 cases he had only 44 of recovery and 31 of arrest. The successive Reports of the Manchester Hospital for Consumption give closely correspondent figures; but I have myself a list of over 50 persons who have been under my own observation for many years, in whom the disease has made no

¹ *Brit. and For. Med.-Chir. Rev.* Jan. 1849.

² *Pulmonary Consumption*, p. 324.

progress, and who may be considered as practically cured.

It is possible, however, that most medical observers, whilst rightly cautious in admitting the fact of complete cure, have, in consequence, given too small a number as representing the success of their efforts. The evidence derived from post-mortem examinations of adults, who have died of other diseases than phthisis, goes far beyond anything that has been admitted by any of the observers hitherto quoted.

In England, France, Germany, and Italy, many experienced and careful pathologists have recorded the results of post-mortem search for signs of healed tubercular lesions of the lungs. Many thousand bodies have thus been examined; and, although the proportion of those supposed to be cured varies very greatly, the greater number of these observers agree in assigning a very large number to the list of cures.

In France, Cruveilhier, Rogée, Déjerine, Boyer, and Boudet are the principal authorities.

Cruveilhier enumerates no less than six modes in which pulmonary tubercle may be healed, and remarks that we rarely make a post-mortem examination on adults, and especially on old people, without finding in the apices of the lungs changes which indicate the healing of previous tubercle.

The encouraging words in which Cruveilhier states his experience in this respect are well worthy of being transcribed. In his great work, '*Anatomie Pathologique du Corps Humain*,' fasc. xxxii, he says: 'We feel our courage rise in the treatment of pulmonary tubercle, which is too generally considered as marked with the stamp of incurability. During the six years

that I have practised at Salpêtrière I have had many opportunities of remarking the many exceptions to this fatalistic doctrine. I have been able to mark the various methods that Nature follows for the reparation of the disorder ; and if, on the one hand, tubercle often belongs to that destructive pathology which shows us by what routes the human body is conducted, rapidly or slowly, but not the less certainly, to death, yet, in a very large number of cases, it belongs to that pathology of restoration which notes in what ways the disorder is set right. The diverse modes in which tubercle may be cured is indeed a worthy object of study.'

Rogée, in 100 old people who had died of other diseases than phthisis, found 51 cases of caseous masses.¹ Boudet, out of 135 patients dying between the ages of fifteen and seventy-six, found 116 who had either recent or old tubercles.²

The observations of Boyer give a still larger proportion of cures, 157 to 160 subjects ; but, as Dr. Thomas Harris, whom I shall quote presently, remarks, 'there must be some mistake in these numbers.' Barthez and Rilliet also made some observations on children, which go to show that in these, although cicatrisation is rare, it is not impossible even in them.

In Germany, Bollinger, Heitler, Standacher, and others have made similar observations, but of very different degrees of weight. Bollinger and Standacher had almost identical results, the former giving 27 per cent., and the latter 26 per cent., as the proportion of cures. Heitler searched the records of the Vienna Pathological Institute, and found that out of

¹ *Arch. Gén. de Méd.* 1809, vol. v.

² *Rech. sur les transformations des Tub.* vol. v.

16,562 post-mortem examinations on supposed non-tubercular persons, there were 780 instances of obsolete tubercular nodules (indurations, closed cavities, and yellow masses)—i.e. in 4·7 per cent. But he excluded cases in which there was only fibrous shrinking of the lung apex. And Dr. Harris, from whom I quote these figures, rightly points out that most cases of such simple fibrous cicatrices are the remains of former active tuberculosis. Dr. Harris himself found that about 39 per cent. of all non-tubercular cases over twenty years of age 'presented signs of involuted tubercle.'¹

Massini² arrived at almost exactly the same figures; and Dr. Hughes Bennett³ gives it as his opinion that spontaneous arrest of tubercle has occurred in from one-third to one-fourth of all individuals dying after the age of forty.⁴

Altogether, it will be seen that there is a great mass of evidence in favour of the view that pulmonary tubercle undergoes spontaneous cure in a very large number of cases, much larger, in fact, than any hospital physician has ever ventured to claim.

And we cannot doubt that in most of these researches the greatest care was taken not to overstate the facts. No one who reads Dr. Harris's excellent paper can fail to appreciate the care that was taken to avoid sources of fallacy.

There are, in truth, only two points with respect to which mistake was possible; first, that the indurations and cretaceous nodules found might not have

¹ *Brit. Med. Journ.* Dec. 21, 1889.

² *Deutsches Archiv*, xi. 446, 1873.

³ *Clin. Med.* p. 737.

⁴ Still more recent are Schlenker's observations (*Virchow's Archiv*, Band cxxxiv. p. 145), and he reckons 44 per cent. as the number of cases of latent tuberculosis.

been due to tubercle ; and, second, that the tubercle was not really obsolete, i.e. that they were cases which were still active, but where the tubercular process was progressing with a very chronic course. With regard to the first point, it is possible that both the forms of change noticed may have been due, in a very small number of cases, to other causes than phthisis ; the cretaceous nodules to bronchiectasis, and the indurations to collapse. But, as Dr. Wilson Fox points out,¹ no other diseases of the lungs can be shown to produce these formations with any approach to the frequency with which they are found. Then, as to the second point, although the lesion may not have been entirely cured, there must have been at least a tendency to heal. The fact also, that the most numerous cases were those of old people makes it the more likely that most of them were genuine instances of cure.

On the whole, therefore, I think that we may feel safe not merely in affirming the curability of phthisis, but also in asserting that a very large proportion of those attacked are cured, either by the 'vis medicatrix Naturæ' or the 'ars medendi.'

But there is one serious drawback to the prognostic value of all this evidence. Even if the possibility of a natural cure, in so large a proportion of cases, is established, there remains the doubt whether we can always trust to discovering the disease in a sufficiently early stage to warrant us in promising a cure. Supposing that all the above-mentioned cases had been systematically examined for lung disease, could we have declared its presence in them all ? I fear not ; for, in many of them, the disease probably passed entirely

¹ *Dis. of the Lungs*, p. 837.

without notice, even by the persons affected ; and we can hardly expect to equal such figures when it has fully declared itself. Yet it is well to have them put on record, as a standard to which, at some future period, we may hope to attain.

CHAPTER II

ÆTIOLOGY AND PATHOLOGY OF PHTHISIS IN RELATION
TO TREATMENT

Results of the discovery of the bacillus of tubercle—Morbidity anatomy of pulmonary tubercle—Its bearing upon anti-bacillary treatment—Natural history of the bacillus—Its modes of entrance into the body—Opposing forces—Lymphoid tissue at entrance to larynx and pharynx—Antagonism of living tissues—Mucus—Ciliary action—Professors Delépine and Sims Woodhead on metastatic extension—Indications for treatment—Survey of secondary causes—Favourite habitats of the bacillus—Hereditary and acquired predisposition—Local lesions—Occupations—Stooping postures—Irritating dusts—Pneumonic conditions—Tuberculous dust—Professor Koch's and Dr. Cornet's researches—Sources of fallacy—Antecedent conditions of infection—Distribution of the disease—Influence of race.

THE discovery by Dr. Koch of the essential organism of tubercle is undoubtedly an event of the very highest importance, yet it has produced far less effect upon the efficacy of treatment than might have been expected. In the case of many diseases, the recognition of a cause has been followed immediately by an improvement in the methods taken for their cure; but in the case of phthisis we can hardly say that much result has followed the discovery of the bacillus of tubercle. The so-called anti-bacillary treatment cannot be said to have met with the success that was anticipated by its promoters. An explanation of this fact may probably be found in the morbid anatomy of the disease.

When the bacilli of tubercle have lodged in the alveolar epithelium, there is, after a time, an increase in their number, and subsequent desquamation: then, later on, there is hyperæmia, with migration of white blood-corpuscles into the alveoli, accompanied by a reactive increase in the neighbourhood of the disease focus, which thus tries to protect the surrounding parts by encapsulating itself. The organism is then hedged round with the products of inflammatory action, with exudation cells or fibroid material. It is thus closely shut in from the air passages and is placed at a distance from vascular supply; and it must then be most difficult to reach either through the medium of the respired air, or by the currents of the blood. When once it is entrenched behind its barrier of exudative material, it is almost secure from attempts to reach it with either volatile or liquid disinfecting agents.

It is probably owing to this peculiarity of tubercle that so little success has attended so far the purely anti-bacillary treatment. Yet Dr. Koch's discovery is not rendered entirely useless on this account. He has not only shown us the true cause of the disease, but he has traced its natural history. He has marked (1) the small range of temperature within which the organism can be successfully cultivated,¹ (2) the length of time required for its development, (3) its tenacity of life under favourable conditions, and (4) the antagonism that exists between the living elements of the body, especially between the phagocytes and the bacillus. He and others have also traced the mode of entrance

¹ It is noteworthy, however, that other observers have succeeded in cultivating the bacillus in very diverse media, and at a temperature as low as 60° Fahr. See Sir H. Beevor's communication to the Pathological Society, reported in *The Lancet*, Jan. 10, 1891.

of the organism into the system, and have thus put us on our guard against its attacks. All these points are most valuable aids to our treatment, both prophylactic and curative, as we shall presently find ; and we therefore owe to him a debt of deep gratitude.

It was ascertained, even before the discovery of the bacillus, that the virus of tubercle might be introduced into the body at almost any point, but with various prospects of spreading generally through the system. Thus, (*a*) when inoculated into the skin, either through a purposely made abrasion, or through a sore, it would usually be arrested at the first lymphatic gland ; and it would then often be discharged from the body by suppuration. (*b*) It has been shown to be possible for it to enter by the genital tract, and thus we may have either infection of the mother, or congenital disease of the offspring. But both these accidents are probably of very rare occurrence. (*c*) The organism may undoubtedly enter by the alimentary canal ; and there can be little doubt that this is one of the commonest sources of abdominal phthisis. Lastly, (*d*) the virus may be breathed into the air passages in the form of tuberculous dust, and, as Cohnheim pointed out long ago,¹ no organ of the body is attacked by tubercle with the same frequency and intensity as the lungs. In most cases this fact can only be accounted for by a primary and immediate attack by the virus upon the respiratory tract ; though the lung disease has sometimes been known to arise from extra-pulmonary infection.

As a general rule, when a sufficient number of the organisms has been lodged within the outworks of the

¹ *Die Tuberculose vom Standpunkt der Infectionslehre*, p. 20.

animal body—i.e. when the dosage has been sufficient—the disease spreads infectively along the track of the lymphatic system.¹ But before these organisms can effect a complete lodgment within any organ, they have to run the gauntlet past many opposing forces. In the case of the alimentary canal, as Dr. Woodhead points out, ‘there is a ring of lymphoid tissue surrounding the entrance to the larynx, and a similar ring surrounding the entrance to the œsophagus. So long as the tonsils, with their accessory lymphoid tissue forming this protecting ring for the pharynx, remain healthy, or so long as they are attacked by no extraordinary number of pathogenic micro-organisms, they are capable of resisting attack, and of dealing with micro-organisms even of what would be called a most virulent type. In this they are of course helped by the epithelium with which the lymphoid structure is invested; but some at any rate of the work appears to be performed by the wandering lymphoid cells of which I have spoken.’

If, owing to the number of organisms, or to the weakness of the defending leucocytes, the bacilli are able to rush the first line of defence, they are carried to the nearest lymphatic gland, and there they are again subjected to the destructive powers of the system. Professor Delépine and, more recently, Dr. Woodhead have pointed out the extreme regularity with which tuberculous lesions spread through the body, along the course of the lymph channels, in susceptible animals such as the guinea-pig. ‘In more resistant animals, however—and amongst these must be classed the human subject—it is sometimes noticed that this

¹ See *Milroy Lectures*, 1890, p. 13.

process of extension is rather what is called metastatic than direct. This metastatic invasion, just like a local manifestation of anthrax at the seat of inoculation, must be looked upon as a sign that the tissues as a whole are engaged in carrying on a vigorous resistance against the invasion of tubercle bacilli; and that the wandering cells are, on their part, doing their utmost to destroy the bacilli; and it is only when their efforts are weakened, or when they are imperfectly assisted by tissues of lower vitality, that the tubercle bacilli have a chance of resisting their attacks.'

The important point to note is that healthy tissues are almost always able to deal with any moderate number of invading organisms; and that it is only when these tissues are weakened by antecedent disease, that the living virus can take root and grow into a formidable malady. In the case of the lungs, besides the safeguards that have just been mentioned, the fine tuberculous dust, floating in the respired air, runs the risk of being caught in the entangling mucus poured out from the mucous glands, and of being carried up again to the top of the larynx, to be there discharged forcibly by an act of coughing. If it should escape these pitfalls, there is still usually to be found within the lung means sufficient for destroying these germs of disease, before they have had time (one to three weeks) to form a colony, or to entrench themselves within a tuberculous nodule. When organic disease becomes finally implanted in the body, we may be sure that there has either been an overwhelming mass of invading particles, or that the tissues have been weakened by previous injury.

A careful study of these pathological facts will reveal

at least four indications for treatment. (1) That all conditions, under which numerous active and virulent bacilli can be introduced into the body, are to be avoided. (2) That the protective forces of the general system must be strengthened as far as possible. (3) That all local injuries likely to facilitate the entrance of the bacillus must be attended to, and thoroughly healed, as far as possible ; and that patients with such ports of ingress open, should not be permitted to remain in the presence of danger of infection. (4) That the tissues of the body surrounding any focus of disease should be rendered impenetrable, or, at least hostile, to any further advance on the part of the invading enemy.

A short survey of the predisposing, or secondary, causes will show us the directions in which we may look for help in carrying out these indications.

(1) First, as to the quarters from which the greater proportion of the specific bacilli are likely to come. Phthisis is now well known to be a ubiquitous malady—that is, it is found more or less wherever human beings are gathered together, whatever the climate. But it is especially present where the air is rendered foul by respiration, where the ventilation is bad, where the subsoil is badly drained and impure, and where the dwellings are dirty and ill-lighted.

These conditions are favourable to all forms of tubercular disease ; but, in the case of mesenteric and meningeal tubercle, we must add to them the ingestion of milk, and possibly of meat, from tuberculous cattle.

(2) Next, as regards the bodily condition of persons susceptible to phthisis, we may have either hereditary

or acquired predisposition to the disease. Although tuberculosis itself is very rarely inherited, we cannot deny that the tendency to contract this disease is often transmitted in families. This hereditary tendency may be due either to local weakness in the lungs themselves, rendering them more prone to inflammatory or to other disabling affections ; or it may be owing to the transmission of a small power of resistance in the defensive cells of the body. But, in either case, it is well not to attribute to it too great an importance, nor to let it interfere with our hope of cure. The transmission of an aptitude to contract the disease does not necessarily lead to the disease itself ; and, though the prognosis is necessarily graver if phthisis supervene, yet much may be done to avert a fatal issue.

A predisposition to contract the disease may, however, undoubtedly be acquired.

Certain disorders, such as enteric fever, measles, and small-pox, often leave behind them a serious tendency to tubercular disease, especially after an imperfect recovery. This tendency may be due to their debilitating influence ; and, in that case, the result would come under our present head ; but more frequently they prepare the way for the bacillus by causing local lesions in the lungs or bowels.

Over-lactation, frequent pregnancies, diabetes, and debilitating disorders generally, also predispose to phthisis, usually by rendering the system less able to destroy the organisms that accidentally make their way into the body.

(3) The most common causes of bodily predisposition are, however, to be found under the third head

—namely, the local lesions and weaknesses that render it possible for the bacillus to effect a lodgment within the tissues.

Without affirming, as some observers do, the absolute necessity for some antecedent injury to the lungs, before the bacillus can effect an entrance, it is certain that many cases of phthisis are preceded by purely inflammatory affections of these organs, such as pleurisy, acute bronchitis, broncho-pneumonia, and imperfect resolution of ordinary pneumonic inflammation. Any such disorder, leaving an abraded surface, or injuring the expulsive machinery of the lungs, destroying the ciliated epithelium, weakening the muscular apparatus, allowing dilatation or plugging of the air tubes, or causing a permanent loss of elasticity of the lung tissue, —any of these lesions may make it easy for the bacillus to find a site of lodgment within the lungs; and true tubercular disease may be set up.

It is well known that most of the occupations that produce a tendency to phthisis are such as interfere in one way or another with the full play of the lungs. Thus, cramped or constrained postures when at work, as in mining; stooping over the work, as do cobblers, lace-makers, strawplait-makers, and book-binders: these modes of working, when accompanied, as they generally are, by the inhalation of foul and virus-laden air, are amongst the commonest causes of phthisis. Another most serious predisposing cause of the disease is the inhalation of dusts of various kinds, especially those of an irritating character. All the forms of pneumo-konioses, except perhaps anthracosis, provide a condition of the lungs that renders them apt to receive the organism, and to contract true tubercular disease.

(4) The fourth indication for treatment will be more fully considered in Chapter X.

But none of the predisposing influences that have been mentioned, however potent they may be, can produce tubercular disease without the presence of the specific germ ; and we may add to this the condition that this germ must be in an active or virulent state.

It becomes necessary to inquire, therefore, into the limits to infection by the bacillus, or rather, in relation to our present subject, into the limits to infection by phthisical persons.

In one of his earliest papers on the bacillus of tubercle, Professor Koch points out, as the chief cause of the spread of phthisis, the widespread distribution of virulent tuberculous sputum. This sputum, teeming with active bacilli, dried up and powdered into fine dust, may then be carried about by currents of air, in a condition ready to enter into the lungs, to lodge in milk, or upon articles of uncooked food.

He and others have also shown the prolonged vitality of the bacillus in sputum ; that it will resist for a long time desiccation, putrefaction, freezing, alternate freezing and thawing ; and that it has proved refractory to many of the disinfectants which will destroy other pathogenic organisms. Professor Cornet also has made direct experiments upon the dust collected from the walls of wards, bedrooms, and other apartments, that had been occupied by consumptive persons. He has succeeded in conveying tubercle by the inoculation of this dust into the bodies of guinea-pigs and other animals.

Dr. Cornet again made an elaborate statistical inquiry into the mortality from phthisis amongst the Catholic

Nursing Orders in Germany. He showed that the deaths from tuberculosis form nearly two-thirds of the total deaths ; and that in half the returns, this proportion was exceeded, and in some mounted up to three-fourths. In two small mother-houses every death was put down to tuberculosis. Dr. Cornet ascribes this fearful mortality mainly to infection from dried-up sputum. It is important to observe, however, that Dr. Cornet's successful inoculations do not measure the extent of danger to human beings simply from inhalation ; for the animals used were all much more susceptible to tuberculosis than is mankind ; and, again, that the virus had not to run the gauntlet of the opposing forces which we have seen are to be met with in the air passages. Moreover, in Dr. Cornet's statistical research, nothing is said as to the general sanitary condition of the dwellings in which such terrible mortality took place ; in other words, no reference is made to the cleanliness, drainage, or ventilation of these abodes. I have searched carefully through his report, and little or nothing is said on these points, which are nevertheless of extreme importance in a practical study of the subject.

The whole history of phthisis shows the close connection of these factors in the causation of the disease.

It may be confidently affirmed, without fear of contradiction, from a broad survey of the facts, that wherever plenty of Nature's disinfectants—pure air, light, a dry and pure soil—are to be found, there consumption is rare ; but that wherever there are overcrowding, filth, and darkness, it breeds rapidly, and carries off large numbers.

The phthisis death-rate in the army and navy, in

public institutions, and in populations before and after the introduction of free ventilation into their habitations, proves the relation of the two sets of facts. Nay, without going any further, the statistics of Dr. Cornet himself would be amply sufficient to support this contention; for monastic buildings are notoriously badly ventilated. Again, it is constantly to be observed that the same races of men, under one set of conditions, escape its ravages almost entirely; and under another, are seriously exposed to its attacks. We are told, by both Lombard and Hirsch, that there is almost complete immunity from the disease in Nubia and Upper Egypt, in Asia Minor, Syria, Arabia, and Persia; yet in Asia Minor it is often met with on the coast or in the principal towns. The Bedouins on the coast of the Red Sea, 'who exchange their tents for stone-built houses,' suffer from consumption. In Syria it is met with at Aleppo, and in the Soudan at Khartoum. In Zanzibar it is said to be especially common among Arabian women of the higher class, owing to their greater seclusion. Whilst it is rare among the native Persians, who lead an almost open-air life, it is less rare amongst foreigners. In Algeria, the nomad Arabs are free, but amongst the captives many die from the disease; and in Egypt it is noted that whilst Syrians, Turks, Armenians, and Europeans seldom contract the complaint, Jews often become scrofulous, and frequently die of consumption.

The wretched natives of Australia escape the disease almost entirely; but in the large towns of that continent it is as common as it is in Europe. The Highlanders, who inhabit well-built houses on the mainland of Scotland, are subject to the same fate as

the other inhabitants ; but the ill-fed, ill-clothed, fishermen of St. Kilda and the Hebrides, who live much in the open air, though of the same race, hardly ever contract the disease.

A striking case under this head is quoted by Dr. H. Bennet from Professor Hind : 'Consumption,' he says, 'is unknown amongst the natives of Labrador whilst they remain in their own country. Here they live a kind of wild life in tents made of spruce branches, imperfectly lined with skins, and more or less open to the air ; they are exposed to famine and all kinds of hardship, but when they come down the great river St. Lawrence to take part in the fisheries they occupy well-built houses, and, being well paid, they live in comparative luxury, and then many of them in the course of a year or two become consumptive, and thus miserably perish.'

Dr. MacCormac¹ gives other instances. Thus, 'At Nassau, New Providence, where the negroes and half-breeds sleep pell-mell, *ventre à terre*, consumption, the sweet salubrity of the climate notwithstanding, is of terrible frequency. Mr. Mulvany cites the medical officer in chief of the Spanish forces in Cuba as bearing testimony to the vast prevalence of pulmonary disease among the densely packed military, as contrasted with the lesser prevalence of phthisis amid the civil population of the island.'

Ruelhe² notes that 'Icelanders frequently contract the disease on removal to Denmark ; and so also do negroes who are brought from the interior to the coast or to Europe.'

Again nearer home, we do not find that men who

¹ *The Breath Re-breathed*, p. 47.

Ziemssen's *Cyclopædia*, v. 491.

are much in the open air are especially prone to affections of the lungs. Soldiers on campaign, sailors, fishermen, hunters, gipsies, engine-drivers, coachmen, gardeners, agricultural labourers—none of these people suffer much from consumption, unless they are intemperate.

On the other hand, people who inhabit close, badly ventilated, ill-lighted, badly drained houses are peculiarly liable to the disease. We need not seek far for an explanation of these facts. They obviously point to some influence in or about the dwelling.

It will be necessary to enter more fully into the discussion of the limits of infection from phthisical patients: and, as I believe that these patients are themselves subject to re-infection, and that in most cases a fatal issue depends upon such re-infection, it will be necessary to include this subject in our preliminary remarks, before passing to the study of the direct treatment of the disease.

CHAPTER III

ON THE LIMITS OF INFECTION IN PHTHISIS

Contagionist doctrines—Koch, Cornet, Tyndall—The consumption-scare—Limits of infection in phthisis—Direct and indirect infection—Conditions of infection—History of contagionist doctrines—In South of Europe—Gueneau de Mussy, Villemin, William Budd, Weber—Collective investigation record—Fallacious reasoning—Evidence against direct infection—In favour of indirect infection in houses, &c.—Infective tubercular areas—Hirsch, Parkes, Luzuriaga, Laennec—Incidence of phthisis in Manchester and Salford—My own and Dr. Tatham's and Dr. Niven's observations, and those of Dr. Flick, of Philadelphia—Conditions essential to infective power of bacillus—Observations by Professors Delépine, Dreschfeld, and myself on the influence of natural agents upon the virulence of the bacillus.

THERE can be little doubt that the discoveries of Professor Koch and the researches of Professor Cornet gave a great impetus to contagionist doctrines, especially in Germany; and that much alarm was spread throughout England by Professor Tyndall's exposition of Professor Cornet's doctrines. At the present time the dread of infection from consumptive persons is out of all proportion to the danger, and goes far beyond what the facts of the case justify. In its results this alarm is likely to cause much injustice to many poor invalids, and, in some cases, to endanger their prospects of cure. Already persons affected with almost any chest disease find it difficult to obtain places as domestic servants. The close ties of family affection are not always strong enough to induce the

relatives of consumptives to undertake what is considered to be the dangerous duty of nursing them. The sites for consumption hospitals are becoming as difficult to find as those for small-pox hospitals ; and utterly unfounded reports as to the spread of phthisis by such institutions are recklessly made, even by medical officers of health.

It is important, therefore, to endeavour to ascertain the true state of the case, and to learn to what extent the danger of infection is limited.

The controversy as to the possibility of contracting consumption by contagion is a very old one ; it dates from the time of Galen, and even earlier. Great names are ranged on either side : and the fact that such men as Drs. Andrew, Wilson Fox, and Theodore Williams are ranged on one side, and Drs. Weber, Heron, and Burney Yeo on the other, should make us hesitate before we venture to dogmatise on the subject. It is, however, impossible to avoid remarking that in this, as in so many other controversies, the combatants are often not meaning nor talking of the same things, that they do not discriminate between direct and *indirect* infection, and that they frequently neglect to inquire as to the essential conditions of danger or safety.

At the present day no one can doubt that tubercle is, in some sense, always due to an infection ; that the pathogenic organism always enters the body from without, by means of the air respired, in food or in drink : but there are still many people who do not sufficiently take into account the circumstances which alone can permit it to develop its virulent qualities. In the words of the late Dr. Addison in reference to

certain other infections, 'they forget that one blade of the destroying shears may be forged at home, and without it the other cannot do its work.'

The truth is that, under a certain set of conditions, the infection of tubercle is one of the commonest events ; under another it is, in this climate, one of the very rarest.

The opinion that phthisis is an infectious disease, to be treated, and to be rigorously dealt with as such, has been held for centuries in the South of Europe, notably in Spain and Italy. In these countries, even the medical attendants avoided direct contact with a phthisical patient ; a screen was interposed, and the pulse was felt through a glove. No one used his bed linen, his table-cloth or serviette. After death the walls were scraped, they were re-papered, the floors were washed, the linen and bedding were burned, and the furniture and hangings were exposed to the open air for a whole year.

But it is only quite recently that the idea of contagion has gained any vogue in this country, in France, or in Germany.

In 1859, indeed, Dr. Gueneau de Mussy contributed a paper to '*L'Union Médicale*' (No. 137), in which he contended that phthisis is communicable by cohabitation, and that it is most frequently transmitted from husband to wife ; but he expressly repudiated the doctrine of Morgagni, who believed in the direct contagiousness of the disease.

In 1865, Villemin proved by a series of admirable experiments that tubercle was communicable by inoculation, by feeding, and through the breath. Dr. William Budd also, in 1867,¹ propounded the view that

¹ *Lancet*, ii. 461.

tubercle is a true zymotic disease ; that the tuberculous matter is itself (or includes) the specific morbid material by which phthisis is propagated from one person to another : and that, by the destruction of this matter on its issue from the body, seconded by good sanitary conditions, we may hope to rid ourselves of this fatal scourge.

It does not appear that this remarkable anticipation of recent doctrines met with any general assent at the time. On the contrary, several eminent physicians, amongst whom was Dr. Wilks, attempted to controvert these views. Five years later Dr. Weber's important paper, 'On the Communicability of Phthisis,' attracted much more attention. The report of the Collective Investigation Committee of the British Medical Association undoubtedly strengthened the feeling in favour of Dr. Budd's view ; although, out of 1,078 answers to the question, 'Is Phthisis Contagious?' only 261 were affirmative, 778 were negative, and 39 were doubtful. It is noticeable that all witnesses to the case for contagion rely mainly upon the coincidence of one or more cases of the disease, following cohabitation or attendance upon phthisical patients ; and that, throughout the report, little or nothing is said as to the surrounding conditions, which were really, in almost every instance, the true sources of the infection. In only 26 cases is the subject mentioned ; but in one, (No. 166), Dr. Dewar, of Arbroath, strikes what should have been the key-note of the inquiry by remarking that, in all his cases, 'the patients lived in small, confined houses, and slept in the box-beds in use in Scotland.' He adds: 'During twenty-five years I have not seen one case of contagion in the airy houses of the well-to-do.'

There are other defects in the record ; and, regarded simply as statistics, it cannot be said to prove anything. Moreover, if we were to accept it as such, the affirmative answers fall short of what they should be, even on the hypothesis that the disease is not contagious. Dr. Longstaff happily supplied, with the Record, a method of testing the results. He calculated the probability of the accidental and fatal incidence of phthisis, upon both husband and wife, during the ten years, 1871 to 1880 ; and he found that, without any infection being assumed, 4,358 cases of deaths of both husband and wife would have occurred in this period. On applying these figures to the data given in the record, it appears that about 250 of these purely accidental double deaths ought to have been noted by the 1,078 medical men who had made returns. This number is, however, barely reached in the tables meant to prove contagion, so that it would appear that many of the cases given were only coincidences. In the record, moreover, the observations extend over a variable period, dependent upon the experience of the observer, in some cases less, in some more, than a period of ten years, and some extend back even so far as fifty years. In any definite comparison also it would be necessary to deduct cases occurring out of Great Britain ; and it would be hardly right to include the thirty-five cases said only to have become manifest a few months after the partner's death. On the whole, therefore, as a statistical record, it appears to be at once imperfect and misleading.¹

¹ In Dr. Wilson Fox's *Treatise on Diseases of the Lungs* (pp. 560-574), there is a critical review on this subject, which contains several other points adverse to the contention of the direct communicability of phthisis.

Even if we do not deal with the figures before us as mere statistics, there is a much more serious objection to the admission of the evidence, as a proof of contagion, in the consideration that the occurrence of phthisis in both husband and wife may simply have been due to their exposure to similar influences, and the coincidences observed are thus only proofs that these influences greatly favour the virulence of tubercle. In reference to the question of contagion, therefore, it is obvious that we have mainly to consider the conditions under which alone infection can take place, and not simply the fact of contagion, about which nowadays there can really be no doubt whatever.

Nearly all the cases of supposed direct infection recorded are of the same type ; one or more successive cases occurring in a house, often without any proof of hereditary tendency to the disease, and in some instances there is evidence that the infecting material was brought from without into a house. In most there is great probability that the infection was in some way connected with the dwelling, but there is no trustworthy proof that the disease was caught directly from an inmate.

There is certainly nothing antecedently improbable in the theory of direct infection, seeing that the bacillus has been found, though very rarely, in the condensed aqueous vapour of the breath of consumptive persons, and that the spray scattered by their cough would be likely to contain still more of these organisms ; yet I believe that the direct transference of the disease is one of the rarest events in this climate.

There are several considerations against the theory of direct contagion. First the meagre result of the

inquiry just mentioned, and the likelihood that, even of the few cases thus brought to light, many were instances of indirect, and not of direct, infection. Second, the remarkable fact that the prevalence of phthisis is greatly affected by the nature of the subsoil of dwellings; and it is difficult to see why drainage of the soil should affect the contagiousness of phthisis. Third, if the simple contagion theory was true, hospitals for consumption should have been, at any rate in the past, centres and hotbeds of infection. But the universal testimony of the physicians to these institutions is, that no conveyance of the disease can be traced in any such institution, even before the practice of disinfection of the sputa had been carried out.

I have never yet found any satisfactory proof of infection, direct or indirect, in any well-ventilated house in this country; and this in spite of close contact, as in the attendance of a wife upon her husband, or in the nursing, and sleeping together, of near relatives and friends.

Other observers, notably Drs. Andrew, H. Bennet, Baumgarten, Ricochon, Wilson Fox, Walshe, and C. T. Williams, have come to the same conclusion; and, on the whole, we may conclude with Hirsch 'that contagious transmission of phthisis plays but a subordinate part in the spread of the malady.'

But the case is far otherwise when we transfer the accusation from the person of the consumptive, to the house or rooms in which he lives. Here the evidence is overwhelming that not only houses, but whole districts, are 'infecting tubercular areas.'

Distinct areas of infection are to be found in both town and country, though most abundantly in crowded,

ill ventilated houses, in the low-lying, badly drained, districts of large towns.

The best examples of infecting areas are to be found in the records of public institutions, such as workhouses, prisons, orphanages, &c. Hirsch, in his 'Handbook of Geographical Pathology,' gives a long list of such instances relating to scrofula,¹ and others relating to consumption in vol. iii. p. 222. Dr. Parkes, in his work on Hygiene (6th ed. p. 134), gives further examples; and Luzuriaga and Laennec anticipated Cornet, by giving cases of monastic establishments, in which there had been terrible proofs of the deadly influence of these badly ventilated dwellings upon the production of phthisis.

Most of the cases mentioned in the Collective Investigation Record, as proofs of direct contagion, may be cited as instances of infected and infecting houses. I have myself noted some striking cases similar to those given in the record. One was that of a whole family of six members carried off by the disease in one house, the mother, an old woman, alone surviving. In another family, again, four or five children were thus disposed of, one of them, a son, dying in another house after he had contracted the disease at home; but a daughter who was in service escaped altogether. In two other instances, several members of each family died of the disease within short periods of one another. The important feature in all these cases was that they occurred in small, badly ventilated cottages, situated upon clay soils. Some years ago, also, I made an inquiry into the inci-

¹ Syd. Soc. ii. 632.

dence of phthisis in some of the worst districts of Manchester and Salford.

Its results showed that the portions of these districts most affected by the disease were the close courts and alleys, the shut-in or blocked-up lanes, and above all the houses built back to back with no through ventilation. I especially noted the cases in which, in the space of five or six years included in the inquiry, double or treble occurrence of the disease had taken place in the same houses, and I found them very numerous.

These results have been confirmed by other observers. Thus Dr. Niven, of Oldham, writes to me, respecting 3,001 deaths from tuberculosis which occurred in that town during eleven years (1877-88), and states that they took place in the worst class of houses, and that in 302 cases there were two or more in a house. He has calculated mathematically the chance of any one house being twice affected (not infectedly), and he finds that only sixty-eight, on this hypothesis, would have thus suffered, whereas 274 houses were so attacked, and that whilst not more than 7.6 houses should have suffered thrice, the actual number so attacked was 24.

Again, Dr. Flick, of Philadelphia, has recently carried out an elaborate topographic study of phthisis in that city, extending over a period of twenty-five years, and he draws the following conclusions :

(1) 'That a house which has had one case of consumption will probably have another within a few years, and may have a very large number of cases in close succession ;' (2) 'that when a case of consumption occurs in a house, approximate houses are considerably exposed to contagion ;' (3) 'that houses in localities

where endemic after endemic has existed have, nevertheless, escaped the disease ;' (4) ' that tuberculoses of different kinds occur in the same localities and often on the same lots as consumption ;' and (5) ' that during the twenty-five years scarcely 20 per cent. of the houses of the ward were so affected.' He ascribes these results to contagion in the houses themselves.

There can be little doubt, I think, that the infective quality residing in these houses is due to tuberculous material, probably dried up, and reduced to dust, and remaining for weeks or months in an actively virulent condition. But it is not quite so clear to what this continued virulence is owing, nor yet why some houses should thus foster the disease, whilst others are free from blame in this respect. We have to ask, in the presence of the facts that have been recorded, whether any conditions outside the mere presence of the bacillus are necessary, or at any rate auxiliary, to its infective power.

From the history of the distribution of phthisis throughout the world we know, (*a*) that free ventilation and abundance of light are antagonistic to infection by the bacillus ; that under these conditions it does not usually spread from person to person, even under circumstances of the closest possible personal contact. We know, further, (*b*) that the prevalence of phthisis is greatly affected by a certain elevation of the site of dwellings, and that dampness of the subsoil under dwellings has a distinctly favourable influence in promoting attacks of the disease ; and, lastly, (*c*) that tuberculosis is more deadly and rapid in its action in hot, damp climates, and less common in cold and dry countries.

It is probable also that filth in dwellings is a

factor of some importance in determining the incidence of the disease, but freedom of the air from ordinary organic pollution is not essential to immunity from consumption. Many very dirty dwellings are free from it; such as the wattled huts of the Labrador fishermen, or the loosely constructed dwellings of the island of St. Kilda, and yet in these the inhabitants are almost exempt from phthisis.

It is difficult to explain these facts without having recourse to some hypothesis of outside conditions, necessary to the successful attack of the pathogenic organism. Either there must be some conditions in the dangerous dwellings which enable the bacillus to live longer outside the body, or else some which even increase its power of attack.

It might possibly account for the facts if we were to assume that the first of these hypotheses is true. For if it could be proved that an atmosphere laden with respiratory impurity, or a damp subsoil, or a hot, damp climate gives a longer term of life to the bacillus, the probability that some of these organisms would find a suitable host would be greatly increased; but I am inclined to think that something more than this is necessary, to account for the difference in intensity of bacillary infection in pure air, and in air reeking with organic vapours.

I have, therefore, ventured to suggest that the tubercle bacillus, like some other infective organisms, may actually increase in virulence, during a sojourn for a time, in some medium external to the body, whether that be polluted ground air or an atmosphere saturated with aqueous vapour from the lungs.

There is nothing in the natural history of such

organisms that need run counter to this theory. It is well known that the intensity of the poisons of cholera and enteric fever increases after their extrusion from the body; it may well be possible, therefore, that contact with a certain kind of organic matter may assist the multiplication of the bacillus of tubercle, and, after a time, also render it more virulent than at the moment of its exit from the lungs of a phthisical patient. From observations made at the Manchester Hospital for Consumption I have come to the conclusion, that a fresh infection of the lung, in persons already suffering from phthisis, is much more likely to take place from without than from within the body. Many times I have seen patients with sputum teeming with bacilli improve in health, gain weight, and almost lose the physical signs of their disease; and then they have returned home, and in a few weeks they have come back to the hospital, sometimes with fresh disease in the damaged lung, sometimes in the opposite lung that had been previously healthy, and sometimes with laryngeal phthisis. Such facts as these certainly seem to show, that there was something in the air of their own homes much more infective than the bacilli of which they were themselves the hosts.

We should probably find an explanation of all the facts relating to infected and immune homes if it could be shown, on the one hand, that sputum exposed for long periods in the former class of dwelling preserved its virulence, and even increased in activity, and, on the other hand, that sputum exposed in the immune house, lost its power for evil before it could have had time to dry up, and get powdered into dust

sufficiently fine to be capable of being carried about in currents of air.

Now, there are ample proofs, in the researches of Koch, Bollinger, Galtier, and others, that the bacillus is extremely long-lived under such conditions as are likely to prevail in infected houses. I have myself proved that such sputum, exposed to the air in a poor cottage in Ancoats, retained its virulence for two or three months at least. But the same sputum, exposed freely to the air and light in a consumption hospital, and in a well-lighted, well-ventilated, and well-drained house, entirely lost its power of communicating the disease after inoculation into guinea-pigs.

These experiments were carried out with the assistance of Professor Dreschfeld, of the Owens College; and the results were communicated to the Royal Society, in 1890.¹ Other observers have noted still longer periods of activity.

During the past year (1894) Professor Delépine joined me in the work, and we carried the research a step further.

We endeavoured, amongst other objects, to determine how short a period of exposure to air and light would suffice to destroy the virulent action of the microbe. The results were communicated to the Royal Society in May 1894, and published in vol. lvi. of the 'Proceedings.' The experiments were made with both pure cultivations and with dried sputum, in some cases scraped and reduced to dust. Guinea-pigs were used for the inoculations. The experiments with the dried sputum are the most interesting, as they conform most closely with the conditions that would be

¹ *Proc.* xlix. 66.

met with in practice. The specimens were exposed for short periods only—two, three, and seven days, though control specimens were kept for long periods of time in darkness, and with a very slight access of air. It was observed that in all the specimens exposed in the dark tuberculosis was the result, even with short exposures to free currents of air. It must be noted, however, that in the latter case only three days were allowed to elapse before the sputum was removed from the air current, and that therefore the minimum exposure to air alone was not discovered; but even with this short exposure it was rendered evident that air alone did somewhat attenuate the virus even in the dark. On the other hand, all the specimens exposed to both air and light even for two days only, and for one hour of sunshine, were found to have entirely lost their power for evil. It will be noticed that these times of exposure to either air or light were less than would suffice for the pulverisation of the sputum under ordinary circumstances. Specimens of the same tuberculous dust gave tubercle to guinea-pigs after it had been kept in the dark, and with very little air, for thirty-five days. It must be remembered that these tests were much more severe than would be found under ordinary circumstances. The animals employed are the most susceptible to the disease that could be found, and they took the virus through inoculation, and not merely by breathing; the usual safeguards against infection by the latter route, therefore, were entirely absent, and human beings might be expected to be much less vulnerable than guinea-pigs and rabbits.

It was doubtless important that these researches should be made, and that they should be repeated by

others ; for, if confirmed, they would explain the immunity from consumption of certain districts, and the infected character of others. I do not think, however, that they ought to be considered indispensable.

If men could give its due weight to the strong circumstantial evidence that has preceded the direct proof, they would have long before recognised the limitations of the infectiveness of tubercle. The history of the disease, and its distribution throughout the world and throughout society, would have been quite sufficient to place them on the right track. In reality the circumstantial evidence goes somewhat beyond the direct ; for we can hardly suppose that, in well-ventilated houses, there were no dark corners in which tuberculous dust had lodged for a longer or shorter time, and yet we can affirm that no infection took place.

The great value of the observations that have just been quoted is, that they afford an explanation of the immunity of certain places, and the danger of infection in others. They show that where tuberculous sputum can be exposed to sufficient light and air, to deprive it of virulence before it can be dried up and powdered into dust, no danger of infection need be dreaded. It is only when there is sufficient organic material in the air, derived from impure ground air, or from the reek of human bodies, that the tubercle bacillus can retain its existence and its virulent power. Long-lived though it be under these conditions, it is rapidly disinfected by the natural agency of fresh air and sunlight ; so rapidly that when these agents are present, even in comparatively moderate degree, the tuberculous material cannot reach its dangerous state of dust before it is deprived of virulence.

The direct experiments, then, show the mode in which disinfection is accomplished, and they point out the line that should be taken in any measures having for their object the eradication of tubercle from our midst. In the words of the dying Goethe, 'more light' is what we want, conjoined with more air and with greater cleanliness in our houses.

It will readily be seen that these considerations have an important bearing upon treatment, and we shall presently have to recur to them. They are especially important, however, in regard to the question of re-infection of already tuberculous cases.

CHAPTER IV

ON RE-INFECTION IN PHTHISIS

Laennec on secondary infection—Differences in this respect between rich and poor—Causes of—Theories to account for recrudescence—Migration of spores—Re-infection from external sources—Probability of the latter occurrence—Experience of hospital physicians—Considerations in favour of re-inoculation—Cases in illustration—Recoveries after change of residence—Practical lessons.

HITHERTO the existence of tubercular infection in houses has been considered chiefly as a source of danger to the healthy, but I wish to point out its importance to those who are, or have been, suffering from phthisis.

In his great work '*Traité de l'Auscultation Médiate*' (p. 699) Laennec expresses the opinion that 'no consumptive succumbs to a first attack of the tuberculous affection.' He also gives his reasons for believing in the complete arrest of the disease in certain cases. The truth of the latter belief has now been abundantly proved, not only by the experience of all who have closely watched the progress of the disease, but also, as we have seen, by the results of post-mortem examinations; and these last have the further advantage that they not only prove the possibility of cure, but demonstrate the very large proportion in which cures take place. It is obvious from these that in all places there must be a large

number of persons in whom one attack at least had been recovered from, and who are unconscious of the peril through which they have passed.

In a very large number of cases also Laennec's first proposition is true; and we may extend it by saying that not only do they not die of the first attack, but not a few recover from it, and have no more seizures.

Unfortunately this occurrence is not so common amongst the patients of our consumptive hospitals as it is amongst the rich, or amongst those who can take the necessary precautions against further attacks.

This difference in the results naturally opens up another question—why, in so many cases, the patients suffer from a series of attacks until ultimately they end in death—and again, whether there may not be something in the homes of the poorer class of patients that renders them more liable to a return of the disease?

The usual and, in many instances, the correct answer to this question is, that tuberculosis is an infective disease; that it spreads along the lymphatics or blood vessels, and that, though the bacilli may cease for a time to irritate, and may many of them be discharged from the body, yet a sufficient number remain behind to sporulate, and spread through the lungs or through the system; and that this occurrence is most likely to occur in unhealthy conditions of life.

According to this theory, recovery takes place only because the tissues are so well nourished, or otherwise protected, that the bacilli cannot spread from their first focus, and at length are either entirely discharged or die out. If any subsequent attacks occur, this

desirable result has not been obtained ; but the bacilli or their spores have taken advantage of some temporary weakness, or of some catarrh, to make a fresh start into surrounding parts. As I have already acknowledged, this is probably in many cases a perfectly correct representation of the course of events.

But there is at least one other explanation of a revival of the disease, and that is by a *re-infection* from *external* sources ; and if this occurrence is not rare, it points to a further source of danger to consumptive invalids.

It will, no doubt, be extremely difficult to prove in any given case that such re-infection has taken place, and that any particular outbreak of the disease has been due to such a cause ; but a few considerations will show not only its possibility, but its extreme probability in a large number of cases.

(1) We have now the certainty that the primary infection must have come, in most cases, from external sources ; and hence there can be nothing unusual in a second infection, or even in multiple infections, from similar surroundings.

(2) The patient has already proved himself to be susceptible of the disease, or vulnerable by the bacillus ; and is therefore probably by nature more liable than others to the disease.

(3) By reason also of his first attack, he is especially prone to become for a second time the host of the invading parasite. His damaged lung is less elastic, and less provided with the natural safeguards against its lodgment. We may also presume that the anti-microbic influences of the body, whether phagocytic

or antitoxic, are weaker than in the generality of human beings.

(4) It is almost certain that the primary source of infection was to be found in the unhealthy house, or in some usual haunt of the patient ; and, therefore, when he returns to his former condition of life, he will probably meet again with a contingent of the same enemy that made the first attack on his lungs.

(5) We may adduce the abundant evidence already given as to the existence of infected houses and infected workshops.

The distribution of phthisis in towns, and in places where bacillus-laden dust is most likely to be met with, its favourite haunts in badly ventilated, badly drained tenements, the evidence that now exists of the introduction of infection into houses, the discovery of the organism in these houses and in places inhabited by consumptives—all these facts show the presence of the poison in the places from which most of our patients in hospital come ; and they make it most probable that the inhalation of the bacillus will take place again and again, and that it will be received into susceptible lungs.

(6) Under this head also we may note the longevity of the bacillus of tubercle in the presence of respiratory impurity—polluted ground air or other organic filth—and its possible gain in virulence under these circumstances. The presence of a former consumptive, and the probability of his having left the specific poison somewhere in the house, make it still more likely that his home is a source of infection.

(7) And, lastly, we come to the experience of individual medical men ; and, although, for the reasons

already given, it will be impossible to affirm that re-infection, *ab extra*, has taken place in any one case, yet a frequent repetition of cases open to this interpretation will enhance the probability that some of them at least are of this character.

These considerations make the case for re-infection very strong. There are few hospital physicians who have not suffered the disappointment of seeing cases of phthisis deteriorate rapidly upon their return home, after they had greatly improved in hospital, and had even shown signs of cure.

It is one of the most disheartening facts connected with the treatment in hospital of this disease, whatever may be the nature of the medicinal agent used. In the hospital, after the first two or three weeks, most of the cases begin to improve; fever diminishes; the cough and expectoration subside; and the patients gain weight; sometimes to a considerable extent. But when they are discharged, after a few weeks or months of residence, and are obliged to return to their former occupations or to their old homes, they frequently break down, and they come back to the out-door department with a fresh development of the disease.

This is a common experience at most consumption hospitals, and it is, of course, open to the explanation that the fresh air, and good food, and healthy surroundings of the hospital, kept the enemy at bay for the time; but that it again advanced, when the poor food, and unhealthy conditions of the dwelling, had so far lowered the patient's vital power that he could no longer resist its attacks.

No one can affirm that such a course as this is not in accordance with what we know of the natural

progress of the disease ; and yet, from the considerations which have just been noted, it is at least as likely that the virus, instead of coming from within the body, has been derived from the poisonous atmosphere of the home. And in some of these cases there are certain facts to be noted that make the latter the most probable explanation of the case. Thus :—

(1) In not a few instances the disease, instead of spreading in a natural and usual fashion along the track of the absorbents, commences afresh in some part of the opposite lung, or in the larynx.

(2) In other instances the patient does not return home at once after leaving the hospital, but goes to stay with friends in the country, with people who are as poorly off as himself, where the main difference between his own home and the place of his temporary sojourn is fresh country air ; and, whilst he is under these otherwise unfavourable conditions, he still continues well and gains in weight ; but after he finally returns home, and has remained there only a few weeks, the disease again breaks out, makes rapid progress, and soon comes to a fatal end.

(3) In some of the cases the interval between the first return home and the fresh outbreak of the disease is from three to six weeks, just about the usual incubation period of tubercular infection.

(4) Lastly, it is fair to count the numerous cases now known to have remained free from fresh outbreaks after change of residence, as presenting, for the most part, instances of escape from re-infection from without. If, as some physicians contend, after a first attack the disease remains latent, waiting only for an opportunity

to develop, it is difficult to understand why so many of these cases escape, in spite of the many depressing circumstances that often attend the change of residence and change of occupation.

It is precisely among those persons who take to a hard life, with exposure to out-door influences, often with poor and insufficient food, that we find our best instances of permanent cure. In many cases, in order to avoid the foul air, which I and so many others consider the chief source of danger, our poor patients often have to descend into a lower grade of labour, such as agricultural employment, omnibus conducting, ship stewardship, and so on; and yet the so-called latent tubercle finds no fresh point of attack; and the disease only reappears when the patient has been exposed to new sources of infection from without. To my mind, the theory of redevelopment of latent tubercle under these circumstances is contrary to all the canons of scientific evidence.

The following cases will illustrate one or more of these points tending to incriminate the infected home:—

CASE I.—J. T. J., æt. 19, was admitted to the hospital on January 10, 1888, with softening tubercle at the right apex, and slight consolidation on the left side. His weight on admission was 108 lbs., and under treatment by iodoform, cod-liver oil, and ozone inhalations (five cylinders daily) he improved steadily, the disease remaining absolutely stationary, though bacilli were abundant in the sputum. He was discharged on April 27, weighing 124½ lbs.—a gain of more than 16 lbs. He then went to stay with friends at a little farm in Wales, where the food was scanty, but he continued to improve, and gained 10 lbs. more in weight in the course of this year and the next. He returned to his own home in the autumn of 1889, and he was readmitted to the hospital on

November 22, 1889. He still looked robust and well, and weighed 135 lbs. His left lung was normal, and there were no signs of extension of disease on the right side, but his voice was hoarse, and on laryngoscopic examination tubercular infiltration of the epiglottis was found to be commencing. From this time he steadily lost ground, the disease spreading through the right lung and in the larynx, and he died in the spring of 1891.

CASE II.—E. F., male, æt. 29, was admitted to hospital on July 18, 1888, with a twelve months' history of phthisis, now in the second stage on the left side, and slight consolidation at the right apex. His weight on admission was 141½ lbs., and after four months' treatment with cod-liver oil and ozone inhalations he gained 5¼ lbs. in weight, and the disease in the lungs remained stationary. He was discharged on November 5, but was readmitted on January 18, 1889, having lost 10 lbs. in weight, with an extension of disease in the right lung and a cavity in the apex. He regained 7 lbs. in weight in the next two months, and improved for a time, but after his discharge he again rapidly lost ground, and died in the autumn.

CASE III.—R. H., male, æt. 17, admitted May 5, 1889, had hæmoptysis six months before—now a cavity in the right apex—left side normal. He was treated with iodoform, cod-liver oil, and ozone inhalations (three cylinders thrice daily), and on September 10 he was discharged, having gained 6 lbs. in weight, with the note that 'the disease had not progressed in the slightest.' He returned home, but was readmitted on November 19, having lost 7 lbs. in weight, with softening tubercle on the left side, considerable extension of the disease on the right, and with tubercular laryngitis. He died a few months later.

CASE IV.—J. B., male, æt. 29, clerk, admitted to hospital April 17, 1885, with softening tubercle at both apices (one year's history). He remained five weeks, taking chiefly iodoform and cod-liver oil, and improved very much, gaining several pounds in weight. He then (in June 1885) went to Canada, but returned in fourteen months. He had been

employed as a farm labourer, and found the food inferior and the hardship great ; but notwithstanding this he had gained weight, and the disease had not advanced in the least. In September 1886 he went home ; and in March 1887 he was readmitted as an in-patient, with increased disease on the right side. He again improved, however, and left in June, weighing 121 lbs. He returned to work and to his old home, and in April 1889 he was again received as an in-patient, having lost 19 lbs. in weight, and with a large vomica in the left upper lobe.

CASE V.—A. W., female, æt. 16, weaver, had hæmoptysis in September 1890, and twice in the spring of 1891. Was admitted to hospital on May 20, 1891, with a vomica at the left apex and slight consolidation of the right. Sputum crowded with bacilli (B. 3). She was treated with creasote, cod-liver oil, and carbolic inhalation, afterwards with iodoform ; and was discharged on December 11, having gained 20 lbs. in weight. The cavity contracting, the sputum much diminished in quantity, and the bacilli reduced to B. 1.

A place as waiting-maid was found for her in the country ; but before going to it she went home to Bradford, in Manchester, for a week. Three weeks after going to her situation she fell ill, with increased cough and expectoration, fever, and night sweats, which lasted several weeks. Three months after her recovery she came to the out-patient department and was examined, and although the disease was again quiescent, it was evident that there had been an extension in the right lung.

CASE VI.—S. D., box-maker. Phthisical history of three years. Admitted to hospital May 13, 1889, with a large cavity in right apex. Left side, doubtful consolidation at apex. In three months gained 21 lbs. in weight on cod-liver oil and iodoform. Returned home, and to work six or seven hours a day. Cough returned six months later, and she lost 13 lbs. in weight.

Readmitted October 4, 1890, with softening tubercle in the left upper lobe ; no extension of the disease on the right side. She died in the spring of 1892.

The following table gives a further record of cases of practical recovery after change of residence, in most instances in this country, and often in the same district.

CASES OF PHTHISIS WHO HAD CHANGED THEIR RESIDENCE

No.	Name	Sex	Age	Stage	Duration of life
1	Mc. K. . .	Male	34	Third	Living 7 years after
2	Mrs. C. . .	Female	35	First	Died 20 "
3	L. C. . . .	"	30	"	Living 26 "
4	Miss R. . .	"	25	"	" 15 "
5	Mrs. J. . .	"	30	Second	" 20 "
6	G. S. . . .	"	18	First	" 17 "
7	Th. J. . . .	Male	45	"	" 20 "
8	F. R. . . .	"	36	"	" 14 "
9	W. W. . . .	"	45	"	" 10 "
10	Mrs. M. W. .	Female	25	Third	" 17 "
11	" K. . . .	"	39	Second	" 12 "
12	" S. . . .	"	30	First	" 20 "
13	" D. . . .	"	30	"	" 18 "
14	J. G. . . .	Male	28	Second	" 40 "
15	A. B. . . .	"	19	First	" 20 "
16	F. G. . . .	"	18	"	" 18 "
17	C. C. . . .	"	47	Second	" 30 "
18	A. H. . . .	Female	18	First	" 20 "
19	D. W. . . .	Male	30	Third	Died 40 "
20	H. B. . . .	Female	20	Second	Living 8 "

These cases are not to be regarded in any sense statistically. They are merely examples of a numerous series of instances of similar character which have come under my notice at the Manchester Hospital for Consumption. Not one of the detailed cases can be recorded as a distinct and undoubted instance of re-infection; for in each there is the possibility that the subsequent outburst of disease had an internal source: but the repeated occurrence of such cases, viewed in the light of the *a priori* considerations which have been mentioned, has left a profound impression on my own mind; and has led me to affirm the strong probability of re-infection upon a patient's return to previous conditions of life.

It also leads to the inquiry as to the best means of preventing such an occurrence, especially in the numerous class of cases in which removal to another dwelling cannot be carried out ; and I venture to think that the practical lessons to be drawn from the facts are : (1) The need either of change of residence, or of the thorough disinfection of premises occupied or frequented by consumptive persons ; (2) the duty of constantly destroying the sputum from these patients by fire, by prolonged boiling, by carbolic acid, or by corrosive sublimate.

These measures have hitherto been chiefly advocated on the plea that they are necessary for the protection of other members of the family, or of the public ; but if it be true that in many cases of phthisis, the primary lesions would entirely heal unless fresh infection takes place, it becomes a part of our treatment for the cure of these cases to take care that these measures are carried out.

It may be stated that these considerations so far weighed with the then Medical Officers of Health for Manchester and Salford, Drs. Tatham and Paget, that they agreed to disinfect any houses notified to them by the medical staff of the Hospital for Consumption ; and this course has since been carried out in several instances in both districts. Experiments as to the most efficient system of disinfection have also been carried out, under the direction of Professor Delépine, of the Owens College, and have been published in a Report on the Disinfection of Tubercle-infected houses.¹

¹ *Brit. Med. Journal*, vol. ii. 1895.

CHAPTER V

PREVENTIVE MEASURES AGAINST PHTHISIS

Checks to the marriage of persons hereditarily predisposed to phthisis—Statistics as to influence of heredity: Briquet, Pollock, Welch, C. T. Williams, Walshe—Sources of fallacy in these statistics—Caution as to marriage—Means of preventing acquired predisposition—Means for preventing infection from without: in food or drink, in the atmosphere—Prevention and disinfection of tuberculous dust—Modified notification of phthisis—Disinfection of dwellings—Hospital accommodation—General sanitary measures—Drainage of subsoils—Influence of dry sites for houses—Free ventilation: of towns, of houses—Sanitary reconstruction—Building bye-laws

WHAT we have learnt as to the causation of phthisis we may now apply to its prevention, both in individuals and in communities.

1. First, as to the question of preventing the disease by attempting to check marriages of persons with what is called the hereditary taint of tubercle. Some writers, notably the eminent German authority, Professor Baumgarten, and Professor Germain Sée, believe that the chief mode of origin of the disease is by spores, that may lie latent all our lives, waiting for favourable circumstances to enable them to declare themselves; and there are others, like Dr. Chaplin,¹ who, while they admit that infection comes from without, yet believe so strongly in hereditary predis-

¹ *Med. Mag.*, May 1893, p. 1026.

position, that they hold that, 'unless the bacilli can be banished, so to speak, a complete scheme for the prevention of consumption must prohibit marriage among those with a strong hereditary predisposition.'

Now the best authorities seem to agree very fairly together as to the influence that may be assigned to heredity. Briquet, as the result of a special inquiry into this subject, found that rather less than one-third of his consumptive patients were born of consumptive parents, on one side or the other.

Dr. Pollock gives 30 per cent. as the proportion noted at the Brompton Hospital. Mr. Welch found that, in the Army, 60 per cent. of the cases of phthisis were non-hereditary. Dr. Quain and others state that amongst the lower classes hereditary predisposition could only be traced in 25 per cent.; and, amongst the rich, Dr. C. T. Williams shows that amongst 1,000 cases only 12 per cent. of direct influence, and 48 of family predisposition, could be discovered. But there are two important sources of fallacy in all these calculations; one is the extreme difficulty of obtaining accurate information as to the causes of death of progenitors, and the other is the impossibility of separating the effects of external influences from hereditary predisposition.

Dr. Walshe points out that the above-given ratios are really no more than we should expect to find, even if there were no transmitted taint: for consumption now carries off from one-third to one-half of the population at ages between the child-producing periods; and hence the above-mentioned ratios would be likely to be found, even without predisposition.

Still, though it may be over-rated, no one who has

had much experience in consumption can doubt that a certain vulnerability by the bacillus may be, and often is, transmitted in families ; and, hence, that it is our duty to minimise the risk as much as possible. It would be impossible to prohibit marriages between the members of tuberculous families. But it is doubtless of importance to secure a healthy public opinion on this point ; and fortunately most intelligent people are already on our side ; the heads of families are even now cautious in sanctioning marriages with individuals suspected of having a tuberculous ancestry. Medical men and ministers of religion also have much in their power, and may assist in discountenancing these marriages ; but this is the utmost that we can do.

2. But there is not only an inherited, but also an acquired predisposition to the disease ; and the sources of this predisposition are much more within our control.

Thus, in occupations that involve stooping and cramped postures when at work, much may be hoped from the introduction of machinery for at least the worst part of the work. For seamstresses and boot-makers, the sewing machine ; machines are even now largely employed for lace-making, hosiery, and embroidery, machine-made watches are rapidly taking the place of hand-made articles, and other trades are more and more making use of machinery in order to lighten labour.

We may hope that, eventually, by means of a better organisation of labour, even the poor button-hole and shirt makers may escape some of their most arduous toil.

3. Again, in dusty employments, especially those producing the more injurious dusts, the use of free

ventilation, and of fans to carry the irritating particles away from the mouth, has become almost universal. It is to the credit of England that most of the forms of life-saving machinery in unhealthy occupations have been introduced in this country ; and Mons. de Freycinet, in his great work on this subject, was obliged to draw nearly all his examples from the workshops of Great Britain.

4. The baleful consequences of imperfectly cured injuries to the lungs were also alluded to in our second chapter ; and they render necessary the most careful prophylaxis against the ingrafting of tubercle in regions of the chest, thus prepared for the reception and fostering of the bacillus. In the Milroy Lectures for 1890, I have ventured to point out that discrimination must be used in selecting the cases to be submitted to the restrictions, which it is needful to impose upon those who are most prone to such harbourage of tuberculous dust.

Thus, it is necessary that, during attacks of acute bronchitis, pleurisy, and other inflammatory complaints, care should be taken to secure the complete resolution of the disease : but when this has been attained, and the full elasticity of the lungs has returned, it has not been within my experience, that persons who have suffered from these complaints are more liable to consumption than other people ; though, of course, subsequent attacks may at last leave the lungs more open to the disease. After these complaints, and especially after pneumonia with imperfect resolution, after broncho-pneumonia, and pleuro-pneumonia, there is undoubtedly danger so long as there remain any contraction of the chest, and want of full expansive

power. There seems to be less reason to dread the occurrence of phthisis in chronic bronchitis, asthma, and emphysema.

In all cases in which the respiratory movements are impeded, however, it is well to guard sedulously against the introduction of the bacillus into the lungs; and I have been in the habit of forbidding such persons to go into crowded assemblies of any kind, unless an antiseptic respirator can be worn; and I have enjoined a constant attention to the hygienic rules which will be laid down in the next chapter.

5. We come next to the means to be used in order to minimise the danger of the introduction of the bacillus from without.

We have to guard against the ingestion of the milk or flesh of tuberculous cattle, and against the inhalation of virulent tuberculous dust. It would probably not be difficult for sanitary authorities to prevent the first of these evils. It would simply be necessary to have more thorough, and more scientific inspection by experts, both of meat markets and dairy farms, the injection of tuberculin being used for diagnostic purposes. A greater solidarity between urban and rural authorities than now exists would also be necessary, so that the sources of milk supply could be kept under efficient control. Private persons would have to be taught the paramount necessity of thorough cooking of food, and of boiling milk.

A much more difficult matter is the prevention of the inhalation of virulent tuberculous dust. Doubtless, if we could secure that every particle of tuberculous sputum was effectually destroyed or disinfected, we might rest assured that no element of infection could

be spread abroad to convey the disease ; but under present conditions no such security can be ours. We should have to know and to recognise each case from its first inception ; but every medical man knows how subtle the disease is, and how stealthily it often makes its first advances ; and yet the sputum, even in the earliest stages of phthisis, usually contains multitudes of bacilli. Again, we should have to make sure that every affected person, even amongst the most ignorant and careless, was thoroughly instructed how to deal with this material of disease. I venture to say that, as neither of these essential conditions can be observed, there remains to us only the alternative, almost equally difficult to carry out, of seeing that the conditions of life, which surround these dangerous persons, are such as to secure the destruction of the virus, before it can become transformed into dust ; sufficiently light to be carried into the air, and through this medium into the lungs of susceptible persons.

It has been found, both by direct experiment and by the evidence gathered from the history of the disease, that the only natural means of disinfection are pure air, a dry and pure subsoil, and abundance of sunshine. Can we say that these means can be secured to the poor denizens of our overcrowded towns ? I fear not.

Yet, in spite of all the difficulty, there is no need for us to stand with arms folded, as if nothing could be accomplished.

1. The first and most important part of the work must necessarily be undertaken by local sanitary authorities, the end in view being the lessening of the danger of infection.

To this end it seems to me of the greatest impor-

tance that medical officers of health should be made aware, as soon as possible, of the presence in any unhealthy dwellings of persons affected with phthisis, who are unable themselves to carry out the necessary measures of disinfection of sputum, clothing, or houses.

Hence, some kind of modified notification of such cases will be required. It would be unnecessary, and undesirable, to put into force any compulsory powers for this purpose ; but poor-law medical officers, and medical practitioners in poor neighbourhoods, and the medical attendants at public institutions, might be requested to notify to the Health Office such cases as they thought needed assistance of the kind ; they might be supplied with receptacles for specimens of sputum ; and they might be informed that, for every such case of phthisis, ascertained to be such by an official pathologist, they would receive the customary fee for notification.

2. Next would come the measures for disinfection : the regular cleansing and whitewashing and ventilation of the premises, the disposal of excretions, and especially of the expectorated material.

If necessary, disinfection of rooms by a one per cent. solution of chlorinated lime, after Prof. Delépine's method,¹ should be carried out. The sputum of consumptive persons must be destroyed quickly, and must not be allowed to become dry. A spitting cup, containing just enough 5 per cent. solution of carbolic acid or a weak solution of chlorinated lime to cover the bottom, should be used ; or, better still, a paper spittoon that can be burnt.

¹ See *Med. Chronicle*, May 1894.

Out of doors, a pocket-flask, such as Dettweiler's, that can be scalded after using, should be employed.

Small pieces of linen, or calico, or Japanese paper, should be carried, and if absolutely needful may be used, and immediately burnt. Pocket-handkerchiefs should never be used to receive the expectoration.¹

After death, measures should be taken for the thorough disinfection of the house, bedding, and clothes.

3. *Hospital accommodation.*—There would next come the question of the propriety, or possibility, of removing the sick person to hospital. So long as he (or she) could work, and so long as he would consent to use the necessary means for destroying the infective material, it would be unnecessary to do more than I have already indicated: but, when the patient becomes unable to follow his employment, and the family are obliged to seek for assistance from the parish, he has a claim to be received into the workhouse hospital; and such an asylum should be offered him, and should be made as little humiliating, and as free from ignominy, as possible. I would also put in a plea for those who are not reduced to pauperism, but who could be removed to hospital to receive appropriate treatment in the wards. Towards the close of their illness, persons who live in close, confined dwellings become a serious source of danger to the rest of the family; and, as they are without proper lodging and accommodation for the safe treatment of such a disease, I would submit that it would be a legitimate expenditure on the part of local authorities, if they were to provide male and female

¹ Specimens of leaflets, that may be distributed, containing directions on these points, are given in the Appendix.

wards, for the reception of such cases, in connection with their hospitals for infectious diseases. Although consumption is not directly infectious, yet its products are undoubtedly infective under certain conditions, such as have been mentioned ; and local boards would be taking the right measures for preventing the spread of disease if they were to make such provision : for there are probably few exanthematous diseases that can be so easily and effectively controlled.

4. *General sanitary measures.*—It is probably to these that we must look for any large reduction in the rate of mortality from tubercle. We have already seen that this rate is high wherever the subsoil is badly drained or impure ; and it has been found that deep and thorough drainage of this subsoil has in many instances greatly diminished the mortality. In the case of Salisbury it was reduced 50 per cent., and similar reports have come from other towns. We are not greatly concerned with the universal application of this general rule ; but it may be pointed out that where it failed, as at Reading, it was because the necessary drying of the soil was not secured. It is sufficient for us to point to the results noted by Sir G. Buchanan, Dr. Bowditch, Dr. Haviland, and by the Registrar-General for Scotland. My own observations also, detailed in a paper on ‘Tubercular Infective Areas,’¹ are entirely in favour of the view that a pure, well-drained subsoil is antagonistic to the spread of the disease. I have recently obtained confirmation of the results cited in the paper above mentioned.

It seems to me that the story is well worth retelling.

¹ *Trans. of the Epidem. Soc.* vol. vi. (N.S.).

I had been struck with the freedom from the disease enjoyed by a section of the locality in which I myself then lived ; and it occurred to me that I might ascertain how many cases originated in the different parts of the district. A great portion of it is composed of deep, porous, sandy soil ; but it is surrounded by boulder-clay, the result of glacial drift : and a great part of Bowdon, and parts of Dunham and Altrincham, are built upon a thick bed of sand, in many places over 100 feet in thickness. The climate is thus rendered more temperate, and the air and soil drier and purer.

After the wettest weather the paths speedily become dry ; and the basement of a house is often as dry as its attic. It has the further advantage that it is virgin soil. The sand is as pure and free from organic matter as in the days when it was deposited by ice-floes, or was silted up by the Mersey. No house is ever built upon freshly made ground, or on pits that have been filled up with refuse. The locality is well-sewered, and has a plentiful supply of good water. Moreover, the inhabitants are, for the most part, well-to-do people. Out of 2,559 of population at the last census, only about 500 are poor ; and these live on the low-lying clay lands that surround the sandy downs upon which Bowdon is built. The remainder dwell in well-built, salubrious houses ; they are well fed, and comfortable in their circumstances.

It will thus be seen that such a community are in a position peculiarly well fitted to preserve them from attacks of tubercular disease. I was, however, hardly prepared for the result of my inquiries. Owing to the courtesy of the Registrar-General, and of Dr. Farr,

I was able to obtain, from the superintendent-registrar at Knutsford, a return of the deaths from diseases of the lungs occurring in Bowdon in the nine years 1875-84. Of these, twenty-two were from phthisis; but eleven of them took place in the low-lying clay lands before mentioned; and nine of the remainder were found to have contracted the disease before coming to Bowdon. This leaves two to be accounted for; and one of these was a gentleman connected with the City Mission in Manchester, who was, therefore, constantly obliged to attend crowded evening meetings in different parts of the town. The other was a merchant's clerk, who went to town at eight every morning, and did not return until 7 P.M. No woman or child died of the complaint; in other words, the disease did not originate in any of the stationary population resident during the nine years upon the sandy portion of the district. This year (1895) I have obtained similar returns for the nine years succeeding 1884; and the results are strikingly like those just given. Again, the total for the nine years was twenty-two; and of these nine were on the clay lands, thirteen on the higher ground; but seven of them were ascertained to have been imported. It must be remembered also that the population of the higher grounds was five times as numerous as that on the low ground.

The moral of all these researches is that it should be one of the chief aims of local authorities to have their districts thoroughly well drained, and to make sure that all dwellings are sufficiently protected against ground air, and ground water, by efficient concrete foundations, damp-proof courses, &c. &c.

Most large towns have now secured ample powers to compel the observance of these provisions, so requisite, not only for protection against consumption, but also for the general health. But the old parts of towns, which supply the largest part of the phthisis death-rate, are still left in a dangerous condition.

Local authorities, again, will have to pay more attention than they do at present to the subject of free and thorough ventilation. Viewed in relation to the prevention of phthisis, however, the subject of ventilation, in its widest sense, is a very large and a very difficult one. It involves not only the mechanical problem of admitting to living rooms a sufficient number of cubic feet of the outer air, but it includes the removal of what has been aptly termed the air-sewage from that air, and from the air of all places where human beings congregate. In the streets of towns there must be free course given to the winds of heaven ; there must be no blind alleys or streets closed up at one end. It is very important, therefore, that houses should be made healthily habitable by securing thorough ventilation ; that back-to-back houses, and undrained and unaerated basements, should be utterly abolished ; in other words, that the cave-dwellers of modern times should be provided with decent and healthy tenements ; that workshops and factories should be properly ventilated and freed from dust ; that schools and places of public assembly should be more efficiently supplied with a sufficient flow of air in proportion to their temporary inmates ; but, whilst all this is being attended to more thoroughly than it is at present, greater attention must also be

paid to the laying out of the streets, and to the condition of the outer air.

To satisfy these requirements, the local authorities of most of our large towns will have to undertake extensive works of sanitary reconstruction, and will have to put in force the strongest powers they now possess for the prevention of pollution of the atmosphere, by smoke and noxious vapours; and they must provide ample lung space in the shape of public parks and open play-grounds. There can be no doubt that, in order to carry out these views, and to lower the fearful death-rates from diseases of the respiratory organs, and from infantile diarrhœa, which now prevail in well-known unhealthy areas of such towns as Manchester, Salford, and Preston, it will be necessary to entirely reconstruct large portions of the old parts of these towns.

Owing to the enlightened policy of certain city councils, such as those of Liverpool and London, powers have now been obtained to secure that an adequate space shall be left around all houses or buildings in the future; and that this space shall be proportional to the height of the buildings, so that, not only sufficient air, but also sufficient light, shall have access to the dwellings. We have already seen how important this provision is in respect to the destruction of the virus of tubercle; and we cannot doubt that, when these towns are reconstructed upon these principles, the reign of phthisis will be much less secure than it has been in the past.

But the defensive measures to be taken against phthisis must by no means be confined to the public authorities: as much or more care must be taken by

private individuals not to live in damp houses ; not to breathe air that has already been befouled by previous breathing or by filth of any kind ; and not to close the living rooms against the beneficial influence of direct sunlight. Hence the need of cleanliness and brightness in the house ; soap and water washing, dusting, &c., done in such a manner as not to add fresh evils to those of dirt ; and the daily flushing of rooms with free currents of the outer air.

The maxims of cleanly housewives against dust and dirt have all been strongly reinforced by the researches of modern bacteriologists. People will, however, have to be taught the importance of more light, and of more constant currents of air through their houses. Ventilation, as it is practised nowadays, is often a mere sham. The inlets and outlets for fresh air are usually far too small for the number of the inmates of the dwelling-rooms ; and the ventilation of most of our places of public assembly are a disgrace to modern science.

Fresh air, day and night, must be admitted to all living rooms and bedrooms ; and the present foolish dread of what is called ' night-air ' must be overcome. Light, too, which is now often excluded from a fear of spoiling the furniture, &c., must be admitted as freely as possible ; and must come to be regarded as—what it indeed is—Nature's best gift for the prevention of disease.

These measures, along with as abundant, simple, and nourishing food as possible, will afford a better protection against consumption than could be obtained by any collocation of drugs, or by the use of the most vaunted disinfectants.

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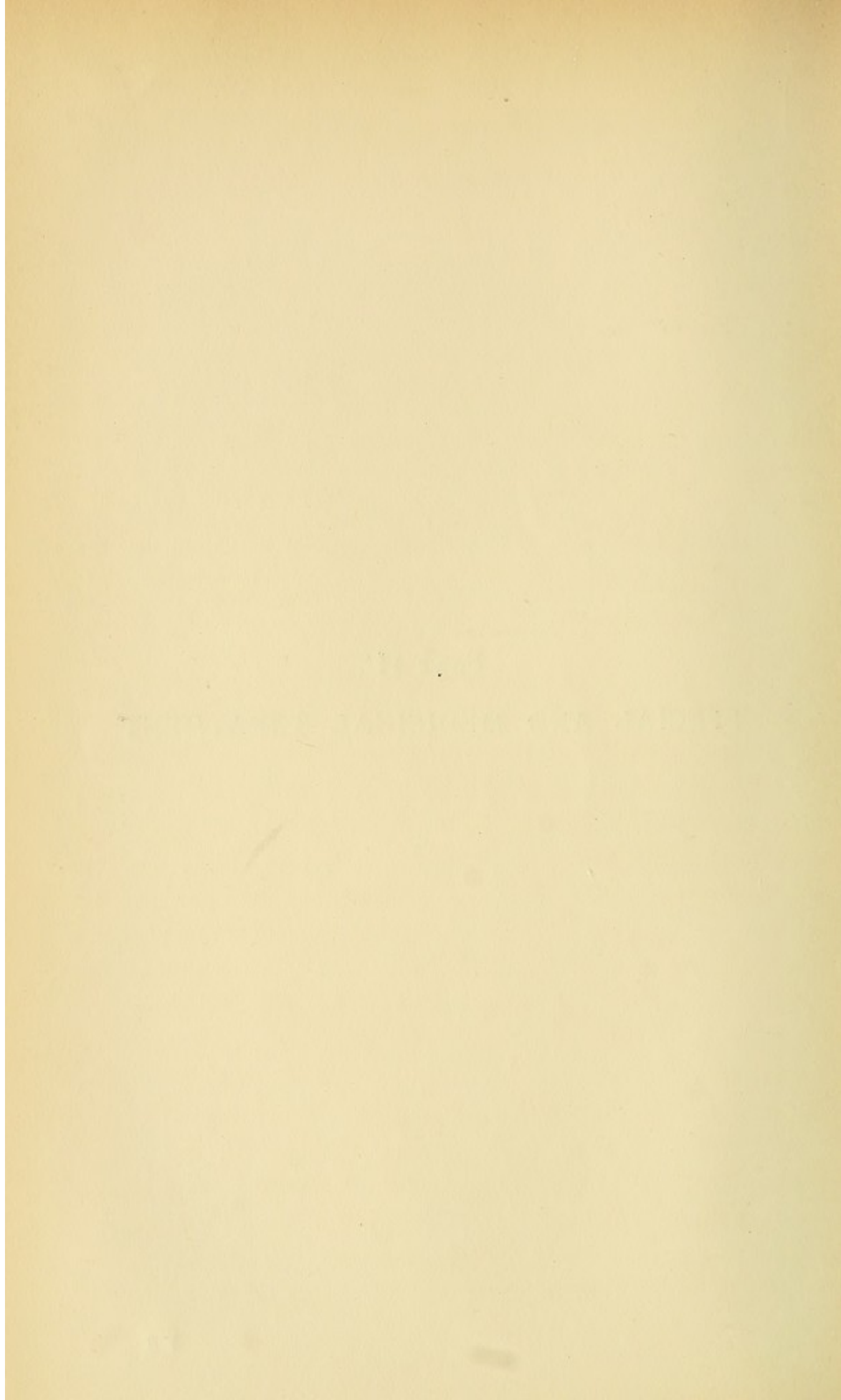
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PART II
SPECIAL AND MEDICINAL TREATMENT



CHAPTER VI

PROPHYLAXIS AGAINST PHTHISIS

Management of susceptible persons: of the hereditarily predisposed—Dr. H. Weber's case—Duties of the medical attendant—Change of residence—Offspring of tuberculous parents—Artificial mother's milk—Diet—Site of dwelling—Ventilation, Dr. MacCormac on—Open windows—Education—Occupations—Care after illness—Treatment of strumous glands, deformities, &c.—Exercises

THE means to be adopted in order to preserve susceptible persons from contracting consumption may be conveniently placed in three categories: (1) measures directed as far as possible against the predisposition to tubercle, whether this is inherited or acquired; (2) the avoidance of probable sources of infection, or occasions of inhaling, or otherwise admitting into the body, any particles of the tubercular virus; (3) measures, chiefly hygienic, directed towards ensuring full vigour to the system and of so strengthening the protective powers of the frame, that it may be able to cope with any particles of the virus that may chance to gain an entrance within its precincts. These subjects necessarily somewhat overlap those already touched upon in speaking of the prevention of phthisis, and those concerned with the direct treatment of the disease. We have already indicated the means to be employed by the State, and by local authorities, and

presently we shall have to take up the subject of hygienic treatment, but it will be well to call attention to the special management of susceptible persons.

The patients who are to be subjected to this treatment may generally be classed under the following heads: (1) Those who are hereditarily predisposed to the disease; (2) those who have become vulnerable by the bacillus of tubercle owing to disease affecting the general system, or the lungs; (3) those who have already shown themselves susceptible to the virus, by experiences in which either certain glands have become tuberculous, or in which actual mischief has occurred to the lungs, which mischief has become latent. This last class, as we have seen, is much larger than is commonly supposed.

Moreover, as was pointed out by Dr. G. Heron, Percy Kidd, and others, in the discussion at the Med. Chir. Society (May 1888), it is often impossible to detect the first beginnings of phthisis, whether by the bacillus search, or by means of physical signs. Dr. Dobell, also, has done good service in calling attention to what he calls the pre-tubercular stage—the ‘eventful period,’ when the system is being prepared for the admission of the bacillus; an indefinite, but yet precious period, in which much may be done to strengthen the defences of the body.¹

¹ Dr. Dobell lays great stress upon the ‘loss of weight,’ which often precedes all other manifestations of consumption, on the deranged digestion, and on the presence of *débris* of tissues. He also suggests the following as the ‘order of events’: (1) Deficiency of fat in the blood, (2) Oxidation and disintegration of albuminoid matters *in situ*, with the consequent production of molecular *débris*, (3) The presence of this molecular *débris* determining the habitat of the bacillus. (*Bac. Cons.* p. 62.) Whatever may be the ultimate fate of these hypotheses, it is certain that we cannot be wrong in including all persons in this stage in our list as suitable for prophylactic treatment.

We may add that the precautions that we shall advocate may well be adopted by all those who are admittedly consumptive as they also are liable to fresh invasions of the bacillus.

The measures to be taken, even though they may be deemed somewhat onerous, have, at least, the great merit that they are certain to be successful in the case of the first two classes of patients, always providing that they are rigorously carried out, and that nothing is allowed to interfere with their full operation.

We have already discussed the question of the possibility of preventing the bringing into the world children, whose organs are predisposed to tubercle by inheritance, either the offspring of the marriages of consanguineous persons, or of those with a strong family history of phthisis; and we have decided that, however desirable it might be, it is, at the present time, quite impossible.

But, however strong the family taint may be, I believe that it is quite possible to prove that the families born of such marriages are not necessarily doomed to the disease, if only they have the means and the will to carry out all the instructions that physicians can now prescribe. In other words, I believe with Louis that 'very few people are born necessarily to die of consumption,' and that very much may be done to save the children of consumptives from the fate of their parents. A case of great interest in this regard is given by Dr. H. Weber, in the Croonian Lectures of 1885. He says, 'About thirty years ago I saw a lady affected with rapid consumption, living in a small street near Bloomsbury Square; the husband, a teacher of languages, had just died under my care,

at the German Hospital, of chronic consumption, at the age of 38. He was a member of a consumptive family. The wife's family, also, was by no means free from consumption; indeed, out of three brothers and two sisters, two brothers and one sister had already died of the disease. She herself had had seven children, between the ages of 12 and 1. The second of these had died from tubercular meningitis. The others, namely, four boys aged respectively 12, 9, 7, and 2 years, and two girls of 5 and 1, were fairly healthy, excepting the youngest boy, who was pale and rachitic. After the death of the mother, some relatives, intelligent and wealthy at the same time, took entire charge of the children. They took them to their home in a mountainous region of Silesia, one of the healthiest parts of Germany. The oldest son remained well so long as he took much outdoor exercise; but at the age of 23 he became wrapped up in the study of languages, worked day and night, gave up exercise, took most of his meals in his study surrounded by books, and perished from rapid consumption in less than eighteen months. The second son took to farming, and was in excellent health up to the age of 29, when he found his occupation not remunerative enough, and began to work in a commercial house, being confined in an ill-ventilated office during the greater part of the day, and working besides this at home, with the hope of gaining a better position. After scarcely two years of this intensified city life he had several attacks of hæmoptysis, and died in less than two years from the outset. The third son has become a cavalry soldier, leading a judicious life, and is a strong and healthy

looking man. The fourth child, then a girl of five years old, is now a country parson's wife in a healthy part of Silesia, has no children, and is perfectly healthy. The youngest son, rachitic as a child, has become a powerful man, and is a farmer near Manitoba in Canada, and the younger daughter, staying with him, is likewise strong and healthy. The history of this family is very instructive; it shows that, by favourable circumstances, even a strongly marked family tendency may be neutralised; and this becomes still more manifest when I add that by far the majority, namely nine out of eleven, of the cousins of these children have died from consumption before the age of 28. It further teaches the serious lesson that, if the stringent rules of health be neglected, even after the constitution has become satisfactorily developed, the disease may suddenly show itself, and run a rapid course. My experience, indeed, forces me to say that a strong hereditary tendency, especially from the mother's family, requires the strictest attention, not only during the first thirty years, but from infancy to old age, for old age does not shelter from phthisis.'

I have myself observed several instances in which the progeny of consumptive parents, on one side or the other, have remained perfectly healthy, and the grandchildren also have shown no sign of the tuberculous taint.

But undoubtedly, as Dr. Weber elsewhere observes, 'no disease demands so many, and as long-continued sacrifices, as phthisis; and those who are able to make them have, as a rule, a greater chance of recovery than those who cannot.' Poor people are sadly handicapped in the race for health.

Truly, neither the prophylactic nor the direct treatment for phthisis can be considered as a light or easy task. It needs constant watchfulness on the part of the medical attendant, and implicit obedience and prolonged patience on the part of the persons submitted to it. Moreover, we must continually bear in mind the first aphorism of our great master, Hippocrates, and remember that 'the physician must not only be prepared to do what is right himself, but also to make the patient, the attendants, and externals co-operate.' It is often no easy task to carry out this precept in the case of a tedious and delusive illness such as phthisis, nevertheless the patient may often be encouraged to persevere by the hope of ultimate cure, and by repeating to himself the wise words of Montaigne: 'Toute voie qui nous mènerait à la guérison ne saurait se dire ni âpre ni chère.'¹

It would be a good thing, both for the consumptive and for his doctor, if a fixed monthly or annual payment

¹ There are some admirable remarks on the duties of the medical attendant in Dr. Dobell's work on *Bacillary Consumption*, chap. vi. He also quotes the following passage from Professor Clifford Allbutt: 'Let us, then, bring the friends always, and the patients generally, to realise that recovery from phthisis, however incipient, probably means a very costly and prolonged system of treatment, and, what is more, a steady, clear-eyed, persevering walk on the part of the patients and friends, if success is to be attained . . . Now, when a man has had it put straight before him what phthisis means, even in its small beginnings, he will learn that a serious, an unflinching and vigilant attitude is his one way of safety; and a little home sickness, some sense of tedium, and some love of change, must not be allowed to turn him from his long and arduous course . . . Once more, I would urge upon all phthisical patients the importance of incessant medical supervision. Apart as I am from practice in Alpine health resorts, I may brush aside all scruples, all suspicions of self or class service, in saying this and repeating it. For those medical men who do practise in these health resorts there must be a fear of misconstruction of their motives when constant supervision seems to them more necessary than it may seem to the patient or his friends. But scruples of this kind, honourable as they are to the physicians, must give way to a clear view of the need of such supervision. The patient must be kept at his best—at his best of digestion, as well as his best of pulmonary disorder. His temperature should

could be substituted for the charge per visit. There could then be no unworthy suspicion as to the motive for constant attendance and supervision.

With regard to the treatment of hereditary predisposition to consumption, I am inclined to place in the first rank *change of residence*. At any rate, it is undesirable that the prospective parents should remain in the house in which either of them has contracted the disease. It is always possible that it may have been due to some infection inherent in the house itself, some nook in which may lurk parcels of tuberculous dust, or some emanation from the sub-soil, impure, organically charged ground-air that may have kept alive, or nourished into virulence, the specific organism.

This is of all the more importance if the phthisical parent is the mother; for, after her confinement, she will be more than ever exposed to re-infection. It is highly probable that the increased rapidity of the disease, so often noticed after delivery, is due to the notoriously increased susceptibility of the system to microbic diseases. The child also will necessarily be exposed to the same influences. In the next place, of course, for the sake of both mother and child, the mother cannot be permitted to suckle her own offspring. A healthy foster-mother should be found for it, or, if this is impossible, it must be carefully hand-fed upon diluted cow's milk, previously boiled. The recent report of the Royal Commission on tuberculosis

again be scheduled whenever any sense of lassitude is felt, and the catarrhal and other varying conditions of the lungs should be systematically recorded. Not only so, but the regular visits of his doctor keep up the patient's serious resolve, strengthen his will, inform his judgment, and discipline his habits. And in all this *lies most of the battle!*'

has added force to the misgivings with respect to the use of unboiled milk in the feeding of children, and henceforth every household must possess a double saucepan, for the boiling of milk in a water bath without fear of burning it.

Quite the best rough-and-ready way of imitating mother's milk is that proposed by the late Baron Liebig. Fresh good cow's milk is placed in a tall glass jar for a couple of hours ; the upper two-fifths, or rather less than one-half of this milk, containing most of the cream, is then poured into a saucepan with one-third its bulk of water, and boiled. When cool enough it is ready for use, and, if it is stored in a clean well-ventilated dairy, it may be warmed up again if necessary. It requires the addition of a little sugar or milk-sugar, in order to bring it up to the normal sweetness of human milk. If crude cow's milk cannot be made to agree with a child, various devices may be tried in order to assist its digestion, such as the addition of thin barley-water, lime-water, a few (5 to 10) drops of brandy, or the milk may be partially peptonised after Sir W. Roberts' methods. The peptonising powders of Benger and others are very useful for this purpose. Failing milk, I have sometimes succeeded in preparing the way for its use by allowing, for a day or two, small quantities of pure beef- or chicken-essence to be given at short intervals, a little cream being cautiously added after a time in increasing quantities.

Raw meat scraped, and mixed with sugar, has been recommended by some physicians ; but in view of the possible dangers, not only of tuberculosis, but other diseases as well, this is a course that should only be

taken with great circumspection, and in my experience is very seldom required.

As the child grows up, it should still be fed with the greatest care, milk and easily digested fats still forming an adequate portion of the diet; and after the age of ten years, meat foods, of a light and easily digested character, should be allowed twice a day.

Plenty of fresh fruit and vegetables, of a digestible kind, should also be allowed, and as much variety as can conveniently be obtained. Much has of late been made of the importance of a sufficiency of phosphates in the food, and no one can doubt that these and other salts are necessary; but there is no need, as Sir W. Roberts has pointed out,¹ to seek them in the tough insoluble particles of bran, so often recommended, in meal or bread.

We find in milk, meat, fish, eggs, soups, and fresh vegetables, a superabundant provision of mineral matter. . . . 'the branny matter of flour is both indigestible and irritating to the *primæ viæ*; and although it may not injure, or even may be useful to the strong and healthy, it is quite an unfit element in food designed for the weak and tender membranes of the invalid or infant.'

The dwelling of the susceptible person, whether child or adult, should be on a well-drained, high, and airy site; and, if possible, such an one should never dwell in one that does not fulfil these conditions; I have often seen harm come from even a temporary sojourn in an unhealthy locality.

But above everything else must we put the free ventilation of the rooms occupied either day or night by such persons.

¹ *Digestion and Diet*, p. 191.

We have already (Chapter II.) seen the great influence of pure and impure air for good and evil respectively in the causation of phthisis. It is equally certain that free ventilation is of enormous value as a protecting agent for those most prone to the disease.

Dr. MacCormac¹ gives several instances of this fact, one of which may be quoted with advantage. It is the history of a country-house, with all material comfort and luxury, in which two sisters, 'snuggled up to death in a perfectly airless sleeping-chamber by their devoted mother,' perished of galloping consumption within a year of one another. The mansion had been noted for the phthisical mortality of its inmates. Of the next occupants, one lady was carried off by phthisis, as a sister had already been. The third and only surviving sister, with a niece, whose father had himself been destroyed by phthisis, now began to cough, spit blood and matter, and, doubtless, would soon have gone the way of the rest. 'With some difficulty I induced both of them to alter their habits absolutely, to sleep with chamber door and windows widely open at night, by day to live almost continuously on horseback, and otherwise in the open air. . . . The upshot was that both, aunt and niece alike, recovered perfectly. Both are married women, nor have the years which have since elapsed witnessed the slightest return of tubercular disease.'²

¹ *Air Re-breathed*, p. 109.

² Dr. MacCormac had himself the courage of his opinions ; witness the following passage from his introduction. 'I would speak in especial of a chamber which I once entered, as I had often before entered it, early one winter's morn. It was the sleeping-closet of my son. His low trestle bed stood betwixt the severally widely open window and door, while the keen, but exquisitely fresh sweet atmosphere from wind-swept hills careered through the apartment

Certainly the mistake of most modern ventilation is that there is not enough of it. Most persons nowadays, and assuredly all medical men, will acknowledge, in words, the advantages of fresh air, and consequently of ventilation; but when it comes to be put into practice it will be found that one and all begin to make excuse.

They are afraid of catching cold, of draughts, of 'night air,' of rheumatism, and so on. Let any medical man declare his experience of the state of the air of almost any bedroom on going into it early in the morning! The ventilation of ball-rooms, concert-halls, theatres, and places of worship is a scandal to civilisation!

And yet it is not difficult to admit the outer air quite freely, without any sensation of a draught.

I have for some time adopted an excellent method of extemporising a capacious Tobin's tube in any sash-window. It consists in placing a sheet of strong plate-glass inside the window frame, and resting against the inner framework, not the sash. It extends right across the bottom of the window, and should be about fifteen inches in height. It can be fixed by the householder himself. The window can then be opened to any extent, from half an inch to one foot, and there will then be two spaces for the inlet or outlet of air—one at the bottom of the sash, and the other between the two sashes, and yet there will be little or no draught, for the incoming air current will be directed upwards through either one or both openings.

ceaselessly. The hue of exuberant health mantled over the boy's every feature, while bordering the margin of the coverlet there extended a fringe of pure white snow, which the genius of the fragrant night had wafted in, all harmlessly, during the hours of my child's repose.

It is remarkable how little the temperature of a sleeping room is lowered by opening the window, always provided that there is a fire kept lighted in the grate ; and a gas-fire, or a slow burning fire of anthracite coal, lighted by means of gas, will keep a room warm all night. Two or three degrees of temperature is all the difference that can be noted even in the winter, and, as we all know, it is not desirable to have a high temperature in the bedroom.

As the susceptible child grows up, and the question of education comes forward, we must condemn all forcing of the intellect. A strumous child is often very precocious, and should only be trained on the lines so ably laid down by Dr. Hope many years ago : the leading out of the faculties of observation and memory, and the avoidance of reasoning, deduction, and analysis ; the encouragement of open-air studies, such as botany, entomology, ornithology, physical geography, &c.

If the time comes when a school must be selected, the greatest care must be taken that it secures the same requirements that we have laid down as necessary in the case of dwellings—a high dry site, plenty of sunlight and air.

A few years ago I made a round of the principal public schools in England, and I was surprised to find how few of them had complied with these essentials for healthy life.¹ The cubic space in the dormitories

¹ In a Lecture on the *Ventilation of Schools*, delivered before the College of State Medicine, May 22, 1889, Sir Henry Roscoe said, 'The first care of all those to whom the education of our children is entrusted should be their welfare, and their mental and bodily progress. Our educational authorities are still far behind in the recognition of the sanitary condition of their schools. I have shown that our primary schools are, as respects healthy atmospheres, in a deplorable condition.'

was for the most part sadly deficient, though in some of the more modern of the masters' houses, an attempt had been made to obtain both the needful space and ventilation. Only in the new buildings of one large school, and here and there in detached masters' houses elsewhere, did I find that 1,000 feet of cubic space had been provided in the dormitories, and anything short of this must be regarded as quite inadequate. I would urge all parents who are looking out for a school to insist upon this essential condition, and to see that there are the means for thorough ventilation, and exposure to sunlight.

The other hygienic measures, such as clothing, cleanliness, and exercise, will be more fully discussed in the next chapter ; but it will be well in this place to say a few words as to future occupations, and as to the care of the health during and after illness.

No person who is predisposed to consumption should look forward to an indoor occupation, or to one that involves the stooping over a desk or confinement in close, ill-ventilated rooms or offices, or in places where there is much dust or foul air. He should seek for an outdoor business, or at least one in which there is abundance of fresh unpolluted air. In such cases as these the prospect of gain must not be allowed to compete with the pursuit of health ; and hence, if necessary, one with less remuneration and prospect of future emolument must be preferred to those that seem to offer otherwise greater advantages. ' Let a boy choose to be a farmer, a breeder of cattle, at home or abroad, in some suitable climate, a land steward or agent, a surveyor or civil engineer. In a lower grade, other occupations may have to be selected, such as

that of an agricultural labourer, with all his hardships, a sailor, ship's steward or fisherman, a carter, butcher, cab-driver, bus or railway guard, or even a costermonger.'¹

With regard to the care to be taken during and after illnesses, I would again refer to what I have said (Chapter V., p. 55) concerning the consequences of imperfectly cured injuries of the lungs, and the weakening of the system by typhoid fever, measles, whooping cough, diphtheria, &c. I would, however, also point out the probability that, after these diseases, a large part of the danger of subsequent phthisis arises from the dread of 'catching cold,' the confinement to hot rooms, and the bad ventilation. People have yet to learn that, after the first feverish stage is past, colds are not to be treated by keeping indoors, but by exposing their subjects, judiciously clothed, to pure outdoor atmospheres.

In childhood again, the greatest care must be taken in the treatment of all sores, so common in delicate persons, about the orifices of the body—the nose, mouth, ears, &c. They should be treated antiseptically, and all skin eruptions must be dealt with as promptly and as thoroughly as possible.

During the 'cutting' of the teeth also, whether of the first or second set, sores are very apt to form in the mouth, through which the specific bacillus may gain an entrance to the system, and it is important that they should be early treated with antiseptic washes. I have found the eruption of the first permanent teeth, the 'milk-wisdom teeth,' especially prone to give rise to glandular swellings of a strumous character, and when

¹ *Milroy Lectures* for 1890, p. 110.

any such glands do form they should be boldly and promptly treated, either by extirpation, or, if they suppurate, by thorough scraping, and antiseptic treatment with iodine or carbolised oil, or better still, by iodoform.

Imperfect development of the thorax, or deformities, such as chicken-breast, due to whooping-cough, asthma, &c., must be treated by gymnastic and athletic exercises, directed to strengthen the muscles of the chest, and to increase its power of expansion. Club or dumb-bell exercises carefully graduated, lawn-tennis, golf, anything that will carry the arms above the head, running, jumping, judicious climbing—all these amusements may with great advantage be forced into our service ; and if care is taken that wet or damp clothes are changed, immediately on the cessation of the exertion, anxious mothers may rest assured that no ‘ cold ’ will be taken : rather that the fresh draughts of pure air will preserve the system from such attacks.

CHAPTER VII

HYGIENIC MEASURES

The first line of defence—Systematic and forced feeding—‘Gavage’—Débove’s method—Physiological feeding—Diet table—Milk—Koumiss—Kéfir—Malted foods : Sir W. Roberts on—Cod-liver oil : Statistics concerning ; Methods of administration—Emulsions—Alcohol—Fresh air—Healthy homes—Clothing—Principles of clothing : Professor von Pettenkofer upon—Over-clothing—Materials—Chest-protectors—Cleanliness and bathing—Exercises and amusements—Respiratory gymnastics—Local rest—Horse exercise—Passive exercises—Sea-voyages

DAREMBERG, in his excellent work, ‘*Traitement de la Phthisie Pulmonaire*’ (vol. ii., p. 43) remarks : ‘*L’hygiène sagement dirigée est le grand agent de la guérison des affections chroniques, comme la tuberculose.*’ And again, Bouchard says : ‘When a man has become phthisical, hygienic measures are indispensable aids to therapeutic treatment.’

It is not by these means that we directly attack the microbe, but we reach it indirectly. We do not hope to kill the bacillus at once ; but we so modify nutrition that the tissues become a medium unfavourable to the existence of the organism ; and we probably increase the activity of its enemies the ‘phagocytes.’

It seems certain that, unless the bacillary invasion is in enormous numbers, the disease cannot take root, except in what is called figuratively ‘a suitable soil.’ Human beings are refractory to the bacillus ; and, unless the defensive outworks are weakened by here-

ditary delicacy, by previous illness, or by direct injuries to the lungs, it is not possible for the organism to form colonies within the body, and so produce true tubercular disease. (*See Chapter II.*)

It follows, that our aim must be to render the susceptible person less vulnerable by the bacillus, and that our first line of defence will be careful hygienic treatment.

The hygiene for consumptives, or for those inclined to be consumptive, may be summed up in few words. Briefly, it consists, first, in abundance of light, nutritious, and easily-digested food, which must comprise a large allowance of fat; second, an almost entirely open-air life, with as much sunshine as can be obtained; third, suitable clothing; fourth, cleanliness, and bracing cold-water treatment; fifth, innocent amusements, and exercise without fatigue.

1. *Feeding*.—Much can be done even for consumptives by careful and systematic feeding. The most favourable cases are those who have good appetites, and who habitually eat well; and we should exert all our ingenuity to enable an abundance of food to be taken, even when there is little or no appetite. It has been well said that the less appetite a patient has, the more he needs to be fed. The French proverb, moreover, is especially true of these cases, that ‘*L'appétit vient en mangeant* ;’ and if you can succeed in inducing patients to take a little, they will by degrees soon begin to take more.

Even forced feeding may, in some cases, be necessary; and Débove's system of ‘*sur-alimentation*,’ or forced stuffing, has had some very striking successes. He has, in fact, adopted for consumptives the method

of fattening, which may any day be seen at the Jardin d'Acclimatation, in which fowls and other animals are fed by 'gavage,' *i.e.* by forcing down the œsophagus, through a tube, various nutrient substances in a state of pulp.

Weir-Mitchell, however, has shown us how the same end may often be attained, even in those who have no desire for food, by a persistent course of massage, electricity, and milk-feeding. We can always hold 'gavage' in reserve; and we should not scruple to use it if other means fail.

Débove's method consists in drying and powdering raw meat, mixing it with milk, and introducing it by the œsophageal tube.

The meat is first thoroughly dried at a temperature of about 150° Fah. (65° Cent.) The temperature may then be carried to above boiling point, in order to sterilise the food; for, after drying, the heat does not render the albumen indigestible. About $\frac{3}{4}$ lb. of this powdered meat, mixed with milk, is at first administered three times a day; and the quantity is gradually increased until the patients are taking from one to two pounds of the dried meat, mixed with four or five pints of milk, in the twenty-four hours.

Notwithstanding the good results obtained by Dr. Débove with this treatment, it will rarely be necessary to have recourse to it, or to any modification of it; and I cannot but think that not only the quantities, but the proportions of proteids given, are unphysiological; and that the necessity for getting rid of the large excess of nitrogenous matter must put a heavy strain upon the excreting organs of debilitated subjects.

It is far better to gradually train the digestive

organs to perform their duties ; and to frame a dietary such as will not overload the system with refuse material, and which will steadily build up the tissues.

I would point out that, for true hygienic feeding, the due proportions of proteids, carbo-hydrates, and fats must be administered, but with some excess of the latter ingredients, and with an abundance of phosphatic salts.

Where the appetite is small or capricious, it is a good plan to resort to rather frequent meals ; but in order not to overtax the powers of digestion, the more solid meals should still be kept at a sufficient distance from one another to ensure complete digestion, somewhat after the following fashion, which has now been adopted by most physicians.

7 A.M. A large cup of warm milk, flavoured, if needful, with a tablespoonful of strong coffee, or with a dessert-spoonful of brandy or rum ; and, if this latter is used, it should be first diluted with a little water ; for the pure spirit is apt to make the milk less digestible.

9 A.M. Breakfast : milk with cocoa or coffee, bread and butter, bacon, fish or poultry, eggs, and marmalade or preserve.

11.30 A.M. A light fluid meal : Egg-flip, *i.e.* an egg beaten up with a little boiling water, flavoured with diluted brandy or sherry, and sweetened with sugar ; or, as a change, a glass of milk and a light Savoy or other biscuit ; or, again, a glass of koumiss, kéfir, or buttermilk.

1.30 P.M. Dinner : As much tender, light-fibred meat, preferably minced, as can be taken ; potatoes, fresh vegetables, with bread, or toast. Light, milky, farinaceous puddings, stewed fruit, a glass of sherry and

water, claret, or a half-pint of bitter ale or porter ; fresh fruit and a cup of hot coffee.

4.30 P.M. Afternoon tea, or a cup of beef-tea or beef-essence with toast.

7 P.M. Calves'-feet jelly, or beef-tea with toast, and a glass of wine.

9 or 10 P.M. Supper: some light farinaceous pudding, milk-gruel, or revalenta, flavoured with brandy or sherry.

Persons with more robust stomachs may take a late dinner, at 7 or 7.30 P.M. ; and may, with advantage, add to their breakfast or supper a bowl of porridge (oat or wheat meal) and milk.

The greater the variety in the diet the better.

Milk was regarded as an excellent food for delicate people, and for consumptives, in the days of Hippocrates, Celsus, and Sydenham ; and an old doggerel rhyme that I came across some time ago very fairly represents modern feeling regarding it :

If consumption cured can be,
 (Which is a mighty rarity,)
 These three things you must prepare :
 Milk, traumatics,¹ and fresh air.

It is, however, sometimes prescribed in excessive quantities ; and in such cases it has been known to cause dilatation of the stomach and digestive troubles. The amount should not exceed usually more than about a quart a day ; and should not be taken, in the liquid form, with meat meals. As a further precaution, it would be well always to have it boiled shortly before it is taken ; and if it then disagrees, to mix with it a little barley-

¹ Blisters, issues setons.

water or lime-water ; or, better still, a little effervescing potash-water. In some cases, asses' milk or goats' milk will be better borne.

Koumiss again, made from cows' milk, is a valuable addition to our stock of easily digested foods. It may readily be made at home by either of two methods : (1) That of Dr. E. Charles, of Cannes. 'Nearly fill a quart bottle with fresh milk, leaving enough room to shake it easily ; add a spoonful of crushed lump sugar, and a bit of German yeast the size of two ordinary 5-grain pills ; cork, and tie down with wire and string. Keep in a cool place, and shake twice a day. The koumiss will be ready on the sixth day ; but earlier in hot, and later in cool, seasons.' (2) The method that we have adopted at the Manchester Hospital. To one quart of fresh milk add a tablespoonful of butter-milk, in a shallow dish ; place it where it will keep moderately warm (about 70° to 80° Fah.) near the kitchen fire. Let it be stirred at intervals during the day ; and after 24 hours, let it be poured from jug to jug, so as to thoroughly break up the curds ; and it will be ready for use ; or it may be bottled, with the same precautions as in the first method. In the latter case it will keep good for a week or two, gradually getting sourer ; and, when it is opened, great care must be taken, or it will spirt out violently.

If koumiss is well made and smooth, it is a very pleasant drink, especially in summer, tasting like rich butter-milk ; and it has slightly exhilarating properties, from the traces of alcohol that it contains.

Not only milk, but other foods as well, may often be made more suitable for weak stomachs by 'pre-digestion,' after Sir W. Roberts' method. The whole

of his work, 'Digestion and Diet,' is well worth reading; but for the information of those who have not access to it, I shall here transcribe his method of malt-ing gruels and other farinaceous foods.

A suitable gruel is prepared from wheat, or from oatmeal, groats, pearl-barley, arrowroot, or any other farina. The gruel may be made with water alone; or, as is more usual, with the addition of milk or some kind of meat broth. In either case, the gruel should be well boiled, and strained to separate the lumps. When the gruel is cold, or at least sufficiently cool to be tolerated in the mouth, the malt infusion is added. One tablespoonful (well mixed therewith) is sufficient to digest half a pint of gruel. The action is very rapid; in a few minutes the gruel becomes thin from the conversion of the starch. When this point is reached the food is ready for use. The only precaution to be observed in the process is to make sure that the gruel is, at least, *sufficiently cool to be borne in the mouth*, before the malt infusion is added.

To make malt infusion.—Three ounces (or three piled-up tablespoonfuls) of crushed malt are thoroughly well mixed in a jug with half a pint of cold water. The mixture is allowed to stand overnight—that is to say, for ten or twelve hours. The supernatant liquor is then carefully decanted off from the sediment, and strained through two or three folds of muslin until it comes through fairly clear and bright. The above quantities yield about six ounces of product. Malt infusion is very prone to fermentation; and it must either be prepared fresh for each day's consumption, or means must be used to preserve it from decomposition. This may be easily accomplished by adding a few drops of

chloroform to the infusion, and keeping it in a well-corked bottle.

Cod-liver oil is another food of paramount importance ; for being a fat, easily digested, and ready to take part in building up the tissues of the body, it should rank first of all.

It is to be regretted that it has come to be regarded as a medicinal agent ; and still more, that its ineradicable taste makes it difficult for many to take it as a food.

Dr. C. T. Williams says :¹ ' I have no hesitation in stating my conviction, that this agent has done more for the consumptive than all other means put together.'

He also gives a striking proof of this assertion, viz. an examination of the duration of life in 250 consumptive patients who wintered in various foreign health resorts. ' The total duration of life among them, from the date of the first symptoms, was, for those who died, 8 years, for those still alive, nearly 9 years. Of these 40 took the oil irregularly, or not at all ; of which number 17 died, giving a duration of 4 years and $8\frac{1}{2}$ months, little more than half the duration of life of the total number. Yet, at the commencement of the treatment, these cases were not more unfavourable than the rest.'

Dr. Austin Flint² gives a similar comparison, but in a smaller number of cases. He says : ' How then does the mean duration in 15 cases treated with cod-liver oil, together with hygienic measures, compare with the mean duration in 14 cases treated by hygienic measures without the cod-liver oil ? The mean duration in the latter cases is a fraction over 27 months.

' The mean duration in the cases treated with cod-liver oil is nearly $32\frac{1}{2}$ months. This comparison thus

¹ *Pulmonary Consumption*, p. 336.

² *Phthisis*, p. 323.

gives as a result an increase in the duration of $5\frac{1}{2}$ months by the use of the cod-liver oil.'

It has been shown that not only does cod-liver oil add weight to the body, out of proportion to the quantity taken, so aiding the assimilation of other foods, but that it also tends to increase the number of red blood corpuscles. It usually produces a sense of increased vigour and warmth, a diminution of cough and expectoration, and of the night perspirations.

'Marrol' may sometimes be used, with advantage, as an alternative.

Cod-liver oil, being a fatty food, is best taken with, or immediately after, other food. It will be well to begin its administration in small quantities, one or two teaspoonfuls, once a day; and, at first, the best time will be at night, immediately after the last meal; any little inconveniences arising from its first use will then not be noticed. The quantity should be gradually increased, until about one tablespoonful is taken three times a day. More than this would probably not be digested, and would be worse than wasted.

It may be best taken in a little lemon-juice, or orange wine; and the taste may be masked by biting the rind of lemon before it is taken. It should not be ordered if fever or diarrhœa are present, or if the stomach is already disordered; and if it causes nausea or vomiting it should be discontinued.

If the pure oil cannot be tolerated, it will sometimes be better borne in the form of emulsion, of which there are several preparations, with or without malt-extract, in the market. It would be well, however, to make sure as to the proportion of oil present in any of these compounds, for in some it is a very minute quantity,

and cannot be of much service to the patient. Its high price is also a disadvantage.

In many cases the best plan will be to make an emulsion at home; and Dr. Burney Yeo gives the following receipt for one that he has used largely. Take

Cod-liver oil	1½ oz.
Solution of potash (or soda)	80 minims
Strong solution of ammonia	4 „
Oil of cassia (or lemons)	2 „
Simple syrup	½ oz.

Mix. Dose, one tablespoonful 3 times a day.

The formula for the ‘Mistura Olei Morrhuæ Preparatæ’ of the Brompton Hospital, introduced by Dr. Reginald Thompson, is as follows:—

R. Olei Morrhuæ	ʒvi
Liq. Ammon. fort.	ʒij
Olei Cassiæ	ʒj
Syrupi	ʒij

Mix.

It was suggested by Sir W. B. Foster, that ether should be given with the oil, or other fatty substances, in order to stimulate the pancreatic secretion, but most persons who have tried it have found that it is either too nauseous to take, or that it gives rise to frequent and disagreeable eructations.

It is sometimes given with a mineral acid, preferably dilute phosphoric acid, in the compound infusion of orange-peel, sweetened with syrup, or with the addition of a little bitter tincture.

Several substitutes for this oil have been proposed; and one of the oldest of these I have often found useful. It is purified mutton suet, well mixed with warm milk, in the proportion of ½ oz. of suet to a pint of warm milk

Pancreatic emulsion also, introduced by Dr. Dobell, will often agree, especially with children, when cod-liver oil fails. Glycerine was strongly recommended by Dr. Jaccoud, in doses of about half an ounce, three times a day ; but I cannot say that my trials of this substance have encouraged me to continue its use. The same remark must also be made respecting the so-called 'Petroleum Emulsion ;' which I have tried in several 'bronchitic' cases of phthisis without benefit.

Alcohol must be regarded both as a food and as a drug ; and therefore its use might be considered under the head of either hygiene or medicine. As a matter of convenience only, I prefer to treat of it in this place. If it is taken in small quantities at a time, it is entirely oxidised in its passage through the tissues ; and thus must be a source of both heat and energy. It has been calculated by Binz, that 2 oz. of alcohol are equivalent, in the production of energy, to $1\frac{1}{2}$ oz. of cod-liver oil. But it also acts as a drug, diminishing metabolism ; and, in any but very small doses, produces a sedative influence on the nervous system. It has been proved, moreover, that under the use of alcohol, less oxygen is absorbed ; the temperature is lowered ; and there is a tendency to the accumulation of fat in the body, and to fatty degeneration of the tissues.

All these properties may be taken advantage of in the treatment of phthisis ; but, owing to the terrible consequences of excess, and to the proclivity of mankind to its excessive employment, it can only be recommended in selected cases, and with many cautions : yet, notwithstanding these serious drawbacks to the employment of alcohol in the treatment of phthisis, it is certain that most medical men enjoin its moderate

use. It is mainly its administration in large quantities, as a drug, that seems to be objected to ; but, whatever may be the final decision on the question of its systematic employment, it is important that any researches on the point should be placed upon record ; and that medical practitioners should be left to form their own judgment as to its advisability. Except as an adjuvant to ordinary diet, I have no records of experiments of my own on the medical use of alcohol in phthisical cases ; but in 1890 I had an opportunity of watching a most complete series of cases, under the charge of Dr. Thomas Harris, at the Manchester Hospital for Consumption, which were submitted by him to definite and regulated courses of treatment by this means.

Hitherto Dr. Harris has refrained from publishing his results, owing to anxiety not to do harm to the Temperance question ; but he has now kindly sent me a brief abstract of his observations. In a work intended for medical readers only, I cannot think that any harm can come from such an honest and straightforward statement of results.

He says : ' Although we undoubtedly meet with cases of phthisis in persons of intemperate habits, I felt that in regulated doses and under proper conditions, alcohol might be of service in the treatment of phthisis in the early stages of that disease. We must remember that phthisis in alcoholic subjects is probably due, not so much to the direct influence of alcohol, as to the facts that such people usually neglect their food, and also take the drug in such quantities as to disturb their digestion, and impair nutrition.' ¹

¹ We may surely add to these circumstances the certainty that a large proportion of drunkards live under conditions most favourable to the infection of tubercle.

Dr. Harris continues : ' I commenced some observations on the effect of alcohol in the treatment of pulmonary phthisis in October 1890 ; and continued the treatment during a period of nine months. During this time, twenty-six cases were treated by the method ; and whiskey, containing 53 per cent. of alcohol by volume, was the form chiefly employed. For obvious reasons this was disguised ; and the addition of liquid extract of liquorice and camphor-water was found most effective for this purpose. The mixture was given regularly every four hours, day and night, and was continued during the stay of the patient in hospital. The average duration of such residence was about eighty days. The dose, to commence with, was 2 drachms of pure whiskey, diluted as above described, and gradually increased up to $1\frac{1}{2}$ ounce of whiskey, which latter dose was continued during the stay of the patient in the Home. A little food, such as bread and butter, was given with the dose to prevent any disturbance of the digestive processes by the alcohol. But during the night-time the nurses soon found that the patients were too sleepy to eat. When aroused for their four-hourly dose they would take it, and at once go to sleep again.'

' The cases were not picked ones ; and it was felt that the most satisfactory way of forming an opinion on the treatment would be to compare the results, as regards increase of weight, with those seen among the patients in hospital at the same time, but who were not taking whiskey, and who were under the care of my colleagues.'

' My own patients were given the same diet, and were allowed cod-liver oil, or an emulsion of the same,

exactly as the other hospital cases. In all cases the general health improved ; the cough and the amount of expectoration, with two exceptions, also diminished. In the majority of cases, no decrease in the number of bacilli in the sputum could be detected. In two or three cases, however, the number of bacilli was less on the discharge than on the admission of the patient. Not only did the patients feel better and gain in weight, but, in several instances, where the gain in weight had been marked, the improvement in their appearance was decisive ; it was not simply a question of having put on fat ; they looked healthier. No case left the hospital in a worse state than that in which he entered it. As regards the physical signs, very little difference could be detected between those at the date of admission and the date of the discharge of the individual.'

'The average gain of the patients, under the alcoholic treatment, was far greater than that under any other of the treatments adopted in the hospital. The average gain in body-weight of the patients taking whiskey was two-and-a-half times that of the average gain exhibited by the patients under any other form of treatment.'

Dr. Harris thought that the treatment was not continued long enough to allow of correct conclusions ; but he felt then, as he does now, that material benefit might result to phthisical patients from a regular administration of alcohol.

I can certainly confirm these observations of Dr. Harris : but it occasionally appeared to me that at certain times of the day the dose of alcohol was unnecessarily large ; and that Dr. Harris had not quite

kept to the limit which he told me he intended to observe, *i.e.* of not producing narcotism ; for some of the patients, at times, were distinctly flushed, and slept heavily even in the daytime.

I have not been able to discover any other observations on this point worthy of notice, except the classical instance given by Stokes,¹ and Dr. Austin Flint's series of cases, recorded in his work on Phthisis. The latter gave alcohol largely, from six ounces to a pint of whiskey daily, in fifteen cases : and he states that, 'of these fifteen cases two ended in recovery ; in three the disease was arrested or non-progressive ; three are among the fatal cases ; and in five the histories are defective as regards duration or termination.' He also points out the 'fattening influence of the drug ; and one case gained 30 lbs. in weight in five months.' None of his cases found any difficulty in giving up the use of spirits at the end of the treatment.

It must be acknowledged that all this testimony is very favourable ; and it should encourage us to at least allow a fairly free dosage of alcohol in the daily diet : but I confess that I am still not entirely without misgiving lest a long continuance in the treatment might end in producing general fatty changes, or degeneration of the liver and kidneys ; which might be as serious an evil as the lung trouble itself. The danger also of encouraging intemperance cannot be lost sight of.

2. *Fresh Air and Healthy Homes.*—Fresh air is not only the preventive *par excellence* of consumption, but is also a most important means of cure ; even when the disease is fully established. We shall, how-

¹ 'Lectures on Fever,' *Med. T. & G.* xxx. p. 487.

ever, have to consider the subject at length under the head of 'Open-air Treatment,' and shall defer entering upon it until then.

We have also already (pp. 60 and 75) seen the importance of healthy habitations, and of a dry sub-soil, for the prevention of phthisis ; but these conditions are quite as essential to cure. Although much relief may be obtained by our poor out-patients from medicinal agents, they will hardly attain to complete cure unless they can, for a long period, reside in clean, well-ventilated, well-drained, and well-lighted dwellings.

3. *Clothing*.—In a work to which I am much indebted for the following remarks,¹ Professor von Pettenkofer says: 'Our clothes are weapons with which civilised man fights against the atmosphere as far as it is inimical, the means by which he subjugates this his element.' It is especially necessary that the consumptive person should be well armed in this respect ; and yet there are few directions in which he makes so many mistakes, or in which his armour is so often untried and inefficient. Owing to his weak circulation, and to the deficient oxygenation of his blood, he is naturally chilly, and nervously afraid of taking cold. He is, accordingly, prone to heap upon himself, and especially about his chest, successive layers of clothing, without adequately considering, or testing, whether it serves all the purposes for which it was intended.

What is required of clothing, is not only that it should keep the external cold from penetrating to the surface of the skin, but that it should retain the animal heat, prevent its loss by radiation, by evaporation of

¹ *The Air in Relation to Clothing, Dwelling, and Soil.*

aqueous vapour, or by its conduction away by means of currents of air. A very light covering will impede radiation ; the thinnest veil will keep us warm in some degree. The transit of heat through our clothes depends essentially on the conductive power of the material and on its thickness ; *i.e.* on the length of time, and the course, which the heat has to take, in order to travel from the skin surface to the outer surface of the garment. The weight of the garments must also be considered ; for the muscular vigour of our patients is not great ; and nothing must be allowed to interfere with the freedom of the respiratory movements.

It must not be forgotten, moreover, that the body has the power of automatically regulating the loss of heat from its surface, (*a*) by the contraction of the superficial blood-vessels, (*b*) by evaporation of the sweat ; and up to a certain point it is well not to interfere too much with the natural functions. All these points have to be taken into account in deciding upon the best form of clothing ; and it will at once be evident that it is quite possible both to over-clothe, and even to defeat our own object, if we pile up unnecessary garments, one upon the top of another.

By over-clothing, the capillaries of the skin are relaxed ; the warm blood brought to the surface, ready to be cooled by any cold blast ; the sweat is poured out, and not only evaporates, still further lowering the temperature, but also moistens the garments ; and renders them more apt to conduct the animal heat to the surface.

Again, closely fitting and close-textured garments are much less protective against cold than loosely combined fibres. Professor von Pettenkofer remarks that 'one can demonstrate, by changing the shape and

volume of the same substance, that great changes of heat-loss can be produced, although the substance and its weight remain the same. If you cover a tin cylinder, previously filled with warm water, with common wadding, and observe the falling of the immersed thermometer, you will be astonished to see how rapidly the fall goes on : as soon as you compress the wadding firmly, and diminish its volume, the outward flow of the heat increases by 40 per cent. The same is the case when a wadded garment is worn out : the quantity of the wadding is the same, but its volume and its elasticity have undergone a change ; and you will find it considerably less protecting.'

It is to the air within our clothing that we chiefly owe our protection against cold. 'A current of air travels incessantly through our clothing. Its force, as in ventilation generally, depends upon the size of the openings, the difference between the outside and the inside temperatures, and the velocity of the surrounding air. Our clothing ought to regulate the rapidity of the air currents passing over the skin, and should keep them at a fairly uniform temperature. The air passing through the meshes and pores of the textures of our clothes should be kept warm by the body-heat. Inside our dress we should carry the air of the south, wherever we may be, . . . we live in our dress like an unclothed tribe in a paradisian country, where the air is constantly calm and the temperature from 75-94° Fah.' It is now generally recognised amongst medical men, that the innermost garments should be of some woollen material, thinner or thicker according to the season ; but it is not always sufficiently understood that it should invariably be of a light, open texture, and

that it should be loosely fitting. As a rule, womenkind are the greatest sinners against this sanitary law.

It will be best to prescribe for our patients merino, or lamb's wool undergarments, vests, drawers, combinations, &c. ; though in the heat of summer a mixture of silk and wool may be worn. Over this, in the winter, quite the lightest, and warmest, and best material is Shetland wool.¹ Its chief inconvenience—which, however, it shares with other woollen clothing, especially Jaeger's—is its liability to shrink in washing; but this may be overcome by proper care, by washing in well-prepared soapsuds and lukewarm water, and by the use of proper stretchers during drying.

The upper clothing must be varied according to season; but it should always be loose, and as light in weight as possible.

I strongly object to the use of additional layers of material, such as the so-called 'chest protectors;' the only exception to this being the wearing of a light band of flannel, or other woollen material, round the loins, 'the cholera belt,' to absorb the sweat in the place where it is most likely to occur.

¹ Prof. van Bebbber (quoted in *Nature*, vol. 52, p. 49) gives the following measures of the temperature of different parts of the clothing, when worn:—

	Temp. 50° Fah.	79°
Temp. on the coat	71°·2	82°·4
„ between coat and vest	73°·6	83°·8
„ „ vest and linen shirt	75°·9	84°·7
„ „ linen shirt and woollen vest	77°·4	85°·3
„ „ woollen vest and skin	90°·9	89°·8

The loss of temperature which the body experiences at a temperature of 59° is diminished by clothing in the following proportions:—

Radiation from the bare skin	100
„ when covered with wool	73
„ „ „ „ wool and linen	60
„ „ „ „ wool, linen, and vest	46
„ „ „ „ fully dressed	33

Chest protectors, as they are usually worn, are a source of danger rather than a protection, rendering the skin of the chest more tender; and from their matted and often foul condition, conducting fumes of a most noxious character up to the mouth, where they continually tend to poison the air about to be received into the lungs.

4. *Cleanliness and Bathing.*—The best ‘chest protector’ consists in well douching the chest, night and morning, with quite cold salt-water. In many cases a general cold sponging of the whole body may be substituted with advantage; and a chill, or cold extremities after it, may usually be avoided by adopting the practice of some hydropathic establishments—namely, making the patient stand in warm water, and hold with both hands a hot pad to the pit of the stomach. Or, what is called ‘the dripping sheet’ may be used instead of the sponging; and a warm, dry bath towel applied immediately afterwards. I need hardly insist upon general cleanliness, both of the person and of clothing. We have already seen, that one great source of danger to the consumptive is the inhaling of fresh particles of tuberculous dust, in a virulent condition; and this is certainly most likely to take place, where the surroundings of the patient are in an organically impure state.

5. *Exercises and Amusements.*—We have already seen that most consumptives must spend a large part of their day in the open air; and we shall presently give further reasons for the practice; but it by no means follows that this time must be spent in exercise. On the contrary, by far the greater portion of it must be spent in rest; and therefore a better heading for this

section might be 'Rest and Amusements.' A phthi-
sical patient has as a rule but little reserve force upon
which to draw. He has much to gain and little to lose.
He must attempt no long walks, no great exertion.
Not for him are

'The wild joys of living! the leaping from rock up to rock—
The strong rending of boughs from the fir-tree—the cool
silver shock
Of the plunge in a pool's living water—the hunt of the bear.'

Whatever exercise he does indulge in must be of the
gentlest kind; and his amusements must be, for the
most part, such as he can carry out while his body is
in a state of repose: reading, drawing, music, the
study of nature, pleasant society, light manual tasks,—
these must fill up the bulk of his day; and only games
that can be carried on without much exertion should
be allowed, with long intervals of rest.

No doubt these restrictions will seem very irksome
to those of our patients—and they are many amongst
consumptives—who are of a keen, active temperament;
and for some of these it may be advisable to relax
them a little, and to allow the occasional recourse to
mild games of lawn-tennis, golf, skating, bicycling, &c.

Horse exercise always has been regarded by physi-
cians, from Hippocrates to Sydenham, as the best exer-
cise for consumptive persons; but even this should be
of a gentle, leisurely character. Galloping and leaping
must be 'taboo.' I have been told that at Madeira the
invalids, *ennuyés* with their dull mode of living, were in
the habit of taking violent gallops; and that they betted
which should draw the 'first blood'—in other words,
which could first bring on an attack of hæmoptysis.

And this shows exactly where the danger of all such active exercise comes in. It can be readily understood how likely the tender, and often excavated, lungs are to give way during the excitement of the circulation, and the quick breathing brought on by such exertions.

Special respiratory gymnastics have been invented, and much praised by some physicians. They consist chiefly in systematic forced inhalations and expirations through the nose, at the same time that the arms are extended and raised above the head: but to my mind these methods are inferior to some of the games which we have already seen to be permissible; and it is not desirable that everything should be sunk in the slough of quackery under the title of 'a cure.' On the other hand, it is often desirable to impose absolute rest upon the portions of the chest-wall immediately over an inflamed part, either of the pleura or the lung.

This may sometimes be secured by strapping the chest with rubber plaister; or by applying a 'chest splint' in the shape of a carefully adjusted pad, as suggested by Dr. Dobell; or by means of a 'Salmon and Ody truss,' with one pad on the spine, the other being placed on the chest-wall over the seat of active mischief.

Any amusement, however, that involves resort to places of crowded assembly must be absolutely interdicted; and hence theatres, concert-rooms, meetings of all kinds, even crowded churches, must be avoided as likely sources of virulent 'tuberculous dust.'

Perhaps the best of all means for taking fresh air, and when possible sunshine, is to have recourse to

what has been called 'passive exercise'—that is, taking drives in a beautiful country, or yacht sailing, or, for those who are good sailors, longer voyages in some one of the floating palaces, of which there are now so many, and which go to all parts of the world. Many of these vessels are provided with every comfort, and carry experienced ship-surgeons. It is very seldom that the passengers are exposed to any hardship, except in the case of the roughest weather. It would be well, however, in any case to make careful inquiry as to the possible ventilation of the berths, in the event of the port-holes having to be closed. In not a few ships, the second-class passengers are better off in this respect than the first; as the berths are not completely closed in, but are open above the partitions, thus allowing the free passage of air.

CHAPTER VIII

OPEN-AIR TREATMENT

Professor von Pettenkofer on the difference between open air and ventilation—Influence of open air ; on diseases and injuries ; on horses, cows, and monkeys ; in the prevention of lung diseases and catarrh ; in the treatment of phthisis—Sanatoria for open-air treatment—Description of Falkenstein—Course of the treatment—Home treatment—Conditions of treatment—The ‘*jour médical*’—Mode of action of open air—Results—Statistics

WE have already seen that fresh air, and plenty of it, (at least 3,000 cubic feet per head per hour) is essential for ordinary health, but this amount of ventilation, and even that employed in our consumption hospitals, large though it is, falls very far short of what is meant by ‘open-air treatment.’ This treatment consists in exposure of the patient to the open air, sheltered only by a verandah or tent from too vivid sunshine, rain, or wind. This exposure means far more than the freest ventilation.

It has been shown by Pettenkofer that, out of doors, the average velocity of the air-currents is about 10 feet per second, or about 7 miles per hour. ‘Imagine a frame about the height and width of a human body ; let us say that it measures about 6 feet by $1\frac{1}{2}$, or 9 square feet. If you multiply this by the average velocity of the air, you will find that in one second 90 cubic feet, in one minute 5,400 cubic feet, in one

hour 324,000 cubic feet of air flow over one person in the open.' This is at least 100 times the amount that is given in ordinary ventilation.

Great though this supply of air may be, there can be little doubt as to its beneficial influence in the cure of many diseases besides consumption, and in the surgical treatment of injuries.

It is especially in military campaigns that this has been noticed. Thus, in the American Civil War it was found that nothing was better for the sick and wounded, winter and summer, than a tent or a ridge-ventilated hut. Erysipelas and hospital gangrene were almost unknown; wounds healed more rapidly; and, even in fractures, the beneficial influence of the fresh air was to be remarked. Camp fever may be almost banished; and Stromeyer observed the remarkable effect of ventilation in arresting military granular conjunctivitis.

The same fact comes out strongly in the records of the Austrian Army. In 1854, at some of the stations of the army in Hungary, the plan was commenced of treating a portion of the patients in tents instead of in the permanent hospitals. The results were very satisfactory. 'The most severe maladies ran their course much more mildly in the free air,' and the patients recovered more quickly and more perfectly than in the confined spaces of hospitals. Typhoid fever, small-pox, wounds, and inflammations did much better in the tents; and in no single case could it be made out that gangrene originated in a tent.

Dr. de Chaumont gives¹ the following instance. In

¹ Parkes' *Hygiene*, Ed. 6, p. 135.

the South Afghanistan Field Force the artillery wintered at Candahar (1880-81) in tents, and remained free from pneumonia ; whilst the disease was prevalent amongst the infantry who were overcrowded in barracks. The 63rd, which was more crowded than the other corps, suffered most, having 30 cases in hospital at one time : one company, however, quartered in large airy rooms near the residence of the general commanding, had no case. On March 25, a part of the regiment was turned out into tents ; and the remainder were distributed in barracks, so that each man had a minimum of 600 cubic feet of space : from that time no more pneumonia occurred.

Similar testimony is forthcoming with regard to animals. The French cavalry horses before 1836 suffered an enormous mortality, from 180 to 197 per 1000 annually. During the war in Italy in 1859, M. Moulin, veterinary surgeon-in-chief, kept 100,000 horses for several months in open camp : amongst these animals scarcely any case of illness occurred.¹

It is also well known how bad is the health of cows kept in confinement, and how many of them succumb to tuberculosis ; and the same must be told of monkeys.

With regard to simple catarrh again, we do not find that men who are much in the open air, and exposed to vicissitudes of weather, are prone to catarrh, or to affections of the lungs. Arctic explorers confront the coldest air without taking any harm. We are told that Whymper slept safely, '*sub divo*, in chill Alaska, with only a screen to windward, when the mercury in his barometer was frozen hard ; and Von

¹ Proust, *Traité d'Hygiène*, p. 331.

Wrangel relates a similar experience in respect of the dwellers by the shores of the Arctic Ocean.' ¹

The experience of Volunteers, who are generally men unaccustomed to open-air life, is to the same effect.

We may also give one more instance with regard to phthisis, recorded by Tholosan, who remarked during the Crimean War that, 'at Sebastopol, in spite of bad nourishment and living in tents in rain and snow, out of 1,200 sick, scarcely any were phthisical.'

We have indeed seen the remarkable results that have been obtained in the prevention of phthisis by the adoption of the principle of pure air supply, brought about by good drainage and thorough ventilation. It is not surprising therefore to find that these methods should have been pressed into the service of medicine for the cure of the complaint after it has been fully established.

The prescription is, in fact, an old one; it dates at least from the time of Aretæus and Galen. The former says, 'living on the sea will be beneficial.' But in more recent times, and in this country, Sir James Clark, Dr. MacCormac, and Dr. H. Bennet, were really the first apostles of the gospel of an abundance of fresh air, and preached the value of open windows. But the 'cure à l'air' was really first systematised by Brehmer, the founder of the Sanatorium of Görbersdorf, in Silesia, and by Dettweiler at Falkenstein, and, since these were started, numerous other establishments for the same purpose have been formed in different parts of the world, though hitherto not in this country.² Dr. Knopf, in a work entitled 'Les

¹ MacCormac, p. 40.

² Since the above sentence was written, arrangements have been made at Bournemouth by which the treatment can be carried out in its entirety at several establishments.

Sanatoria' (Carre, Paris, 1895), gives a list of twenty-five such places devoted to this form of treatment, actually in use, or in process of construction. Of these the principal are Görbersdorf, already mentioned; Falkenstein, in the Taunus, directed by Dettweiler; Hohen-Honnef, on the Siebengebirge; two or three at Davos, in the Engadine; St. Blasien, in the Black Forest; the Adirondack Cottages, in the State of New York; Canigou, in the Pyrenees; Tonsaasen, in Norway; Leysin, in Switzerland; and there are now several in California.¹

Some of these establishments are placed at high altitudes, and doubtless the pure air of the mountains is an important aid to cure, but this condition is by no means indispensable.

Daremborg gives the following description of Falkenstein, which may be taken as the type of this kind of establishment:—

'In this sanatorium, situated at an elevation of 200 metres, in the midst of a fine park, the sick pass the greater part of the day on reclining chairs, placed in galleries or covered kiosks. It is truly a curious spectacle to see a hundred phthisical patients lying in the long semi-circular gallery which surrounds the ground-floor. All these patients are rolled up in their

¹ The following list of such places is given by Daremborg:—Görbersdorf, at 550 metres of altitude, founded by Brehmer, and directed by Wolf; Falkenstein, in the Taunus, near Frankfort, at 500 metres, founded by Dettweiler; Reiboldsgrün, near Dresden, directed by Driver; Neuschmecks, in the Carpathians, in Hungary, directed by Szontagh; Rehbours, in the Hartz Mountains; St. Blasien, in the Black Forest, directed by Haufe; Davos, in the Engadine, directed by Turban; Honeff, on the Rhine, at 250 metres of altitude, directed by Meissen; Aussee, in Styria, at 700 metres; Gausdal, in Norway, at 800 metres; Adirondack Cottage Hospital, on the banks of Lake Saranack, near New York. Lastly, for the last four years Sabourin directs a sanatorium, on the model of Falkenstein, at Canigou, 130 metres above Vernet-les-Bains, in the Eastern Pyrenees.

wraps ; some read, others write, others sleep or talk. Each person has a " spit-cup " ; it is forbidden to spit on the ground, or in a handkerchief.'

An account of the way in which the treatment is actually carried out is given by Dr. Bezly Thorn.¹ The patient is first carefully examined ; and though something of his condition is explained to him, and he is cautioned against any imprudence, he is encouraged to hope for cure ; and is instructed as to the mode in which he may attain to it. The diet, clothing, and regulations as to rest and exercise are then prescribed in detail ; and the medicinal treatment, if any, is entered in his book.

Arrangements are then made for the gradual acclimatisation of the patient to the open-air treatment ; but, as soon as possible, it is *de rigueur* that he must pass the entire day of twenty-four hours under the influence of fresh air. ' Throughout the day-time all alike are out of doors, except during meal-times and such intervals as may be devoted to correspondence, music, or an occasional game of billiards.' Those who need the rest-treatment lie extended on deck-chairs in the verandahs or garden shelters, beguiling the time with reading, conversation, or any other pursuit compatible with the maintenance of the recumbent posture. They are, however, carefully watched. Rugs, hot-water bottles, &c., are arranged so as to preserve them from chill ; and should any sense of cold be experienced, a small quantity of warm liquid food is at once administered. The temperature of the extremities, and even of the nose, is frequently ascertained. At ten in the evening all retire to rest in rooms,

¹ Pamphlet, Churchill & Co.

the windows of which are only closed while the process of undressing lasts ; and which are kept open during the night, in all weathers, winter and summer, to a degree proportioned to the amount of tolerance which has been established. The only exception to these rules is made in cases of acute exacerbescence, as shown by fever. If pneumonia or bronchitis supervene in any case, the patient is confined to bed ; and the temperature of the room is maintained at about 60° Fah., if necessary, by means of artificial heat ; but even in such a case, windows are not completely closed, and a continuous flush of fresh air is kept up. Should the normal temperature of the body not be attained within a week, the patient's bed is transferred, during the day, to the balcony. ' Many are, from the outset, well enough to enjoy the free range of the garden and the park ; and before long have recovered sufficient health and power to take walks of prescribed duration in the adjacent woods and mountains.'

Arrangements are made for changes of under-clothing, &c., for the use of those who may return from their expeditions with a freely acting skin. Instructions in breathing exercises are given, and careful injunctions to avoid any undue strain on the heart. Massage also is brought into requisition in all suitable cases, more especially in those which present any degree of neurasthenia.

A most carefully graduated cold-water treatment is also followed in most of the cases ; but infinite precautions are taken to avoid any chance of 'chill.' It is believed, as I think with justice, that the cold-water treatment has an important influence upon the circulation, and upon the oxygenation of the blood ;

stimulating nutrition, and protecting the system against the effects of cold.

Unless advised to the contrary by the medical attendant, each person comes down to first breakfast in the dining-hall at 8.15 A.M. ; and immediately afterwards the 'air cure' commences. The patients are forbidden to return to their rooms before the time fixed by the physician. Those who have no fever remain thus reclining in the open air until ten o'clock at night. The galleries and the kiosks are lighted by gas ; large stuff curtains can be drawn to protect the patients against rain, wind, or sun. Consumptives who have fever retire at 5 P.M. ; and sleep in a room, the window of which is constantly kept partially open. Walking exercise is scrupulously graduated each morning for each patient. The food is the object of much attention from Dr. Dettweiler ; who often repeats, '*Ma cuisine, c'est ma pharmacie.*' A cow-house for twelve cows is annexed to the sanatorium. The drainage is well carried out ; and its purification is effected, as at Frankfort, by means of lime and alum. One hundred and sixty patients can be received in this institution.

But, as Dr. Daremberg shows, if adequate medical supervision and nursing can be secured, it is by no means necessary to have recourse to such institutions as these. He himself, in 1876, by the advice of Dr. H. Bennet, left Paris a consumptive ; and went to the Riviera. Here he lay all day long in the sun ; at night he left his window partly open ; he fed well, took plenty of cod-liver oil ; and presently began to improve. As strength came back to him, he could walk a little, passed good nights, and presently felt a return of the desire for life. 'I no longer felt that

the sun of my life was setting ; I saw it rise each morning with happiness ; and each day it shone too short a time to permit me to enjoy at leisure the pure air, the bright light, the blue sea, the sky, the earth, everything.'

He gives some excellent directions as to the gradual leading on of the patient towards the 'air cure,' and the overcoming of his prejudices against this mode of treatment ; the opening of windows, in the first instance in adjoining rooms, then in his own room ; adjusting screens to ward off any sensation, or any idea of draught ; and the use of fires ; then at last he accomplishes his aim of freely opening both windows and doors.

He also describes a method of carrying out the open-air treatment at home and at very little cost. He gets a large wicker-work sentry-box, such as is used for sea-bathing ; this is lined with padding, and deprived of its seat. It is light and movable, and large enough to hold a reclining chair. The consumptive can thus lie at length, protected from the wind or sun. If the wind shifts, the position of the couch and the protecting screen can be changed at once ; and the patient can remain out of doors, often for the whole of the day, with his books and amusements, and food by his side. A thermometer should be placed over the patient's head so as to warn him if the temperature rises above 78°. In hot weather it is better for the patient to remain indoors with the window wide open, and the outside blinds shut. Otherwise he will be apt to become feverish or indisposed. It will be noticed that, throughout, great stress is laid upon the necessity for the recumbent posture ; and upon the protection

of the head, whilst the feet are exposed to the sunshine, or, if necessary, the feet can be kept warm by hot bottles, &c. There can be no doubt that these precautions are of great importance. Persons of weak circulation, as are most consumptives, readily become chilled when in the upright or sitting position ; but circulation of the blood takes place much more easily in the lower extremities, when the course of that fluid from the heart to the feet is fairly direct, and is not broken by too sharp angles ; besides which, the recumbent posture better permits the thorough muffling of the lower limbs in appropriate wrappings. It is well also to insist upon the patient retiring indoors when the sun is setting, so as to avoid the dampness of the air and the vapours which are apt to arise at that time.

There are many other modes in which the air cure may be carried out ; and change is often needful, so as to avoid wearying the sick person. I have myself pressed into the service, at Bournemouth, the coasting steamers that ply to Swanage, Weymouth, Portsmouth and the Isle of Wight. Some of my patients have thus spent many days upon the water, and have travelled hundreds of miles at a very small cost—for a subscription of two guineas covers a whole season. Great benefit has been derived from this course, and not a little enjoyment.

The patients were of course well wrapped up, and were placed in sheltered places on the deck, and they were expressly enjoined not to take part in tiring excursions on landing.

With regard to open-air treatment at home, it is most important that the conditions respecting medical supervision and nursing should be observed. The great

advantage of an establishment for the purpose is that these desiderata are supplied at little cost, and more efficiently than is possible when only periodical visits are paid.

Dr. Dettweiler rightly lays great stress upon the need of this skilled care of the patients ; not only is the case well watched, and the first beginnings of mischief detected, so that accidents may be warded off, but confidence is given to the patient, depression of spirits is prevented or soon overcome, and above all, his *education* in many points is carried out ; he is taught to avoid all imprudences, to obey orders, and to take an active interest in the progress of his cure. When we come to examine closely the several details of the treatment, we find that they may be briefly summed up under the following heads. As regards the institution, (1) a well-arranged building with a southern aspect, (2) placed upon a dry, pure, well-drained subsoil ; (3) a pure atmosphere, if possible, with abundance of sunlight ; (4) a garden well protected from the wind ; (5) sheltered verandahs or arbours facing the sun ; (6) constant medical supervision and an adequate nursing staff. If possible, the establishment should be well raised above the level of the sea ; but as we have already pointed out, this is not quite essential.

As regards the patients, the treatment involves, (1) for many of them, rest in the recumbent posture, for the greater part of the day, in the open verandahs or shelters, (2) careful feeding, (3) 'massage' in certain cases, (4) in others, carefully graduated exercises, (5) the judicious use of cold sponging, (6) the provision of suitable amusements, (7) appropriate medicinal treatment.

All these conditions could certainly be secured in many places within the British Isles ; and yet, as we have seen, no such institutions devoted to this form of treatment are to be found in this country. Probably the chief impediment to the establishment of these sanatoria is the opinion widely held, that our climate is too changeable for such an undertaking to be a success. But nothing is more certain than that this form of treatment is almost independent of the weather. The climate of several of the places, where these institutions have been founded, and have done much good, is much more inclement than our own ; and at certain times of the year it is even more treacherous and uncertain ; and yet the treatment is carried on all the year round. It is true that the patients must be habituated gradually to bear exposure to air in the open. The 'dose' must, in fact, be prescribed by the medical attendant, and confidence must gradually be given to the sufferer. Moreover, as we have seen, much stress is laid upon its administration in the recumbent position. With proper care to ward off cold and to avert a chill, it is astonishing what extremes of weather can be borne. It is asserted by those who have had a long experience of the treatment that the sick can, not only with impunity but with much benefit, take their air-cure in almost all weathers—in summer and winter, whilst it rains or snows, even in mist or fog. Almost the only exception made is when the winds are too strong or too cold. Dettweiler says, '*Malgré la pluie, les brouillards, les vents, et la neige, malgré un froid dépassant parfois 12°, très souvent sans soleil, les malades ont des jours médicaux de 7 à 10 heures, quelques uns même de 11 heures.*' M. Andvord, of Tonsaasen,

states that he has been able to prolong the 'jour médical' to 5, 7, and even to 9 hours, with a temperature of 25 degrees Centigrade below zero; and similar testimony comes from Davos and St. Moritz.

The question may be asked, What special advantages are to be expected from this exposure to the open air which cannot be obtained from our present system of abundant ventilation? I think it must be granted at once that a large part of the success of the treatment is to be ascribed to the hygienic measures, and to the watchfulness and care that are exercised by the attendants; but I am inclined to believe that something may be due also to the 'hyper-aération.'

In the first place, we have, as we have seen, an enormous quantity of fresh air passing over the bodies of the patients. It is certain that this air is much purer than that of any living-room. It has been ascertained that the number of micro-organisms, per cubic metre, is very much smaller outside than inside houses, however cleanly these may be; nay, the mere cleansing of a room will often materially increase the number of microbes floating about in the air. We may, with great probability, explain the disappearance of fever from our tuberculous patients, after a short exposure to the treatment, to the almost total absence of streptococci or staphylococci. These organisms are very abundant in the sick-chamber; and they are found almost always associated in the lungs of phthisical persons. It is possible that these microbes are, at least, one cause of hectic fever.

Again, the abundance of fresh air, together with the sunshine, acts antiseptically both upon the bodies and the clothing of the patients, destroying all organic

vapours that may emanate from either, and thus purifying the air that enters the respiratory organs. Further, the air of dwelling-rooms never contains an appreciable quantity of ozone. It may well be, therefore, that only by the open-air method can we get the amount of active oxygen, that is necessary to act medicinally upon the body, or that is sufficient to destroy ordinary bacteria. It is partly on this account, that I have so long thought it necessary to carry on the inhalation of ozone as a part of hospital treatment. The influence for good of these inhalations will presently be considered.

Lastly, we must not forget the beneficial influence of sunlight. The direct heat of the sun has, indeed, been found to be bad for the patients, tending to cause fever and congestion of the lungs. But, on the other hand, De Renzi's experiments (see '*Nature*,' May 25, 1895) show that sunshine materially assists guinea-pigs in combating tuberculous disease. There can be no doubt also that sunshine purifies the air by its bactericidal action; and as the experiments of Prof. Delépine and myself, already quoted, have shown, it has an extremely rapid action in destroying the virulence of tuberculous sputum and of tuberculous dust. (See p. 37.)

The warmth of the sun also, except in the height of summer, must quicken all the vital processes, and thus increase the activity of phagocytic action.

Whatever may be the explanation of the result, there can be no doubt as to the amount of benefit derived from the treatment, when it is carried out in its entirety, with open-air and hygienic measures and medical care all combined.

Although it must be acknowledged that statistics

Sanatoria	Name of observer	Mortality	Cures		Ameliorations	Not ameliorated	Mean duration of residence	No. of beds	Remarks
			Absolute	Relative					
Falkenstein . . .	Dettweiler .	per cent. 4 to 4.5	per cent. 14	14	per cent. 45	per cent. —	days 90	150	—
Görbersdorf . . .	Achtermann	7.51	25	25	50 to 55	—	93	250	—
„ (Römler) . . .	Römler .	7.5	25 to 27	25 to 27	50	—	80	110	—
„ (Rüchler) . . .	Wieher .	4.0	—	—	72	24	—	—	—
Reiboldsgrün . . .	Wolff .	2.5	—	—	70 to 73	—	—	100	—
Turban (Davos) . . .	Turban .	4.36	40	40	40	—	—	70	—
Hohenhof . . .	Meissen .	—	14.51	28.91	—	—	80 to 90	80	—
Nordrach . . .	Walther .	—	30	30	65	—	—	—	—
Halila (Finland) (for the poor)	Gabrilovitch	13.5	36.7	36.7	33	16.7	—	—	—
Falkenstein (for the poor)	{ Dettweiler & Nahm .	—	13	—	77	10	—	—	Only early cases admitted
Canigou . . .	Sabourin .	—	43.8	43.8	—	—	—	—	—
Adirondack Cottage . . .	Trudeau .	—	20 to 25	20 to 25	30 to 35	—	—	—	Patients pay two-thirds of expenses
Leysin . . .	Burnier .	—	—	—	—	—	—	130	—
Saint Blasien . . .	Haufe .	—	—	—	—	—	—	160	—
Winyale (Ashville, N. C., United States)	von Rück .	4.0	22.64	22.64	42.47	—	—	—	Considers that patients should stay 6 months to 2 years

of cures, 'absolute' or 'relative,' are necessarily of doubtful value, it is impossible to read the reports from these different institutions without being impressed with the general success obtained by the method.

Without laying any stress upon the actual figures, I venture to quote Dr. Knopf's table of results (see preceding page), with the simple remark that, if they are trustworthy, as I believe most of them are, they give sufficient grounds for at least a careful trial of the plan.

CHAPTER IX

CLIMATIC TREATMENT

Specific climates—Statistics at home and abroad—Sea voyages—High altitudes—Possible causes of amelioration—Cases unsuitable for high altitudes—Dr. H. Weber's views—Cases suitable for sea voyages—Mountain stations available—Sedative, stimulating, and intermediate climates—Evils of exposed sea-side resorts—Conditions required in climatic health resorts—Evils of long journeys and want of suitable comfort or of medical attendance—Cases suitable for change of climate.

THE subject of Climatic Treatment is closely allied to that of open-air ; for that climate is the best for consumptives which allows of the greatest amount of open-air life. It has been well said that there is no such thing as a climate that is a specific against phthisis. As I have tried to show in my Milroy Lectures, under certain conditions, phthisis exists, and spreads, in all parts of the globe, wherever there are communities of human beings—in the east and in the west ; in the north and in the south ; in high places and in low ; in warm and in cold climates. But it by no means follows that certain localities are not better suited for the cure of the disease than others ; or, at least, that a change of climate, or even of residence, may not be beneficial to the patient.

Attempts have been made to put this matter upon a statistical basis, and tables representing the number of cures, the proportion of cases of arrest, of improvement, of stationary condition, of worsening, and of

death, have been drawn up by various high authorities, notably by such men as Drs. Clifford Allbutt, Austin Flint, Pollock, Weber, and C. T. Williams.

A summary of these results, drawn up by the late Dr. Wilson Fox, is given in the appendix, but no attempt will be made to analyse the figures or to gauge their comparative value.

It is, in truth, extremely difficult to disentangle these statistics, to take proper account of the proportions of the cases in the several stages of the disease, or to estimate the influence of social position, personal temperament, medical supervision, &c.

Taking the figures as they stand, however, it may be pointed out that the relative numbers, quoted from Dr. C. T. Williams, of 700 cases remaining in England, and those for the 235 cases who had gone abroad, do not give much encouragement to patients to seek the dearly bought advantages of foreign travel.

Class	Nos.	Cures	Much improve- ment	Relief	Worse	Death
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Remaining in Eng- land	700	3·1	27·0	9·8	37·4	22·6
Change of climate	235	5·0	38·7	14·0	25·1	17·1

The differences between them are certainly no more than might be accounted for by the assumption that many of the first group were either too ill or too poor to go abroad. The proportion of cases at different stages of the disease are not given in this first class; but of those who travelled, 147 were in the first stage and only 37 in the third. That our assumption is a probable one is confirmed by the

more recent statistics given by Dr. C. T. Williams, in his work on 'Aëro-Therapeutics' (p. 143). Here he gives a table comparing home climates with the Riviera, both sets of patients having changed their residence. They are thus of a superior class to the 700 who stayed at home; and yet it will be noticed that the visitors at our home health resorts present a larger proportion of persons suffering from advanced disease, and of those who had both lungs affected. The general results at home, therefore, are perhaps as favourable as they could be expected to be.

I	No. of patients	Average length of residence	First stage	Second and third stage	Bilateral affections	Results						
						General			Local			
						Improved	Stationary	Worse	Arrest	Improved (including arrest)	Stationary	Worse
Riviera	210	Months	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Home climates	292	9'0	59'0	41'0	36'0	65'2	10'00	24'80	5'9	36'6	17'8	45'6
		9'7	58'0	42'0	42'0	63'7	8'21	28'00	2'0	38'9	20'0	41'1

Dr. Austin Flint's notes are perhaps the most interesting, for they cannot be regarded as mere statistics, but give many important details with regard to each case.

On the whole, they are even more favourable with regard to the results of change than Dr. Williams' figures. 'Thus,' he says,¹ 'of the 74 cases, there was apparently more or less benefit from the change of climate in 56; and in only 11 does it appear that there was no benefit, the disease either making no progress or progressing slowly in the remaining 7 cases.'

He also draws the important conclusion that a

¹ *Phthisis*, p. 383.

favourable influence on phthisis is exerted by a variety of climates. 'It would seem, indeed, judging from these facts, that the favourable influence pertains to the change, rather than to the particular climate chosen' (p. 387).

He also attributes much influence to the change of habits, especially from those which are sedentary, and confining within doors, to those involving out-of-door life and activity.

These facts are distinctly in favour of the proposition with which we started; that the opportunities for comfort, and exposure to the air and sunshine, are of more importance than the meteorological elements that make up particular climates.

There are, however, two startling exceptions to the general average of improvement from change of residence—namely, the influence upon the disease of high altitudes and of sea voyages.

In the same table from which the preceding figures are drawn, Dr. Williams gives his experience with reference to these two forms of change of air. The figures are here given :

I	No. of patients	Average length of residence	First stage	Second and third stage	Bilateral affections	Results						
						General			Local			
						Improved	Stationary	Worse	Arrest	Improved (including arrest)	Stationary	Worse
		Months	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
High altitudes	247	12·2	65·0	35·0	37·0	83·4	2·02	14·57	42·5	75·5	5·3	19·1
Sea voyages	65	1·6 (average of voyage)	63·0	37·0	37·0	77·0	—	21·56	7·7	53·3	10·7	33·8

It will be noted that the proportions of the several classes of patients is as nearly as possible the same as those before recorded. The figures for those who went on sea voyages are slightly the worse of the two, but the results are greatly more favourable; 77 per cent. of improvement by sea voyages, and 83·4 per cent. at high altitudes; and the corresponding figures of local improvement, including arrest, are respectively 83·3 per cent. and 75·5 per cent.

Other writers concur in the favourable verdict thus passed upon these forms of change, with a balance distinctly in favour of the residence at high altitudes. Thus, Dr. Weber gives a total improvement at high altitudes of 62·2 per cent.; sea voyages 47·3 per cent.

In his more recent work, Dr. Williams states that out of 246 patients who resided, on the average, a little more than a year at high altitudes, a cure was effected in 101, or 49·89 per cent.; great improvement in 73, or 29·55 per cent.; some improvement in 32 or 12·95 per cent.; making a total of improved 206, or 83·40 per cent. 'Roughly speaking, nearly seven-eighths improved, and one-eighth deteriorated, of whom 48, or 19·43 per cent., died.' At Davos, Spengler gives 75 per cent. of improvement at all stages, Clifford Allbutt, 37 per cent. In Colorado, Denison notes 47 per cent. of total improvement, 85·3 per cent. in the first stage.

For sea voyages the reports vary from 47·3 per cent. (Weber) to 89 per cent. (Dr. C. T. Williams).¹

¹ I should myself be inclined to accept the medium figures as nearest the truth. We cannot entirely trust the biased reports of local physicians. I have several times examined cases in whom the disease has been professedly arrested, and have found the disease extended and still advancing; but, on the whole, medical opinion, from Hippocrates and Aretæus onwards, is more unanimous in their favour than even those for high altitudes.

It is hardly necessary to enter upon the possible causes of this amelioration—the greater purity of the air, the increase of ozone, the intensity of the sunlight, and so on. It is sufficient to point out the increased vital power, the improved appetite, the increased aëration of the blood, and the nervous energy that are imparted by both these extreme changes of external conditions.

But it is not every phthisical patient who can submit himself to these means of cure, even if he can afford the time and the expense.

Dr. Herman Weber has classified the following as unsuitable cases for high altitudes: (1) consumptive persons belonging to the 'erethic' group; (2) phthisis in a very advanced stage; (3) phthisis complicated with emphysema; (4) with albuminuria; (5) with disease of the heart; (6) with ulceration of the larynx; (7) with rapid progress and constant pyrexia; (8) with great loss of substance; (9) with considerable empyema; (10) phthisis in persons who cannot sleep or eat in high elevations, or who feel constantly cold.

The best cases for high altitudes are, of course, those who have a certain amount of bodily vigour, and who therefore can withstand the cold of winter; but less robust persons often obtain benefit from residence on some alp facing south, during the summer months.

Cases in the first stage are the most suitable; but patients in more advanced stages of the disease are also benefited, if there is no active mischief, and the lesion is limited.

The elevated health resorts available for Europeans are those of Switzerland—notably Davos (5,000 ft.), Wiesen (4,700 ft.), St. Moritz (6,000 ft.), and

Leysin (4,500 ft.), but more genial climates are to be found at Bormio, with an altitude of 4,200 ft., or Monte Generoso (3,700 ft.). All these places have the advantage of being comparatively easy of access, and of possessing excellent accommodation for invalids.

For those who are able to take long journeys, the Rocky Mountain stations of Manitou, Colorado, Denver, and Yellowstone are available; and a genial climate in the winter may be combined with a high elevation by crossing the Line. Thus, Dr. Walshe speaks in terms of commendation of Jauja, in the Peruvian Andes, and others of Santa Fé de Bogota and Quito; others, again, of the South African Highlands of the Orange Free State; but we may well hesitate about recommending any of our patients to run the risk of bad accommodation, and the certainty of hard and expensive travelling, which journeys to these latter places would involve.

Most of the restrictions pronounced by Dr. H. Weber with regard to high altitudes apply also to sea voyages, with the exception of those numbered 3, 5, and 10. A tendency also to hæmoptysis is not a bar to this mode of treatment; for nearly all authorities agree that this accident is very rare at sea.

In my experience, the best results have followed

¹ Dr. Walshe says, 'For my own part, I have no hesitation in avowing my belief that, if downright bad climates be avoided, a long sea voyage, or a protracted cruise, is a remedial measure of real value. It will especially be likely to prove so if the patient be "fond of the sea." The improvement of appetite, the increased facility of digestion (especially of fat), and hence the increase of weight and of strength, are sometimes as rapid as they are marked. Of course, the early sea-sickness must have passed away before these results are observed; and occasionally, when in the neighbourhood of the Line (where the Australian voyage is that taken), the great heat may bring back the perspirations the patient had lost, destroying his appetite, and in all respects throw him back for a while—but only for a while. Not only do I believe with Gilchrist that there is no special danger of hæmoptysis, but, as I

the longest voyages—those to New Zealand or Australia ; but the journey both there and back should be taken round the Cape of Good Hope and not round Cape Horn. In common with Dr. Walshe, I have more than once seen the good derived from the first voyage undone by that back by the second route. Yet I have also seen much good come from the shorter voyages to the Cape and to Natal. In any case, however, the greatest care should be taken to secure comfort and good ventilation of the berths ; and I have already remarked, that, on the best lines of steamships, the second-class accommodation, in these respects, is even superior to that of the first class.

Patients also should be cautioned not to stay at the seaport at which they arrive, but to go up country, if possible, to some high, well-protected, and comfortable health resort, where good medical advice may be obtained.

But there are many patients whose cases are unsuited to either of the modes of treatment that we have been considering ; there are also others who, from one cause or another, are unable or unwilling to avail themselves of them. By these persons we shall often be called upon for advice as to suitable climates ; and we must adjust our recommendations to each individual case.

have several times known, the disposition to constantly recurring hæmorrhage may be effectually checked by the combined influences of life afloat.

‘ To sum up : a sea-voyage, more especially in the case of young adult males, will, I think, occasionally work more effectual change in the phthisical organism than any other single influence or any combination of influences that I am acquainted with. Not only have I seen the local disease stayed, and the damaged lungs attain the maximum of possible repair, but the whole constitution undergoes such remodelling as to render a fresh outbreak of the tuberculising process an unlikelihood.’—*Dis. of Lungs*, 4th ed. p. 655.

Apart from the value of mere change of residence, in which I have already expressed my own profound belief, much may undoubtedly be done for consumptives by residence in appropriate climates. Although we may not be able fully to explain from meteorological data the exact mode in which certain places act upon invalids, the experience of many medical men has taught us that there are important differences in their action upon certain classes of disease.

Questions will chiefly arise with regard to suitable places to sojourn at during the winter and spring; the choice in summer and autumn is generally sufficiently easy.

The winter and spring climates have been conveniently classified into (*a*) sedative climates; (*b*) stimulant climates; (*c*) intermediate climates; (*d*) health resorts having some special advantages towards cure.

(*a*) The first group of climates are generally warm and somewhat relaxing, genial, soft, and moist. Their influence upon the system is soothing and makes against fever and irritation; they prevent over-oxidation of the tissues, and promote the formation of fat. On the other hand, they are apt to be somewhat depressing and enervating. The cases that should be sent to these places are mostly those in whom the disease is of the irritative, pyrexial type, the throat and bronchial mucous membrane dry and irritable, the lungs prone to congestion and hæmorrhage; nervous, restless patients who neither eat nor sleep well.

The places that have been included in this category are, in the British Isles, Cove, or Queenstown, Jersey, Penzance, Sidmouth, and Torquay; in France, Pau,

Hyères; in North America, Florida; and we may add the islands, Corfu, Corsica, Madeira, Bermudas.

(*b*) Stimulant climates.—These, as Dr. Walshe describes them, are dry, stimulant, bracing, tonic, exciting, and, as a rule, exhilarating. ‘But in their evil aspect they are irritating, disposed to excite congestion of the pulmonary mucous membrane and parenchyma, to generate dry cough and diminish bronchial secretion where it has been copious; to promote the occurrence of hæmoptysis; to render nervous people yet more nervous, and prevent, rather than conduce to, sound and refreshing sleep.’ The cases for which these climates are fitted are in all respects the converse of those adapted to the sedative group.’ Amongst them I may mention, as those with which I am best acquainted, in the British Isles, Clifton, Grange, Hastings and St. Leonards, the Undercliff; in France, Cannes, Nice, Mentone, the Riviera generally; in Spain, Malaga; in North Africa, Egypt, Algiers, Mogador, the Canary Islands; in South Africa, Cape Town, Natal.

(*c*) The intermediate group are such places as Bournemouth, Falmouth, Tenby, Arcachon.

In group (*d*) Dr. Walshe chiefly places those with a resinous and balsamic atmosphere, and here again appear Bournemouth and Arcachon, with their brilliant sunshine and forests of pine trees.

We may also class with them places offering special ‘cures,’ such as Meran, with its grape cure, and the various sanatoria which have already been mentioned under the head of ‘open-air treatment.’

A few words must be said as to the influence upon phthisis of the truly maritime climates; of sea-

side places upon the littoral, freely exposed to the sea-breezes.

It has been the custom of many medical men to send consumptive patients to the 'seaside' without distinction of place ; but, in my experience, the results of sending patients with tubercular disease of the lungs to any exposed seaside resort have been little short of disastrous.

I am unable fully to account for this influence of strong sea air : perhaps it may be due to its highly stimulating qualities, or to its rapidly cooling properties : but of the fact I am strongly convinced, and I now never send any but the most robust, or those in whom there are the very earliest symptoms of the disease, to such places, for instance, as Blackpool, Llandudno, or Folkestone.

These remarks do not apply to places somewhat withdrawn, or sheltered from the sea-breezes ; and therefore such places as Ventnor, Bournemouth, parts of Torquay, Mentone, San Remo, &c., show a large proportion of cures and of material improvement. I am glad to find that these views as to the danger of many seaside places are supported by such authorities as Broussais, Beneke, and others.¹

Fodéré long ago maintained² that marine air both favoured the development of phthisis, and acted injuriously on those already affected.

Dr. Walshe says, 'On the whole, the weight of evidence seems to bear rather against, than in favour of, marine air ; that is, *on the sea shore*.'³

I may add that a small elevation, say fifty feet

¹ See Daremberg, vol. ii. p. 130.

² *Méd. Légale*, Paris, 1813.

³ *Loc. cit.* p. 591.

above the level of the sea, seems to remove the danger from this source.

It is important to select a place of sojourn carefully, for many reasons ; first, doubtless, because we hope that the change may beneficially affect the disease in the lung ; and on this account the air must be pure and free from germs,¹ the soil must be also pure and dry, and there must be plenty of sunshine.

But there are other reasons for extreme care in giving our advice. After all, the main object of allowing our patients to quit their homes is, that we may induce them to take as large advantage of Nature's powerful remedies, fresh air and sunshine, as possible. To this end we must coax, and, if necessary, even cajole them into the belief that the air of the place they are going to is likely to do them good. We must choose a place where in the winter the climate is either comparatively warm ; or where, owing to its extreme dryness and the absence of wind, the cold is not felt ; or where there are plenty of sheltered places where the sunshine can be enjoyed in shelter from the wind.

Moreover, it is essential that, wherever he may be, the consumptive should be in comfort. There must be a good hotel, or good lodgings, if possible, with a garden or sheltered verandah, looking south, where he may lie, for the greater part of the day, in the open air. If he is fairly robust, and, as many of them

¹ It is no doubt on this account that, for the most part, places are selected in which there have been comparatively few endemic cases of phthisis ; but this fact alone cannot be regarded as an altogether safe ground for such selection : witness the rapid growth of the disease in certain localities in Australia, as soon as the conditions of sparseness of population, of purity of air, &c., had disappeared.

are, of a quick, energetic disposition, he must have permissible amusements at hand, to prevent his becoming *ennuyé*; and yet he must not be tempted to do things that will interfere with his recovery. It is on this account that, for some persons, one place almost ideally perfect in many respects, namely Monte Carlo, must be closed to him.

Above all, he should be within easy reach of a sensible, cheery doctor; who, in his periodical visits, can infuse hope, and yet keep him to the course of treatment that alone can restore him to health. All these varied circumstances have to be taken into account in deciding upon a 'health resort;' otherwise the result is apt to be disappointing. I have known delicate sufferers, for instance, sent to the Hebrides or to the Orkney Islands, solely because phthisis is a rarity in those places, without any security of finding suitable accommodation, and without the means of procuring the comforts, medical or other, so necessary in their condition. Others, again, have been sent to Braemar in the winter; and after many trials, they have rushed away, frightened by the mists, the cold, and the damp, which they felt themselves totally unable to encounter. 'The wind must be tempered to the shorn lamb;' and if cold air is thought desirable, it must be in places like Davos, St. Moritz, or Leysin, where everything is provided for its onset, and where a gradual approach may be made towards meeting its stern but healthful aspects.

It is on these accounts that we should hesitate about allowing our more advanced cases to undertake long journeys, such as those to the Orange Free State, to California, or to the Peruvian Andes (Jauja).

The requirements as to comfort, &c. should be sought for in any place to which we send our invalids ; but our final choice of a locality will have to be determined by a consideration of their actual physical condition.

To this end, we must know—1. the extent of local disease ; 2. its rate of progress, and the amount of constitutional disturbance, as shown by fever, night sweats, cough, &c. ; 3. the general vigour of the system, the state of the digestion, the available companions, &c. &c.

The cases most likely to benefit from any change of climate are, as we have already pointed out—those who have a small amount of consolidation, limited to one apex, with little or no general constitutional disturbance ; or those in whom the disease pursues a chronic course, with long intervals of freedom from active mischief.

Many of these we may safely allow to take long sea-voyages, especially to Napier and Nelson in New Zealand, or Sydney in Australia. But in neither case should they stay near the coast, but should go ‘up country,’ to some place where they can get the needful rest and comfort.

Others, again, may with great advantage winter on the Nile, in a comfortable ‘dahabeeah ;’ or in Algiers ; or in the environs of Capetown, Wynberg, or Ceres ;¹ or at Davos or St. Moritz in the Engadine ; in Colorado, or the southern parts of California.

Although Madeira is now less recommended by the faculty, mainly on account of its warm moist atmosphere, it has a good record for cases in the first stage ; and I have several times seen cases recover entirely after

¹ I have recently heard that comfortable quarters can be obtained at Middleburg, Cape Colony, on the High Karoo, 4,000 feet above the level of the sea.

a winter or two spent in the island. On the other hand, in spite of the delicious climate of the Canary Islands, I have been disappointed in its effects upon the few patients who have visited Teneriffe and Grand Canary.

Probably the greater part of our patients who leave this country for the winter, do so in order to go to the Riviera, and I have certainly thought that in many of them life has been prolonged, though the proportion of cures has been distinctly smaller: and I cannot say that the general results have been better than those obtained at southern localities in England. It is, moreover, a mistake to suppose that winter is avoided by going anywhere short of Egypt, and even there it is necessary to travel on to Luxor or Assouan. Great precaution also is necessary at all these places, on account of the rapid changes of temperature at sunset, or even on going into the shade. Again, great heat is to be dreaded by consumptives as much as, if not more than, cold. It has been shown that the soldiers in the French Army who come from the North are especially liable to contract rapid forms of phthisis, when they are brought to the warmer regions of the South.¹

No patient should be allowed to travel far, in whom there is active and progressing mischief. Parents and friends should be warned that it is nothing short of cruelty, to allow such persons to be submitted to the inevitable trials and discomforts of travel; and they should be made to understand that the progress of the disease will only be hastened by such a course.

It is quite possible to obtain all the requisites that

¹ *Phthisie Galopante*, p. 5, Colin. Paris, 1874.

have been mentioned as desirable within the bounds of the British Isles ; and often without going far from home. It is, however, much to be regretted that there are so few sanatoria in dry, healthy localities, where special provision is made for the treatment of consumptive patients, by means of pure, open air, and sunshine. There are many places in this country, where, on a dry soil, and in a sunny, sheltered part, on the southern slope of some upland, most of the conditions can be obtained which are now dearly bought and far sought, and often not obtained, in distant parts of the world. I may again remind my readers of the statistics recorded of one such place, in Chapter V, p. 61 ; and I have not the smallest doubt that there are many such places in other parts of the country, for instance, near Bournemouth, Malvern, Tonbridge Wells, or on some of the heights that abound in Surrey, Dorsetshire, Devonshire, or Cornwall.

In the absence of cheap and readily accessible places of this kind, I have often persuaded phthisical persons to make the best of localities near at hand ; and, by means of some device, like that suggested by Dr. Dairemberg (p. 114), have insisted upon carrying out the open-air treatment at home.

The one great drawback to this plan, in the estimation of the public, is undoubtedly the extreme changeableness of our climate ; but even this is not a fatal objection ; and if patients can be freed from their terror of 'taking cold,' all the really essential parts of the treatment can be perfectly well carried out in this country.

CHAPTER X

MEDICINAL TREATMENT

Number of remedies—Possibility of error from results of hospital treatment—Need for bacillus search—(1) Specific remedies—Tuberculin—Blood-serum—Results—Cantharidinate of potash and chloride of gold—(2) Anti-bacillary remedies—Reasons for failures of so-called bacillicides—Their true action—Creasote—Bouchard—Sommerbrödt—Dosage—Formulæ—Results—Mode of action—Guaiacol: Dr. Moritz on—The carbonates of creasote and guaiacol—Results—Iodoform: Various opinions on—Mode of administration—Formulæ—Inhalation of—Influence on body-weight—Other results—Iodol—Iodine, iodides, and iodates—Tannin—(3) Constitutional remedies—The hypophosphites—Dr. Hodgkinson's observations—Other observers—Arsenic—Iron—Dr. Daremberg on mineral waters

THE number of remedies proposed for the treatment of any disease is often in inverse proportion to its curability; and phthisis is no exception to this general rule. Hosts of remedies for this disease have been introduced, each highly extolled by its discoverer; but most of them have been soon discredited on further trial. This fact shows at least an unwillingness to accept defeat; and out of the multitude of weapons some few may be selected, as well tested and worthy of further trial. I do not propose to discuss the merits of most of these medicaments; but I beg to refer those who are interested in this kind of research to Dr. Daremberg's first volume, or to Dr. Neale's 'Medical Digest.'

It will be preferable to mention only the comparatively few drugs of which I have myself had experience, and to give my conclusions as to their efficacy.

Before doing so, however, I would venture to point out the difficulty of forming an opinion as to the results of treatment of *in-patients* of hospitals for consumption. In my experience so large a proportion of these persons do well, whatever course of medicine they are under, that it is extremely difficult to judge between the improvement that is due simply to the improved conditions of hospital life, and that which may rightly be ascribed to the treatment. It is on this account that I have always preferred to found my judgment upon the observations made at the *out-patient* department, where large numbers of patients are submitted to our trials, under all the otherwise unfavourable circumstances that usually surround them. If, under these conditions, we happily succeed in effecting improvement, in lengthening their lives, or even in arresting the disease, we may safely conclude that it is to our intervention that the praise is due.

We may have increased confidence in the results, when, as in most of the cases submitted to us, the bacillus search has been carried out; and I may state that, in our observations, few cases have been pronounced to be distinctly tuberculous, without positive proof of the existence of bacilli.

The remedies that have thus passed under my notice may be classed under the following heads: (1) Specific remedies, or antidotes. (2) The anti-bacillary remedies, so-called, which are supposed to act upon the bacillus itself, or to neutralise the toxins derived from it. (3) Constitutional remedies, intended

to strengthen the system, and to render it less vulnerable and more resistant.

(1) Under the first head, we must put Dr. Koch's inoculations with 'tuberculin.'

This treatment was carefully carried out at the Manchester Hospital upon 17 patients, selected with great caution from amongst those who voluntarily presented themselves for the experiment. Most of them were early cases of the disease, in whose sputum the bacillus had been detected.

The results of the treatment were almost exactly similar to those afterwards reported by the Tuberculin Committee appointed by the Brompton Hospital. The supposed characteristic reaction occurred in most of the cases; but not in all, thus depriving tuberculin of the advantage of being a thoroughly trustworthy diagnostic agent. There was no distinct diminution of the disease in any case, and several were undoubtedly aggravated by it. In most there was some loss of weight, and in none was there any gain comparable with that obtained by other modes of treatment.

Of three private patients, who wished for the treatment, two were no better for it, and the third, a doubtful case, recovered. Fortunately, no speedy death took place amongst any of our patients during the trial: but I had an opportunity of being present at two post-mortems of cases that had been treated by tuberculin at other institutions; and, from these, it was evident that Prof. Virchow's opinion respecting the danger of spreading the disease through the body was fully justified, for, in both, there was abundant evidence of the presence of extensive and recent tubercular deposit.

We may be sure, therefore, that the decision of the profession to abandon the treatment until further investigation had been made by bacteriologists, was a wise one.

Already some attempts have been made, by purifying tuberculin, to get rid of its more dangerous properties, as in Dr. Klebs's tuberculo-cidin; but I have had no experience of these preparations, nor yet of the treatment by means of the blood serum of refractory animals, such as the goat and the dog.

It is certainly right that researches in these directions should be carried out; but it is to be hoped that they will be brought before the profession with more discretion than those on tuberculin. I confess that I have not much confidence that any anti-bacillary vaccine will be discovered for a disease, in which one attack confers no immunity against a second.

In this group of remedies we may perhaps include cantharidinate of potash and chloride of gold. I have seen a few cases treated with these substances, both at the hospital and in private practice; but without benefit, and with sundry unpleasant side-consequences.

(2) Anti-bacillary remedies. After the discovery of the bacillus of tubercle, most medical men regarded its destruction within the body as the chief object to be attained; and set to work to find ways and means of reaching it wherever it had formed deposits. As we have seen, these attempts have proved fruitless, but, in the trial, some of the substances originally employed with this object have been found useful, not indeed as bacillicides, but as a means of protecting the system

against further ravages ; and as antidotes to the poisonous matters secreted by the micro-organism ; and, in some cases, as valuable aids in improving the general nutrition of the body. Amongst these drugs creasote, and its derivative guaiacol, iodoform, perhaps tannin and the salicylates, and some other medicines, have emerged as deserving acceptance by medical men, and as well worthy of trial as remedies for the disease, when not too far advanced.

Creasote was used indeed long before the bacillus was found, and was employed especially by Bouchard, in the form of beech-wood creasote, though all that he could say was :—‘ Parmi tous les remèdes proposés contre la phthisie pulmonaire, ce que nous avons de moins mauvais c’est la creasote.’

Sommerbrödt gave it in some thousands of cases, as he says, with distinct benefit ; and, since his reports it has become the chief drug now used as a general remedy for the disease.

Creasote has been largely employed at the Manchester Hospital for Consumption, both for in-patients and at the dispensary,

On the whole, the results have confirmed the favourable reports from other institutions ; and, for the reasons already given, I am inclined to attribute most value to those derived from the out-door department. In many of the cases there was certainly a distinct improvement ; and there were several of undoubted arrest and apparent cure. It must be acknowledged, however, that most of the latter had spent some time at the hospital ; and had subsequently changed their residence, in obedience to the advice usually given to such patients. The creasote was given to both in- and

out-patients in a simple emulsion, according to the subjoined formula.

R.	Creasoti	.	.	.	.	.	.	mj-x
	Syrup. Tolutani	.	.	.	.	.	.	ʒj
	Muc. tragacanth.	.	.	.	.	.	.	ʒiss
	Aq. vel ac. camph. ad	.	.	.	.	.	.	ʒss
	M.							

It was very rarely found to disagree, and latterly the commencing dose was 5 minims three times a day, a dose increased as soon as possible to 10 minims. Indeed, it was not usually found that much improvement took place, until the dose had been raised to at least 8 minims; and the best results were obtained in those who were able to take 10 minims regularly for long periods of time.

No attempt was made to disguise the flavour of the drug, as that had been found to be futile; but, if the patient complained of the acrid taste or strength of the mixture, the difficulty was generally overcome by ordering it to be taken in milk about an hour after a full meal. I have had charts drawn up showing the progress in weight in those who took this medicine, during the year 1894 in hospital; but I do not lay much stress upon these for the reasons already given.

Dr. Daremberg protests against what he calls 'ces orgies créosotiques,' and thinks that larger doses than one gramme per diem are dangerous, likely to provoke digestive troubles, fatal hæmoptysis, and fresh deposits of tubercle in the lungs, or in distant organs. I can only say that we have never noticed anything of the kind either in the hospital or outside. As a rule the drug is of some service in all stages of the disease; but it should always be discontinued when there is much fever present. If it agrees, as it generally does,

it seems to have a special action upon the stomach, improving the appetite, cleaning the tongue, and adding to the body-weight; but it also has some influence upon the secretions from the lungs. It is well known that it is excreted chiefly through the lungs; and though there was no evidence of direct action upon the bacilli *in situ*, it seemed to check their further spread, and to antagonise their toxins. It generally diminishes materially the expectoration, and therefore the cough; and causes distinct improvement in the general health.

In the few cases in which it has disagreed with the patient it has sometimes been given in capsules; or it has been administered in suppositories, 5 minims in each, or in enemata; and lastly it has been given by inhalation, either on a respirator-inhaler, or under pressure of 6 or 8 kilogrammes, in a Tobold's apparatus. The last-named method was often used at the same time as the internal administration; and it apparently assisted the ordinary action of the drug. I have no experience of the hypodermic or epidermic employment of creasote, but have made a few trials of the creasote and guaiacol carbonates. It is a temptation to try these drugs, on account of their comparative tastelessness, in doses of 5 to 15 grains; but they are too expensive for use in the out-patient department; and, amongst in-patients, neither I nor the other physicians to the hospital saw any good reason, from our results, for substituting these compounds for the simple drugs. On the contrary, in several cases, weight was lost that had been gained under creasote alone.

Guaiacol, the derivative of beechwood creasote, has also been largely employed at our hospital, for

both out- and in-patients. In many cases it has been given at the outset of treatment; but latterly my own observations, in both public and private practice, have led me to give it only when the creasote disagreed with the patient, or when the gain in weight did not seem commensurate with the usual standard. It was given in 2 or 3 grain pills—1, 2, 3 or more at a time—three times a day half an hour after meals. In my experience, as in the case of creasote, it was usually of distinctly less service until the larger doses were used. When from 6 to 10 grains daily were given, there seemed to be but little difference between the results of treatment with this drug and with creasote. It is less obnoxious in taste, and is easily given in pill form or in capsule; but, on the other hand, its cost is much greater, being four or five times that of creasote. There was the same gain in weight, often remarkably steady in its rate of increase, the same improvement in appetite, lessened expectoration, and diminished cough, but, again, the evidence of direct anti-bacillary action was wanting.¹

In combination with menthol, as in the following formula, guaiacol is well adapted for intra-laryngeal

¹ My colleague, Dr. Moritz, who has had a large experience in the use of guaiacol since its first introduction in 1887, has kindly communicated to me his results. He says: 'I have the personal impression that, in the majority of cases of early phthisis, guaiacol is a most valuable remedy. I have found, in many instances, that patients who had been losing weight under other modes of treatment, at once commenced gaining weight, &c., when taking guaiacol.'

'I have the records of five cases of early phthisis in whom the physical signs and also the tubercle-bacilli have disappeared under guaiacol—in one case now for six years. I almost always give hypophosphites, cod-liver oil, &c., if indicated, at the same time. I prescribe guaiacol in doses of one to three minims daily. Only in a few cases have I given the drug in increasing doses, arriving finally at the large dose in vogue a few years ago (10 to 15 minims, *ter die*). I found no advantage from these large doses; on the contrary, they, similarly to large doses of creasote, interfere more or less with the digestive powers

treatment; and, in many advanced cases, especially where the larynx was threatened, the daily injection of half a drachm of this fluid into the trachea, with a laryngeal syringe, was often followed by a period of comparative comfort to the patient.

R	Guaiacol	.	.	.	.	.	.	m℥x
	Menthol	.	.	.	.	.	.	m℥x
	Ol. Olivæ	.	.	.	.	.	.	℥ 80
	M.							

Iodoform has been used in the treatment of phthisis since 1878, when it was introduced for this purpose by Moleschott. It was supposed to have an anæsthetic effect upon the mucous membrane, and to counteract septic changes. In common with almost

of the patient and produce loss of weight. In advanced and acute cases of phthisis, guaiacol only rarely produces any beneficial effect.'

Dr. Moritz appends the following table, drawn up by Dr. Edwards, the resident medical officer to the hospital :—

100 CONSECUTIVE CASES OF PHTHISIS TREATED AT BOWDON BY
DIFFERENT METHODS (*not* GUAIACOL)

72 gained	.	.	.	.	.	.	488 $\frac{3}{4}$ lb.
24 lost	.	.	.	.	.	.	114 $\frac{1}{2}$ lb.
2 remained stationary.							
2 died.							
Average gain in weight	.	.	.	.	.	.	3·74 lb.
Average stay in hospital	.	.	.	.	.	.	77·8 days.
5 patients gained over 14 lb.							

100 CONSECUTIVE CASES OF PHTHISIS TREATED WITH GUAIACOL

80 gained	.	.	.	.	.	.	513 $\frac{1}{4}$ lb.
16 lost	.	.	.	.	.	.	54 lb.
2 remained stationary.							
2 were too ill to be weighed.							
Average gain in weight	.	.	.	.	.	.	4·59 lb.
Average stay in hospital	.	.	.	.	.	.	73·5 days.
4 patients gained over 14 lb.							

Dr. Moritz has also treated a number of cases of phthisis with *benzoesol*, but he found it less efficacious than guaiacol. 'The same patients gained weight, and improved more rapidly with the latter drug.'

all drugs different results have been obtained by different observers. On the one hand, Semmola, Germain Sée, Dreschfeld, and others speak favourably of its action; on the other, Daremberg states that he has never seen the least good done by it, and that it has several times provoked gastric troubles. I have myself had a large experience of iodoform, in the treatment of several forms of tubercular disease; and on the whole the results have been distinctly favourable, especially in its influence upon nutrition. As an external application it has been found of great use, not only by myself but by many others, in the treatment of scrofulous sores and abscesses, especially when it could be brought into immediate contact with the focus of the disease; and it has won much credit in the treatment of tuberculous joints. I began to give it internally in cases of phthisis about twelve years ago, when it was tried in all stages of the complaint, both in public and in private practice. At first, some disappointment was met with. Many persons, especially women, were unable to take it, in consequence of the nausea and disturbance of the digestive organs that it caused.

It was, however, given to all the cases that could take it, in the form of a pill, $1\frac{1}{2}$ to 2 grains, three times a day; and presently it was found that by combining it with 2 grains of croton-chloral (at the suggestion of Dr. Marsh), it could be taken with much greater facility. Shortly afterwards, I found that a little codeia, as in the following formulæ, had a still better effect; and it is now rare to find anyone who cannot take it. The sedative has an excellent influence on the cough; and the cascara, though used chiefly as an

excipient, keeps the bowels and digestive organs in good order.

℞ Iodoformi . . . gr. jss.	℞ Iodoformi . . . gr. ij
Codeiæ . . . gr. $\frac{1}{3}$	Codeiæ . . . gr. $\frac{2}{3}$
Ext. cascariæ . . gr. $\frac{1}{2}$	Ext. cascariæ . . gr. j
M. ft. pil. j.	M. ft. pil. j.

These pills were given three or four times a day, after meals.

Dr. Daremberg made use of the following formula :

℞ Iodoform	1 gramme
Ext. lactucæ	1 „
Coumarine	0.10 gramme
Misce, fiat massa in pil. xx div. Dose, 4 to 8 a day.	

In our practice, iodine, and iodoform, inhalations were also prescribed as a general test of its influence upon the disease ; but I am unable to say whether they did more than reduce any tendency to foetidness of the breath. The following is our formula for iodoform inhalations :

℞ Iodoform	1 part
Æther	10 parts

15-20 minims to be used for each inhalation with a respirator-inhaler.

In our observations upon the action of these and other drugs, the weights of the patients were recorded for some little time before its use, and after its administration ; and, at the commencement of the research, charts were made showing graphically the loss or gain in weight during the treatment, especially in the out-patient department. My observations, however, refer only to the latter class, and consequently the sources of fallacy that have already been alluded to are avoided.

Since it seemed best to make no selection of

cases, the drug was given to all phthisical patients who could take it, without reference to the stage of the disease. As a matter of fact, patients seldom present themselves at the dispensary in the incipient stages; and accordingly, the large majority of those who took the medicament were in a more advanced grade of the disorder. Occasionally the drug was stopped, for various causes, and again recommenced; but, on the whole, the period of administration extended over many months.

The chief effects that were noted were an improvement in the appetite, increased weight, and lessened cough. Its influence upon the body weight was very marked. In the first stage a large proportion gained weight, at least for a time. In the second, most of the cases gained flesh on first commencing the treatment; and some of them lost again on discontinuing it, but on the whole there was a favourable balance; a total gain of from 10 to 20 lbs. being no uncommon event. In the most advanced cases, there was often a temporary improvement on commencing the drug; and, taking the whole series together, in more than 80 per cent. of them there was at least a temporary rise in the curve of weight immediately after the treatment was commenced or recommenced.

I am unable to make any estimate as to the proportion of patients, even apparently, cured; but I can affirm that there were several undoubted cases of bacillary consumption in whom the disease remained absolutely quiescent for years, and who were following their usual employments, and living in their own homes.

From a review of all the results I am inclined also to attribute to iodoform some slight improvement even

in cases in which it was manifestly hopeless to expect a cure ; and, in the earlier stages, I believe that it is one of the best of the medicines that can be given, for the purpose of assisting nutrition and alleviating cough. I have also employed iodoform, in emulsion, with olive or eucalyptus oil, for intra-pulmonary injections ; but these will be considered later.

Iodol was also tried for a time, in the hope that its absence of flavour and smell might make it a less disagreeable drug than iodoform ; but it was not found to have as good an influence upon the body weight as the latter, and was therefore soon discontinued.

In the old days, too, iodine and the iodides were freely employed in the treatment of phthisis ; but, in common with most other observers, I could not find that they were of much service ; and their depressing influence upon the circulation make them dangerous drugs to employ for any length of time.

Tannin had been used by Woillez as early as 1863, and he spoke favourably of its effects. In 1888 I was induced to give it a trial, by reading the researches of Arthaud and Raymond, in Professor Verneuil's 'Études sur la Tuberculose' (vol. ii. p. 309).

It was given with glycerine and alcohol, in doses of from 5 to 10 grains, both in the hospital and to out-patients ; but, after a somewhat extensive trial, it was given up, on account of the great difficulty of gaining the tolerance of the stomach. I am therefore unable to say, whether it merits the encomiums of these observers as a powerful agent in the direct cure of tuberculosis ; but on the whole I am inclined to think that they have been much too enthusiastic.

We may pass now to the medicaments that

have been employed as constitutional remedies, intended mainly to strengthen the system, and to make it less vulnerable by the bacillus.

The Alkaline Hypophosphites.—I have had comparatively little experience with these medicines, and have chiefly used them in the earliest stages of the disease, or in the phthisis of young children; and in these cases I have thought that they had a good influence in promoting nutrition. I have, however, fortunately been able to obtain from Dr. Hodgkinson, senior physician to the Manchester Hospital for Consumption, his opinion on their utility after more than twenty years' use of them in his practice, and in his hospital treatment of both indoor and outdoor patients.

He informs me that he has obtained the best results when they have been employed in the first and third stages of the disease, the latter cases being mostly chronic in character. In these cases, when taken in conjunction with cod-liver oil, he believes that the Hypophosphites distinctly promote the formation of fibrous tissue, especially when the disease is local, and quiescent, at the time of administration. (1) He gives them when the appetite is capricious, and when there is a special dislike of fatty food. In these cases he has found that, even without cod-liver oil, they added distinctly to the body weight; and generally improved the appetite and nutrition.

(2) They have been of benefit where there has been great nervous excitability; assisting apparently in feeding the weakened nerve-tissues throughout the body, promoting sleep, and permitting of more rest than these patients are otherwise inclined to take.

(3) 'Where the dyspnœa is out of proportion to the

physical signs.' In such cases, I should imagine that they assist oxygenation, and promote the flow of blood through the lungs.

They have usually been given according to the following formulæ :

℞ Calcis hypophosph. . gr. 5	℞ Emuls. ol. morrhuæ . ʒss.
Sodii hypophosph. . gr. 5	Calcis hypophosph. . gr. 2
Tinct. quiniæ . . m 30	M. ft. emuls.
Aq. ad $\frac{1}{2}$ oz.	

These medicines were given three or four times a day, after meals. Dr. Daremberg, although he believes, as most of us do, that the hypophosphites have no 'specific value,' yet has a good word to say as to their usefulness in the alimentation of tuberculous patients. He points out that there is a great loss of phosphates from the bodies of phthisical persons, in the sputum, and in the urine; and he shows that the calcareous masses found in the lungs are formed chiefly of phosphates, carbonates of lime, and magnesia. 'Hence,' he says, 'since the ideal of therapeutics in phthisis is to reconstitute fibrous tissue, which contains much phosphates and carbonates, or to produce calcification of tubercle, we may hope that we shall favour the formation of this tissue by furnishing to the organism one of its constituent elements.' He prefers, following in this Jaccoud,¹ to give them in the form of 'phosphated milk,' produced by feeding cows or goats with phosphate of lime in large doses, 2 or 3 oz. daily; or else to give the hypophosphate of lime, 2 or 3 grammes per diem, in combination with hydrochloric or lactic acid.

Drs. Walshe and C. T. Williams believed that

¹ *Trait. Phth. Pub.* pp. 146, 196, 248.

they were sometimes useful; but Dr. Wilson Fox doubts whether 'the cases treated by them have benefited more than they would have done by any other treatment.'¹

As general tonics, *arsenic* and *iron* have won deservedly high opinions from medical men. Various observers have indeed endeavoured to raise arsenic to the rank of an anti-bacillary medicine; but these pretensions have not been made good upon further trial. We must conclude that it owes any good influence that it possesses to its action upon nutrition; as Peter puts it, that it 'stimulates assimilation;' or, as Daremberg suggests, that it acts mainly upon the trophic nervous system. I have myself seen no specific result from its use; some cases have gained weight, but others have lost; and latterly I have only given it as a pure tonic, more particularly where there was much anæmia, or in pleurodynia; and it is most useful in moderate doses. It is best given in solution, with a drop or two of chlorodyne or nepenthe, after meals; but I need hardly say that its use is contra-indicated in diarrhœa.

Arsenic may also be given with advantage in mineral waters, especially in those of Mont Dore and La Bourboule; and the latter has the merit of being the stronger, both in its dose of arsenic and in that of chloride of sodium.

La Bourboule water is therefore generally taken in small doses at first—half a glass, increased to one, two, three, and rarely to four or five glasses, in the course of the day.

Other mineral waters have also a reputation in the

¹ *Diseases of the Lungs*, 1891, p. 872.

treatment of consumption; and Dr. Daremberg gives the following good advice as to their selection. 'When we have decided to send a patient to take the "waters," we should choose a place in which the climate in summer is pleasant and airy (fresh), where the lodgings and hotels are comfortable, where the drinking water is pure, and the drainage good. Afterwards we may concern ourselves with the altitude, and the composition of the waters. Among the high stations we may choose Cauterets and its sulphur springs, or La Bourboule and its arsenical waters, for patients who are lymphatic and not inclined to congestions; we may select Weissenberg and its sulphate of soda waters for congestive and nervous persons; Mont Dore for people with an hereditary predisposition to gout or rheumatism. Amongst the mean or low-placed stations we may select Saint-Honoré, or Allevard, and their sulphur waters for non-congestive consumptives with difficult expectoration; Soden for lymphatic and easily congested patients; Ems or Royat for those who do not mind great heat.' He adds, that 'the physician should never send a patient to the waters during fever, during hæmoptysis, nor during "*la période consomptive*." The sick person should not fatigue himself, nor commit imprudences. He should not forget that the waters do not cure phthisis, and that the baths are not a fundamental part of the treatment of pulmonary tubercle. He should re-read this true sentence of Laennec: "It is probable that the good effects of mineral waters are due in part to the change of residence; for by themselves their efficacy is at least doubtful; and many phthisical patients have found themselves very well in the air of

the mountains, though they could not stand either the baths or the internal use of the waters.”

Iron has been decried by some, more especially by the older writers, on the ground that it produces a tendency to hæmoptysis; but most modern physicians have on this score no scruple about giving it. It is certainly often borne badly by the stomach, and should not be prescribed when there is any fever, or when the tongue is at all furred. In my experience, it is not less useful in the anæmia of phthisis than in that following other complaints; and may be given without any fear of hastening the course of the disease. This contingency was also dreaded by the older practitioners.

The following formula is a useful one; but iron may be given in any preparation that suits the stomach.

R. Liq. ferri. phosph. (magnet.) ʒiij
 Liq. strychniæ ʒj

M. Ten drops in water, three times a day, after meals.

Iodide of iron has been a favourite compound with many, carbonate of iron with others; others again have preferred ferruginous mineral waters; and I have tried each of these in turn, but without modifying the opinion expressed above.

A word should perhaps be said in this place in favour of the simple vegetable bitters, alone, or, better still, in combination with either acids or alkalies, according to the need of the patients. They are doubtless most useful as aids to digestion; and I have often thought that a short course, interjected in the intervals of other treatment, has been of great benefit to the patients.

CHAPTER XI

INHALATION TREATMENT

Objects—Uses—Forms of inhalation—Hot-water inhalers—Sprays—Fuming inhalants—Respirator-inhalers—Compressed-air inhalations, with or without medication—Inhalation of gases—Oxygen and ozonised oxygen—Comparison with fresh air—Brin's pure oxygen—Mode of administration—Cases—Results—Ozone : mode of production and administration—Under pressure—Tobold's apparatus—Specimen cases—Results

INHALATIONS of various kinds have been employed by most physicians in the treatment of phthisis, mainly at first in the hope of reaching, and killing *in situ*, the microbe of the disease.

For this purpose, substances of a volatile nature, and supposed to be more or less antagonistic to the bacillus, have been selected. After what has been said, as to the almost impregnable position of the organism within its buttresses of inflammatory exudation, it is not surprising that this direct attack upon the foe has not accomplished all that has been expected from it. In every case, the bacillicide has failed to reach, or to destroy, the organism, except perhaps by indirect means. It is true that some observers, notably Drs. Coghill and Burney Yeo, have reported favourably on their use ; but, on the other hand, grave doubt has been cast, first by Dr. Hassall, upon the possibility of these applications ever reaching the alveoli at all. Dr. C. T. Williams has shown¹ that even so diffusible a substance

¹ *Brit. Med. Journal*, Sept. 29, 1888, p. 701.

as iodine cannot pass through the lungs into the general system ; and, although he allows that turpentine can be absorbed, he and others have come to the conclusion, that the quantity of any drug reaching in this way the recesses of the lungs cannot be sufficiently concentrated to act as a 'bacillicide.'

Dr. Wilson Fox also says, 'that no solution or substance can be inhaled of a strength capable of destroying tubercular spores is evident.'

Yet it by no means follows that, because we cannot reach and destroy the bacillus in its habitats, inhalants are therefore out of court. On the contrary, it is probable that many, perhaps the majority of them, have their uses. The testimony to this effect is overwhelming. It seems certain that inhalations, properly applied, are of use in several ways : (1) as a means of directly applying to the respiratory passages remedies that tend to restore the mucous membranes lining them to a more healthy condition ; (2) as sedatives to the nerves presiding over the actions of coughing and sneezing ; (3) as antiseptics preventing the decomposition of the contents of the bronchial tubes ; (4) as agents for promoting or diminishing secretion from the mucous membrane.

Inhalations have been employed in various forms : (1) in hot water or steam, medicated in different ways ; (2) in pulverisations of different substances, either in chambers set apart for the purpose, as at Mont Dore and other health resorts, and at the Mont Dore Hotel at Bournemouth ; or by means of the now familiar 'spray-producers ;' (3) dry fuming inhalations, such as are produced by burning certain powders, papers, cones, cigarettes, &c. ; or by volatilising such substances as iodine, ammonium chloride, &c. ; (4) on the numerous forms of respirator-inhalers ; (5) the inhala-

tion of gases, such as oxygen, nitrous oxide, fluorhydric acid, &c. ; or of vapours that are given off, at low temperatures, from such drugs as ether, chloroform, nitrate of amyl, iodide of ethyl.

1. Most of us will be glad to acknowledge the benefit derived from hot-water inhalations, in cases of intercurrent bronchitis or laryngitis. Much relief also is often obtained from the ordinary steam 'bronchitis' kettle, either alone, or with some volatilisable substance like carbolic acid, dropped upon tow, and affixed to the long spout of the kettle. I would point out that this method is far better than that of dropping the medicament into the water contained in the kettle itself ; for the drug is apt to become materially altered by the process of boiling.

Various hot-water inhalers are also in vogue, but they are apt to involve an undesirable amount of effort in inhaling ; and I believe that a wide-mouthed pint, or quart, jug, half filled with boiling water, and with a folded napkin so placed as to give an inlet and an outlet towards the mouth, is far better than most of the more complicated inhalers. Various substances can be put into the hot water ; and the most efficient of these is infusion of hops, or a tablespoonful or two of the 'succus conii,' to which may be added a teaspoonful of compound tincture of benzoin, or a few drops of carbolic acid or creasote ; but these last are better employed with the respirator inhaler. I have carefully restricted my remarks to the treatment of bronchitis, &c., by these moist applications ; for I cannot think that they do any good in the treatment of phthisis, except possibly in its laryngeal form.

2. Sprays also are undoubtedly often useful. A 2 to 5 per cent. solution of cocaine is often most valuable as

a means of diminishing the sensitiveness of the larynx ; and if a catarrh can be caught just at its outset, when the throat feels a little sore and stiff, the abortive treatment by spraying with a solution of 1 or 2 per cent. of nitrate of silver, will often arrest the spread of the inflammation downwards into the trachea and bronchial tubes.

Sprays of 1 to 2 per cent. solutions of tannin, or perchloride of iron, with a little glycerine added, are sometimes of much service in relaxed conditions of the larynx.¹

3. I do not as a rule like the dry fuming inhalations in the treatment of phthisis. Even the fumes of iodine, which at one time were so much in vogue, are much too irritating to the larynx, and seldom do any good.

4. Respirator inhalers are often very convenient, and are, on the whole, the best means of keeping up continuous direct treatment of the mucous membrane. The vapours that have chiefly been used are those of carbolic acid, creasote, eucalyptol, pinol, thymol, menthol, iodoform, turpentine, terebene, according to one or another of the following formulæ :

℞ Ac. carbol. liq. ℥ijss	℞ Creasoti ℥v
Aq. ad 3j	Spt. chloroformi ℥v
Ft. vapor.	Ft. vapor.
℞ Tinct. benzoini co. 3j	℞ Ol. eucalypti
Ol. eucalypti ℥j	Spt. chloroformi āā ℥v
Ft. vapor.	Ft. vapor.
℞ Ol. pin. sylvestris ℥v	℞ Eucalyptol
Magnes. carb. levis. gr. ijss	Chloroformi āā 3j
Aq. ad 3j	Ac. carbolicum
Ft. vapor.	Creasoti āā 3ij
	M. To be dropped on the inhaler.

5. I have endeavoured to enhance the power of the inhalations of creasote, and carbolic acid, by giving

¹ A formula for a useful, cleansing, alkaline wash, in the form of spray, is given on p. 175.

them under pressure of 6 to 10 kilogrammes, the air being compressed in a Tobold's gasometer, and the inhalant contained in a tube lightly filled with tow just in front of the oro-nasal face piece. In the score of cases in which this plan was tried, I thought that these drugs penetrated farther into the lungs, and increased the effect of the other treatment.

6. Lastly come the effects of the inhalation of gases. I have not myself tried the influence of sulphurous acid, sulphuretted hydrogen, fluorhydric acid, or carbonic acid, but Dr. Daremberg speaks of them all in unfavourable terms. The inhalation of air, so heated as to be sterilised, was fully tried in two cases, but without benefit.

The only gases to which I have given any extensive trial are oxygen and ozonised oxygen. It may be well to give some account of these observations, and of the reasons that led me to carry them out; and of the results of the treatment.

The good effects of fresh air, both in the treatment of phthisis and in its prevention, have now been placed beyond all doubt.

Pasteur and many other observers have shown the power of the oxygen and the ozone of the atmosphere to attenuate the infective power of various pathogenic micro-organisms.

Whether, therefore, the beneficial influences of pure air, or of oxygen, were due to their direct action on the microbe of tubercle, or to their influence upon the general defensive strength of the system, it was obviously right that they should be fully tried in the treatment of phthisis.

We may say that in all modern hospitals for con-

sumptives the plan of fresh-air treatment has been adopted, and has been very successful ; but in hardly any institution has it been so fully carried out as in the Manchester Hospital. In the new pavilion wards, erected by Mr. W. F. Crossley, enormous amounts of fresh air from open windows, and also of air from the outside, warmed, however, by passing over hot pipes, were admitted into these wards. Of the latter, if required, 18,000 cubic feet of air could be admitted per head, per hour, and often were so admitted. It was ascertained also that the entering air contained a fair amount of ozone.

In any attempt, therefore, at a comparative treatment with pure oxygen, or ozonised oxygen, this medication had to be placed in competition with the ordinary treatment by abundance of fresh air. Nevertheless, it was thought desirable that the attempt should be made ; and, owing to the benevolence of the Brin's Pure Oxygen Company, large supplies of oxygen were placed at the disposal of the hospital.

In the case of simple pure oxygen the inhalations were not given directly from the cylinders, but a Clover's nitrous-oxide inhaler was used. After the bag had been filled with oxygen, the current was shut off, and the patient was allowed to exhaust the contained quantity ; expiration being performed into the external air, through an aperture with a valve opening outwards.

The following notes on the action of pure oxygen were made by Mr. Cottam, Resident Medical Officer at the Institution :—

Inhalation of oxygen.—Three patients inhaled pure oxygen for periods of time beginning with five minutes, and gradually increasing up to fifteen.

CASE I.—K. W., a case of phthisis, third stage, left chest, early second on the right; bacilli had been found in the sputum. She inhaled oxygen almost every day for four weeks in the manner stated above. The pulse and respiration were both diminished in number at the end of the experiment. These effects were very temporary, and were very possibly exaggerated by nervousness. The patient said she felt clearer and lighter after an inhalation; and on two occasions a headache was cleared away. If given just before a meal, the appetite was improved. No effect, as far as could be ascertained, upon the bacilli.

CASE II.—S. H. In this case the left apex was breaking down; the right showed slight consolidation in the same region. There was a marked family history of phthisis.

The result of a week's inhalations was almost inappreciable. Pulse and respiration unaffected. Appetite slightly improved, and there was the same feeling of clearness as in the case of K. W. Patient was usually sleepy after an inhalation.

CASE III.—M. H. This patient's lungs were both in the third stage of phthisis, the left being more advanced. Bacilli were found in the sputum.

On inhalation, pulse and respiration were both increased at first, afterwards diminished. The patient was liable to headaches, and these always disappeared after respiring oxygen, and she felt lighter and brighter. The respiratory power distinctly increased after a short period of inhalation. No effect could be observed upon the number of bacilli.

In these three well-marked cases of phthisis the inhalations were never found to excite coughing unless the patient took a very deep inspiration; but a deep inspiration in ordinary air produced just as much coughing.

On the whole, the results obtained from the inhalation of these large quantities of pure oxygen were not deemed sufficiently encouraging, as the patients

subjected to it were neither better nor worse than their companions. It was therefore discontinued in favour of a trial of ozonised oxygen.

Ozone.—It was thought desirable in the first instance to ascertain the effect of ozonising the pure gas as it issued from the cylinders. It appeared possible that the deleterious effects of ozone, which had been at various times observed by others, might have been due partly to some impurity. Ozone was accordingly obtained by connecting the wires from an induction coil with the inner and outer tubes of an ozone-generator (Tinsley's), and allowing a gentle stream of oxygen from a Brin's cylinder to pass through the tubes. The apparatus was at first placed in the ventilating chamber underneath one of the pavilion wards. By means of test papers, ozone could be found passing into the ward in increased quantity; but as no appreciable results followed, and as, moreover, atmospheric ozone was found in considerable quantities in the air entering the ventilating chamber by its louvres, this method was soon discontinued. It was then tried in the sun-bath upon nine, ten, or a dozen patients, with the windows closed for half an hour. Irregular results were obtained from pulses and respirations, and there was a marked increase in coughing and headaches (probably due in part to the excessive number of patients in a limited area).

Similar treatment, in a small ward, with three or four patients at the most, and continuing for about six weeks, gave the following results: The room used was 2,790 cubic feet in size. The patients were left in the room for an hour, with the exception of J. S., who remained usually half an hour. The general effects observed were these: Sleepiness—(only one patient out

of five unaffected); increased appetite for the next meal; no marked effect on either pulse or respiration; no irritable effects, such as increased coughing; no headache; no definite alteration in the number of bacilli in sputa. One patient (G. H.) was brought in for one inhalation, but coughed so much that it was not thought advisable to continue the treatment in his case. L. C. felt very little difference during several weeks' trial, though she could readily detect by the smell the presence of ozone. On two occasions the stream of pure oxygen was shut off, and the ozone was obtained from ordinary air. On both occasions *all* the patients complained of coughing and a sense of irritation.

Pure ozone under slight pressure.—Since poisonous properties had been ascribed to ozone by different observers, it was thought necessary, in the first instance, to be very cautious in using it in a concentrated form. Mr. Cottam and I, therefore, tried the effect of inhaling pure ozonised oxygen that had been passed into a Waldenburg's apparatus—a kind of gasometer upon which more or less pressure could be made, by means of weights and counter weights. As we experienced no ill-effects from our inhalation, I selected the following case as one upon whom cautiously graduated experiments with this gas could be tried. The notes have been furnished to me by Mr. Cottam.

A. J. E., aged 49, of good family history, was admitted October 10, 1887. His previous history was as follows:—Winter cough since 1882, usually quite well in the summer. Last spring the cough, instead of leaving him, increased. His breathing became shorter, and he lost flesh. The ex-

pectoration became freer, and changed from a frothy black and white to a yellowish green. No hæmoptysis and no night sweats. On admission it was found that the apex of the left lung was beginning to break down, but no definite signs of a cavity could be detected. Moist râles could be heard down to the base of the fifth dorsal spine behind. Bacilli in moderate numbers were found in the sputum, which was thick and muco-purulent. After he had been in hospital seven weeks, during which time he gained about 7 lbs. in weight, he was given inhalations of oxygen and ozone under pressure. A stream of oxygen, driven through an ozoniser, had about 8 per cent. of its volume converted into ozone by means of a current from an induction coil and battery. The mixture of oxygen and ozone was passed into the pneumatic apparatus, holding (during this series of experiments) 560 cubic inches.

December 5.—The patient was given two inhalations under a pressure of 3 kilos ($6\frac{1}{2}$ lbs.) at first ; and the amount was gradually increased to four inhalations daily at 4 kilos (9 lbs.) pressure, during a period of five weeks. The following observations were made. There was no difference between the pulse taken before inhalation and that taken after, and none in the number of respirations. The patient felt brighter and more buoyant ; and after a few days could walk further and with more comfort ; slept better ; appetite markedly improved, especially for breakfast and tea. Increase in weight between 5 and 6 lbs. (he was taking cod-liver oil during the whole period). Increased respiratory power, gauged by the lessening of the number of respirations by which he was able to empty the ozone chamber. No catarrh, and at no time could any irritating effects be noticed. He never coughed, either at the beginning or at the end of inhalation. The ordinary morning cough and expectoration diminished. At the end of the first week bacilli could not be found in the sputum ; and, when again examined, at intervals, four times subsequently, bacilli were absent. Two other patients (males) were also submitted to daily ozonised inhalations ; but it will be unnecessary to give the details of their cases. One :

B. H., æt. 29, had been admitted as an in-patient three months before this special treatment was commenced. He had a small cavity in the left apex, and infiltration to four inches below the clavicle; and on the right side, under the upper three ribs, and under the supra-spinous fossa behind, the lung was undergoing softening. He had already improved very much in health during his stay in the hospital, having gained nearly 13 lbs. in weight; and he had no fever nor night sweats, but the bacilli in the sputum were numerous. He has now had daily inhalations for three weeks, emptying Waldenburg's gasometer at first twice, and then three times at each sitting, the contents being 633 cubic inches each time. He continues to gain in weight, and expresses himself as feeling much better since the treatment was commenced. Sleeps, eats, and breathes much better; the temperature is normal, and the pulse has diminished in rate from 80 to 70. The sputum has been twice examined, on January 29 and February 12; and on each occasion many bacilli still appeared.

J. T. J., æt. 19, had phthisis in the second stage on the right, and probably slight consolidation on the left side. He commenced the inhalations on January 20, having been in hospital ten days. His weight on January 20 was 110½ lbs., and on February 15 it was 115 lbs. He emptied the cylinder under a pressure of 4 kilos, from two to five times; and seems to have benefited from the treatment. His pulse also has slowed somewhat; he eats and sleeps better, and his temperature is normal. His sputum, examined on January 30, showed no bacilli; but on February 14 a few were found. On the whole he gained 17 lbs. in weight in eleven weeks in hospital; and afterwards, during a visit to Wales, he gained 10 lbs. more.

These preliminary observations seemed sufficiently favourable. It had been ascertained (1) that pure oxygen, without any admixture of air, may be inhaled continuously for at least fifteen minutes, and pro-

bably for a longer period, without the slightest harm resulting; without producing inflammation, or even irritation of the air-passages; without increase of fever, or even elevation of the pulse-rate. (2) It had been proved that from 2,000 to 4,000 cubic inches of pure ozonised oxygen might be breathed, not only without harm, but even with apparent benefit; in the cases in which it was tried. (3) If we might trust our repeated microscopic examinations, the ozone diminished the number of bacilli in the expectoration in two cases; and in the third the expectoration was diminished, and the disease was quiescent. The general condition of the patients was much improved.

I accordingly proceeded to give the treatment a more extended trial; and ozone inhalations have been administered at various times, according to the amount of oxygen in stock, during the last seven years. In all, some fifty or sixty patients have been thus treated, in addition to the ordinary treatment of the hospital. Very little selection was made of the persons submitted to the inhalations, except that, of course, all obviously hopeless cases were excluded. All three stages of the disease were admitted to the treatment. Notes were taken of all the cases; and full notes of the first fifteen have already been published in the '*Medical Chronicle*,' in 1888 and 1889.

It would not be possible in the space at our disposal to give notes of these cases; but, for the sake of illustration, one case in each stage may be more fully reported.

It may be premised that each cylinder used, fully represents seven litres of pure oxygen, ozonised up to about 9 per cent.; and that the inhalations were

made under a pressure on the cylinder of from six to eight kilogrammes. An approximation to the proportion of bacilli found in the sputum is indicated by the signs B. I., B. II., and B. III. But no stress is laid upon the results of the bacillus search.

I. The following case was a male, in the first stage of phthisis.

S. B., æt. 21. Admitted August 25, 1888. Labourer. Good family history. Previous history : Scarlet fever in 1881, typhoid two years ago. Before the latter illness the patient had always been strong and well.

Present attack.—Dates from convalescence from typhoid. Has gradually got weaker and lost flesh. Before the fever, weight was 172 lbs. Cough began early in May 1888. Hæmoptysis ($\frac{1}{2}$ pint) on two occasions at the end of May. Has had heavy night sweats.

Present condition.—Weight, 139 $\frac{1}{2}$ lbs. Temp. 100°. Tendency to clubbing of fingers.

Respiratory system.—Impaired resonance in right supra-clavicular, clavicular, and infra-clavicular regions as far as the second rib. In infra-clavicular region, the difference between two sides very slight.

Posteriorly.—Dulness in right supra-spinous fossa, and in upper part of inter-scapular region. On auscultation, the only difference is divided respiration, and prolonged expiration, in right supra-spinous fossa, right inter-scapular, and right supra-clavicular region, with slight harshness of both inspiration and expiration in right inter-scapular region, but no alteration of quality in other regions ; no adventitious sounds.

About a week after the above notes were taken, moist sounds were heard, but they were only present for a short time.

Sputum.—Muco-purulent, containing bacilli, B. II.

On September 11 began to take ozone, one cylinder once a day ; and this quantity was gradually increased up to October 12, when he took four cylinders three times a day. On two occasions the patient took five cylinders ; but, each time,

the inhalation caused sharp pain in the side, so he continued to take four cylinders. The expectoration gradually lessened, and after this date only showed B. I. on staining. On November 27 there was slight hæmoptysis, and the ozone was stopped until December 19, when it was resumed.

On January 21, 1889, he was discharged. The disease remained confined to the apex, and did not extend below the second rib (*i.e.* it was limited to the same region as on admission). Moist sounds were, however, freely heard over the dull area. No signs of cavity. Weight, $151\frac{1}{4}$ lbs. Before the hæmoptysis the weight was $154\frac{3}{4}$ lbs., or 15 lbs. gained in 10 weeks.

II. Case in second stage.

Harriet B., æt. 27. Admitted April 25, 1887. Good family history. *Previous history*:—Out of sorts for two years. Cough came and went, becoming persistent about three months before admission. Short of breath lately. Catamenia stopped with pain at the usual period.

Present condition.—Weight, $110\frac{1}{2}$ lbs. Temperature normal. Respirations, 20. Percussion note over left apex dull, down to third rib in front. Expansion diminished. Vocal fremitus slightly increased. Breath-sounds harsh; crackles with both inspiration and expiration. Similar signs posteriorly. Right side normal. Expectoration scanty, muco-purulent, contains many bacilli. She was discharged on July 27, 1887; and re-admitted on January 23, 1888, suffering from bronchial catarrh, limited to upper part of left lung. She began to take ozone on March 20, from two to three cylinders three times a day. After April 4, no bacilli were found in the sputum, and on May 5, expectoration ceased. On May 20 her weight was $118\frac{1}{2}$ lbs.; and she was discharged on June 14, having still shortness of breath on exertion, with slight cough, but no expectoration. No advance of the disease, but no improvement in the physical signs. She went into domestic service for several years, and then married; and in 1895 she was in fairly good health, though suffering every winter from chronic bronchitis.

III. Case in third stage.

R. B., Female, æt. 46, domestic servant, residing in Dunham. Commenced ozone inhalations in November, 1888. Family history of phthisis.

Personal history.—Enjoyed good health until sixteen years ago, when she had a severe attack of acute pleurisy, with effusion on the left side, which was slow in subsiding, and left the chest movements much impaired. Two years ago she became thinner, and had a constant cough and shortness of breath; and it was found that she had bacilli in her sputum. Her condition on commencing the inhalations was:—Weight, 116 lbs. On right side: Supra-clavicular dulness on percussion with bronchial breathing. Moist crepitation in the inter-scapular region. Puerile breathing at base. On left side: Dulness on percussion to four inches front and back. Amphoric resonance and whispered pectoriloquy, with occasional gurgling; crepitus above and under the clavicle in front. Dry crackles from two to four inches in front. April, 1889:—After six months' regular inhalations no change in physical signs, but has gained weight to the extent of 14 lbs.

She is still alive, in 1895, and, though thinner, is apparently in much the same condition.

In the first series of cases the total gain in weight was, on the average, 10 lbs. The greatest gain was 17 lbs. in eleven weeks.

In the next series, the average gain was almost exactly the same. Many of these cases, after their return home, again developed active disease, and died after a longer or shorter period; but the fact remains that, while they were under the treatment, only in one or two instances did the tubercular mischief progress.

The question to be laid before a jury of medical men is whether, in such a series of cases of phthisis, as those described, we could obtain such favourable results from other modes of treatment. For my own part I

confess that, although we have often had highly gratifying results from treatment in the hospital at Bowdon, I do not remember any results quite so satisfactory as these now laid before you; such continuous freedom from fever, absence of night sweats, diminution in the amount of expectoration, improvement in appetite and in sleeping power, and such consequent gain in weight. But, on the other hand, it must be pointed out that the ozone does not appear to have acted as a direct germicide; and that its control over the disease does not seem to have been due to its bactericidal action. It is very doubtful whether even ozone could succeed in reaching the organism in the consolidated exudations of phthisis: but it may well be that ozone may have a beneficial action upon the general health of patients; that it may improve the condition of both the white and red corpuscles of the blood; and that it may enable the still healthy portions of the lungs to resist the noxious influence of the organism, and even may ultimately cause the bacillus to die out of the part already attacked.¹

¹ I was informed recently by Lord Playfair, that ozone is regularly used as a purifier at Wellesley College, a ladies' college in Massachusetts, and on writing to the Resident Physician, Mrs. E. J. Barker, M.D., she kindly informed me that the chapel, library, and class-rooms are daily supplied with ozone, generated by an ozone machine, No. 2 type, O.J. volt 75. Ozone Mfg. Co., New York City.

The ozone is used mainly as one of the hygienic measures to purify the air, and not as a remedial agent, for only students in health are retained in college.

CHAPTER XII

TREATMENT OF TUBERCULAR LARYNGITIS, ABSCESSSES, ETC.

Reasons for immunity of larynx from primary attack—Principles of treatment—Dr. Hodgkinson's remarks—Prevention—Disinfection—Remedies—Inhalants—Rest—Antiseptic sprays—Vapours—Local applications and insufflations—Intra-laryngeal injections—Aristol, menthol, pyoktanin, antipyrin, and guaiacol, Dr. Moritz on—Nitrate of silver—Direct treatment of cavities, abscesses, &c.—Intra-pulmonary injections of iodoform, eucalyptus, &c.—Cases of gangrene of the lung, abscesses, vomicae—Notes—Results

It is at first somewhat surprising that tubercle should so seldom attack the larynx, except as an affection secondary to that of the lungs. The larynx is almost the first part exposed to attack; and it might well be supposed that tuberculous dust could find resting places in some of its less prominent parts. Perhaps the swiftness of the current of air over the entrance to the air passages, or the more abundant mucus lining the organ, or the greater toughness of the membrane, approximating to that of skin, which is notoriously difficult of inoculation—any one of these causes may perhaps partly account for the immunity of this organ from direct infection. But I am inclined to think that much more is to be ascribed to the protective influence of the tonsillar and other glands; which stand, as Dr. Sims Woodhead has shown, efficient guardians at the entrance to the respiratory tract. No such sentinels stand on the other side of the larynx; and bacillus-laden sputum

from the lungs finds but little impediment to its onset by this tract, especially when any abrasion or denudation of the mucous membrane has opened the way.

The sites of tubercular lesions of the larynx seem to prove that this conjecture is at least probable. Dr. Hodgkinson, in an interesting communication to the British Medical Association,¹ has shown, by the ingenious method of dusting the larynx with indigo, not only the modes of vibration of the cords, but also the usual track followed by the mucus from the chest. It travels along the posterior surface of the larynx, until it reaches the bases of the cords, passing upwards over the inter-arytenoid fold, into the pharynx. It is precisely in these situations that tubercular lesions first appear; and there can be little doubt, that their intractable nature arises from the continual reinfection of the ulcers, by fresh relays of tuberculous sputum from the lungs.

The best chance of successful treatment of the disease lies in the recognition of these facts, and even though cure may not be attained, the fatal issue may be postponed for a long time by adherence to a treatment based upon them. Dr. Hodgkinson, who has had a large experience of these cases, has kindly communicated to me the principles of the treatment which he enjoins; and I may say that it is mainly the course that I have myself followed. Prevention, as well as relief or cure, must be sought for; and accordingly we must obtain, as far as possible (1) disinfection of the expectoration *before it comes in contact with the larynx*, (a) by means of such remedies as

¹ 'On the Vibrations of the Vocal Cords,' *Brit. Med. Journal*, Aug. 24, 1895, p. 482.

creasote, guaiacol, &c., given internally in full doses ; (b) by similar remedies used in the form of spray, or by volatile inhalants, such as eucalyptol, pumilio-pinol, &c. ; (c) by impregnation of the air breathed, during the night and day, with volatile germicides of the same description, among which it must not be forgotten that fresh air and ozone are amongst the best.

2. Next, the local treatment must, in the first instance, be (a) rest of the voice as much as possible, and, if necessary, cough must be relieved by means of sedative sprays ; (b) in the early stages, before ulceration has taken place, antiseptic alkaline sprays must be used, as in the following formula :

R.	Ac. Carbolic.	.	.	.	.	.	gr. iv
	Sodæ Bicarb.	.	.	.	.	.	gr. xij
	Boracis	.	.	.	.	.	gr. xij
	Aq. ad.	.	.	.	.	.	ʒj.
	M. ft. lotio.						To be diluted if necessary.

(c) During the nights, vapour of creasote, pine oil juniper, eucalyptus or cinnamon, must be constantly given off from cloths placed not far from the mouth of the patient.

3. If ulceration is present, cleansing of the larynx must first be carried out by means of alkaline sprays ; and this must be immediately followed either by spraying with dilute lactic acid ; or, a stronger solution (15 to 60 per cent.) must be rubbed into the ulcers by means of cotton-wool tampons ; and finally, insufflations of equal parts of boric acid and iodoform, with 2 to 5 per cent. of morphia, must be made on to the ulcers.

In many cases, the greatest relief will be obtained from intra-laryngeal injections of one-half drachm to one drachm of olive oil, containing 10 per cent. of menthol

and 20 per cent. of guaiacol. It soothes the cough, disinfects the sputum, and produces a sense of genial warmth throughout the lungs. These means should be used at least once a day towards evening, and if the laryngeal mirrors are used, the injection may be accomplished without provoking either cough or choking.

Occasionally, I have found spraying with a solution of nitrate of silver, ten grains to the ounce, very soothing after the first irritation has passed off. It causes a thin film of membrane to form over the surface, which protects it from further injury.

Dr. Moritz, my colleague, remarks on the local application of guaiacol, 'I think I was the first to make intra-laryngeal applications of guaiacol. I first tried it on a patient (in 1889) with extensive tubercular ulcerations of the larynx, in whom the lung symptoms were not far advanced. The result was most satisfactory, the laryngeal ulcerations healed completely. Shortly afterwards, Dr. Milligan had a case of tubercular ulceration of the larynx in the hospital, in whose case, on account of the swelling, ulceration, and dyspnoea, he thought of performing tracheotomy. On my advice, he tried the local application of guaiacol, and the patient improved rapidly.' 'I have tried this treatment in numerous cases; and, though an improvement often takes place, I have only rarely (I think two or three times) seen tuberculous ulcers healed under application.'

'Shortly after the International Congress at Berlin, where pyoktanin received such fervent recommendations in the treatment of laryngeal tuberculosis, I also tried this drug. It certainly sometimes acts beneficially; but it has to be applied copiously and frequently. One patient, with advanced pulmonal tuber-

culosis, tubercular ulcerations of the larynx, and a deep tubercular ulcer at the tip of his tongue, was able to heal this latter ulcer by himself applying pyoktanin every two hours ; but the laryngeal ulcerations to which it was applied once, and later on, twice a day, did not improve. I have lately obtained some very favourable results, in cases of laryngeal phthisis, from the application of strong solutions of antipyrine (30 to 60 grains to the ounce of water) in the form of sprays or paint : antipyrine so applied acts not only as a local anæsthetic, but it causes a rapid improvement in some cases ; I have used a combination of cocaine, 3 to 5 per cent., and antipyrine, with a little saccharine added, to hide the taste, as a laryngeal spray in a few far advanced and distressing cases of laryngeal phthisis, in whom deglutition had become extremely painful. I have found that the anæsthetic effect of this combination lasts from three to six hours, so that the patient, by a few such applications in the course of the day, may be made comparatively comfortable, and able to swallow his food, whilst, at the same time, a beneficial effect was produced on the ulceration.'

Dr. Hutton has obtained similar favourable results.

Dr. Moritz also says : ' I have used aristol, only locally, in a few cases of tubercular laryngitis, but the results were *not* encouraging.'

Direct treatment of cavities, abscesses, &c.—In 1885, Dr. Shingleton Smith proposed the direct treatment of vomicæ, by the intra-pulmonary injection of iodoform, through the walls of the chest. Out of five cases so treated three were tubercular, and in one of these much improvement was obtained. In no case did any untoward results follow.

A few of the cases admitted into our hospital for consumption seemed to be well suited for a trial of this method; and a record of the results may perhaps be found interesting.

Out of seven cases treated, one was the subject of gangrene of the lung; two of abscess following broncho-pneumonia; and the remaining four were ascertained to be tubercular, by the discovery of bacilli in the sputum.

The following notes are abridged from those taken by the resident medical officers.

CASE I.—*Gangrene of the lung*.—Mrs. W. æt. 33. Married, six children; admitted October 1, 1885. There is no family history of consumption. Had pleuro-pneumonia when fourteen months old, and since then has always suffered from winter cough. After each of her last four confinements had an attack of acute pleurisy. Her last child was born nineteen months ago, and the attack then lasted two months. About six months before admission she had an attack of acute pneumonia, which left a permanent consolidation of the right lung posteriorly.

About three weeks after admission to the hospital, during which time she lost $4\frac{1}{2}$ lbs. in weight, she had a sharp feverish attack; the breath was offensive, and the sputum, which had been frothy and muco-purulent, became excessively offensive, foetid, and of a dark prune-juice colour. There was some dyspnœa, and pain on both sides of the chest posteriorly. Temperature, 101° F.

On examination, there was found slight dulness on percussion in both supra-spinous regions, and at the right base posteriorly, from the eighth to the twelfth rib, complete absence of resonance, and on the left side, in one spot, there was hyper-resonance.

On auscultation, there were heard cavernous breathing, gurgling râles, and pectoriloquy, over the dull area on the right side, especially in the middle of this region; and on the

left side, there were bronchial breathing and some bronchophony, with mucous râles, except over an area about two inches in diameter, near the level of the tenth rib, in the scapular line; and here the breathing was cavernous, with bubbling râles. The breath-sounds at both apices were slightly impaired. The chest measurements were, $14\frac{1}{2}$ inches on the left and $15\frac{3}{4}$ inches on the right, in a line just above the nipples.

The expansion was equal on the two sides. Heart normal. Naturally there was much suspicion of tubercle; but after repeated examinations, no bacilli were found in the sputum; but in one specimen there were seen numerous micrococci, both in masses and in chains. It was concluded, therefore, that the case was one of gangrene of the right base; and, after some hesitation, it was assumed that the cavity on the left side was due to bronchiectasis. She was ordered iron and quinine, and inhalations of carbolic acid from hot water, and eucalyptus oil on respirator inhaler. These means somewhat diminished the foetor of the breath, and of the sputum; and two days later, ten minims of an ethereal solution of iodoform (1 gr. in five minims) were injected into the cavity on the right side. A similar injection was made daily into this cavity, except upon two days when it was injected into the left cavity, where it caused much more pain than on the right side. After two days of this treatment, it was noted that the sputum had lost its prune-juice colour, and was less offensive. The patient felt better, but the cough and the amount of muco-purulent expectoration remained excessive. On November 14, ten minims of ol. eucalypti were ordered thrice daily; and on the 16th it was noted that the expectoration was more frothy in character; but on the 18th it again became prune-juice coloured and offensive. On November 24 further improvement was noted; and on November 28 the injections were discontinued until December 2, when, in place of the ethereal solution, an emulsion of iodoform in olive oil was used, with much less pain to the patient. This treatment was continued, with intervals of a few days, for several weeks; during which time she gained about 10 lbs.

in weight, and improved greatly in her general health, though the signs of a cavity in each lung still continued. Upon one occasion the injection needle used was rather a large one, and apparently it pierced some large vein; for a little blood exuded when the needle was withdrawn, and there was copious hæmoptysis for a few minutes. After her recovery from this accident she went out of the hospital for a fortnight, and, after a short stay as an in-patient, in April, she went to Southport for a month. At the present time (October 1886) the bronchiectasis has disappeared; and, though the cavity in the right lung is still perceptible, she has no cough or expectoration, and appears to be in good health. She lived for six or seven years after this date; and bore several more children. She suffered each winter from bronchitis, and was finally carried off by an acute attack.

CASE II.—*Abscess of the lung*.—J. C., æt. 41. Clerk. First seen September 1889. There was a family history of phthisis; and the patient had himself suffered from tubercular glands in the neck; but repeated examinations failed to find any bacilli in the sputum. He first began to suffer some little dyspnœa five years ago; and four years ago he had an attack of pleurisy on the right side, followed eight months later by 'congestion of the lungs,' with bloody expectoration, probably pneumonia; and four months afterwards a second attack of pleurisy, also on the right side, which left a cough, and much difficulty of breathing, from which he gradually recovered. He was much better until the winter of 1888–89, when he 'had chills;' and in the March of 1889 he 'vomited' a large quantity of pus, about a gill, which was foul, yellow and thick. He has been gradually getting weaker since then; and continues to spit up small quantities of purulent matter at intervals.

Admitted to hospital in September 1889, the physical signs noted were:—Right side, in front, apex somewhat flattened; percussion note impaired from clavicle to fourth rib; inspiration a little rough, expiration normal. From the fourth rib downwards, absolute dulness on percussion; the

breath-sounds blowing and distant ; a few rubs and crackles could be heard ; vocal fremitus diminished. Posteriorly, percussion note impaired, tubular breathing to the middle of the scapula, below this, great dulness on percussion ; breath-sounds distant, pleuritic rubbing and subcrepitant râles heard, vocal fremitus not increased, no pectoriloquy nor ægophony noticed at first ; but later on, cavernous breathing, gurgling râles, and pectoriloquy, were distinct under the lower third of the scapula, over a space measuring roughly $3\frac{1}{2}$ inches long by 2 inches broad ; there were also well-marked signs of a cavity at the right apex.

He was treated with cod-liver oil and guaiacol ; and had one intra-pulmonary injection of iodoform, suspended in olive oil, which did not seem to produce much effect, and which he would not allow to be repeated.

He improved greatly in hospital, gained weight and strength, and returned home, where he did a little book-keeping.

He remained a patient at the dispensary for five years, and then had a sharp attack of bronchitis at home, and died there.

CASE III.—*Abscess of the lung*.—C. W. H. S., æt. 17. Fitter. Admitted June 13, 1893. Family history good. Has suffered much from chronic bronchitis. When eleven years old had diseased bone removed from lower end of left femur. In March last he had pneumonia on the left side, and he says he has been 'spitting matter' ever since. Towards the end of April he had a little streaky hæmoptysis. Weight, 101½ lbs.

Physical signs.—Left lung ; apex, in front, slight dulness with somewhat harsh breath-sounds, laterally, dulness from the axilla, with bronchial breathing ; behind, percussion note very dull, from the mid-scapular region downwards, with cavernous breathing, loud gurgling râles and pectoriloquy, over a space of about 3 or 4 inches in diameter, just below the angle of the scapula.

Right lung and heart normal.

He expectorates daily about one gill of almost pure pus, which has a very foul odour, and the breath is generally very offensive.

After repeated examinations no bacilli of tubercle were found.

He was treated with intra-laryngeal injections of guaiacol, 10 per cent., and menthol, 20 per cent., daily, and creasote internally. A respirator, with carbolic acid or creasote, was worn for several hours a day.

The expectoration gradually became less in quantity, and less offensive. On July 22, a mixture of iodoform, oil of eucalyptus, and carbolic acid, was injected through the thoracic wall, into the cavity in the left lung; this was not tasted in the mouth, or smelt in the breath, until some hours after. He had a slight rise of temperature, and a little pleurisy for a day or two afterwards, but he says that he feels much better, and walks four or five miles daily. There is only occasional foetor of the breath, and the expectoration is less in amount, and less offensive.

He was sent home on September 20, having gained 20 lbs. in weight since he came into hospital.

On October 30 he was re-admitted, the sputum and breath being exceedingly offensive. He had many violent fits of coughing, and at these times brought up large quantities of pus; otherwise his general condition was fairly good, and he was well nourished. Another intra-pulmonary injection was made into the abscess, consisting of iodoform suspended in 10 minims of eucalyptus oil, which was detected in the breath a moment afterwards. Violent coughing was excited, during which he brought up large quantities of pus, which was not offensive. Some improvement followed this treatment, but in December the foetor was as bad as ever. He returned home again on January 11, 1894. On February 21, he was again taken into the hospital, having returned to his old condition, with the addition of considerable bronchitis in both lungs. At my instance he was examined by Mr. Hardie, the surgeon, with a view to the operation of opening and draining the abscess; but as there was no definite evidence of pleuritic

adhesion, it was thought best to continue the intra-pulmonary injections.

On February 25, he was given an intra-pulmonary injection of iodoform suspended in 10 minims of olive oil. This caused no cough, and the iodoform was tasted in the mouth directly afterwards, but at night the temperature rose to 104.2° F. and remained high for a week. He said he felt comfortable, however, and there was no offensive smell in the breath or expectoration.

On March 5 and 9, intra-pulmonary injections of 3 minims of guaiacol in half a drachm of olive oil were made, causing no pain and very little rise of temperature. On March 17, the weight was 118 lbs. On March 29, iodoform in olive oil was again injected, causing considerable pain; and the evening temperature rose to 104° F., but was down again next day. On April 1 it is noted that the sputum has been much less in quantity, and not offensive. On April 8 and 26, he again had intra-pulmonary injections of the same emulsion, and, after the last, the temperature again rose to over 103° F., and remained high for eight days, with all the symptoms of acute pneumonia.

On May 8, though he still was spitting up much pus, it was not offensive, and the cavity seemed smaller in size. His weight had gone down to $111\frac{1}{2}$ lbs. It was now thought best to intermit the treatment; so he was sent to Southport, where he gained strength and appetite.

During the whole of this time he was taking, at intervals, creasote or guaiacol, and using inhalations; but in the autumn he again came to hospital, complaining that, although he felt fairly well, and had gained weight, the foetor of the breath was intolerable, and begging that something more radical might be done to cure him.

After consultation, it was decided to open and drain the abscess; and in October 1894 the operation was successfully performed by Mr. Hardie. There was considerable hæmorrhage, but it was stopped by plugging the wound with antiseptic gauze, a drainage tube was inserted next day, the cavity was sprayed with boracic acid solution, a free discharge came through the

tube ; expectoration gradually diminished, and he made a good recovery. Although the drainage tube could not be kept in more than a few weeks, and the cavity did not contract as much as was expected, the operation had given great relief ; and he was able to return to rather hard work as a fitter in an iron shop. I saw him again in July 1895 ; he had gained flesh and strength, and was earning a livelihood.

The other cases in which the intra-pulmonary treatment was tried were all of them phthisical.

CASE IV., R. R., æt. 18, was a patient of Dr. Simpson, who kindly allows me to mention his case. This boy had a vomica at the apex of the left lung, near the surface, and iodoform in ether was twice injected into it ; but as it caused much pain and distress, without any apparent benefit, the treatment was discontinued.

CASE V., H. W., æt. 35, butcher, admitted November 26, 1885. Phthisis not hereditary. The previous history of undoubted lung disease was only one of four months, and in that time he had lost 28 lbs. in weight ; but he had only coughed for one month. His sputum was loaded with bacilli ; but as the case was so recent, and as he had a vomica at the apex of the left lung, very near the surface, it was thought that it might prove to be a case favourable for injection. For a fortnight, therefore, 15 minims of a solution of iodoform in oil of eucalyptus were injected every second or third day. No bad effects followed, and he expressed himself as somewhat relieved by the treatment, and gained 4 lbs. in weight in the first week ; but after this it became evident that general tuberculosis had set in, and the injections were discontinued. He remained in hospital until January 8, and then went home, and his death was reported to us about a month afterwards.

CASE VI., W. P., æt. 18, a railway advertising agent, admitted March 18, 1886. No family history of phthisis. Has coughed for about four months, and during the last month has had slight hæmoptysis at intervals. The signs of tubercular disease were confined to about three inches of the

right apex, where there was also a small vomica near the surface, just under the clavicle. This vomica was injected four times, at intervals of two days, with 10 minims of a solution of iodoform in oil of eucalyptus (1 in 6). On the last occasion, after about 4 minims had been injected, he said he felt it 'going all through him.' His face became pale, his pupils dilated, his breathing hurried, pulse quick. He complained of an aching in his limbs, especially the legs, and of a pricking sensation in his fingers. He said he felt 'as if about to die.' His cheeks soon became flushed, and there were several irregular patches of erythema on the trunk and limbs. Within five minutes of the injection there appeared several well-marked patches of urticaria on the chest and back. In another five minutes, these, along with the spots of erythema, had all disappeared; his pulse and breathing now became slower, and he soon felt all right again, with the exception of slight aching in the head and legs. About twelve hours afterwards he had an epileptic fit of some severity, and remained dazed and slightly incoherent for some time. He had two slighter fits at five hours' interval afterwards, and between the seizures he complained of frontal headache, but otherwise felt quite well. We could not ascertain that the injections had in any way affected the course of the disease.

CASE VII., Mary H., æt. 16, house servant, admitted March 6, 1886. History of phthisis on the father's side. Has had cough for six months, and has been getting thinner and shorter of breath during this period. Consolidation of the left apex, to the fifth rib continuously, was noted, and a small vomica under the clavicle; no other signs of lung disease.

On April 10 the vomica was injected with 10 minims of a solution of iodoform in oil of eucalyptus, and on April 20 the injection was repeated. These injections produced a good deal of pain at the site of the puncture, lasting about twelve hours.

On April 22, in the early morning, the patient awoke with a severe fit of coughing, when she suddenly felt a sharp

pain over the site of the vomica, and this was followed by signs of pneumothorax on the left side ; but three weeks later it is noted that these signs had entirely disappeared, though the vomica remained the same size as previously.

She stayed in the hospital six weeks longer, and gained 5 lbs. in weight, and seemed much better in general health ; but this improvement can hardly be ascribed to the iodoform injections.

I have since ascertained that the disease is making slow progress.

Remarks.—The injections of iodoform were made, for the most part, with one of Mayer and Meltzer's syringes, having a strong gilt needle. This was inserted between the ribs near the upper margin of the lower one ; care was then taken to ascertain if the end of the needle had reached the cavity, or at any rate an air space, by withdrawing the piston ; and unless air bubbled through the fluid, the needle was moved slightly until this sign of its having penetrated into an air channel was perceived. The injection was then completed.

In the case of gangrene of the lung it was necessary to pierce the intercostal space in the dorsal region, where the ribs are rather close together ; and this fact, together with the large size of the needle, may have had something to do with the occurrence of hæmorrhage, though my impression is that the instrument traversed some very congested vessels near the seat of the disease, and not that an intercostal vessel was wounded.

In Case VI., in spite of the precautions taken, the drug must have been injected into the circulatory system, and the alarming nature of the symptoms produced shows the necessity for great caution in the operation.

In Case VII., in which pneumothorax occurred two days after the puncture, it is possible that the wound may have opened slightly, and that some air may have escaped into the pleura by this track ; but on the other hand, it may have taken place in the ordinary course of the disease. Even if it were due to the operation, however, this accident need not deter us from its performance. The simple pneumothorax

so produced would probably do more good than harm, and would give temporary rest to the diseased lung.

It will have been observed that the only cases in which the treatment was thoroughly carried out, were the case of gangrene and that of abscess, and these patients alone derived distinct benefit from the iodoform injection. There can be little doubt, I think, that the favourable course of the disease in these cases was mainly due to the treatment by injection ; and under similar circumstances I should certainly repeat the experiment.

In Dr. R. Shingleton Smith's case of gangrene, although temporary improvement followed the injections of iodoform, the patient died ; and in the case of chronic pneumonia the treatment was also unsuccessful.

In the tubercular cases, the number of injections in each varied from two to eight ; and it is probable that some good effect was temporarily produced in Cases V. and VII. ; but on the whole the results were not encouraging. I observe that of Dr. Smith's three cases of this disease, only one, in whom nine injections were made, showed any marked improvement from the treatment. It is probable that, to effectually disinfect a tuberculous lung, many more injections would have to be made than we have attempted so far ; and it is doubtful whether many patients would be found to submit to it. Apart from the danger of accidents such as have been mentioned, the procedure is somewhat alarming and disagreeable to the patients. The ethereal solution was very painful ; and the olive oil emulsion was so viscid that a larger needle had to be employed than was absolutely safe. The solution of iodoform in oil of eucalyptus was quite the most satisfactory of all the mixtures that were tried.

CHAPTER XIII

TREATMENT OF SYMPTOMS AND COMPLICATIONS

The 'pre-tubercular stage'—Gastric troubles—Dr. V. D. Harris's observations—Artificial digestion, Sir W. Roberts on—Peptonised nutritive enemata—Varieties of dyspepsia—Treatment—Chronic interstitial inflammation—Absorption of toxic substances, Dr. Soltau Fenwick on—Treatment—Diarrhœa—Vomiting—Treatment of varieties—Fever and Sweating—Dry-cupping, blistering—Fresh air—Febrifuge formulæ—Tartar emetic—Antipyretic drugs—Phenacetin—Antipyrin—Salol—Salicylate of soda—Cases—Charts—Treatment of hectic fever—Drugs—Cold sponging, &c.—Belladonna—Oxide of zinc—External application of guaiacol—Food—Clothing—Treatment of cough—Control over cough—Simple remedies—Sedatives—Other means—Treatment of hæmoptysis—Natural cessation—General measures—Objects of treatment—Drugs—Ipecacuanha—Digitalis—Turpentine—Derivatives—Junod's boot—Ergot and other styptics—Calcium chloride—Treatment of perforation of the lung—Empyæma—Dyspnœa—Fistula—Phlebitis—Bedsores

It is in the treatment of the constantly varying aspects of phthisis that the skill of the physician has its chief opportunities.

It will be best first to consider the principal accidents that may occur in its course, and then to attempt to sketch out the treatment of its successive stages.

Since a healthy nutrition is of the first importance in resisting tuberculosis, it will be well to begin with troubles of digestion.

As Daremberg says, '*l'estomac est la place forte des phthisiques, et l'alimentation leur grand moyen de défense.*'

There can be no doubt as to the frequency of gastric trouble antecedent to, or concurrent with, tubercular lung disease; so common indeed is it that it is the chief symptom relied upon by those who believe in a 'pre-tubercular stage of the disease.' It may be that the dyspepsia is truly a forerunner of phthisis, not indeed as a direct cause of the deposition of tubercle, but as one factor amongst many, enfeebling the general system, and rendering it more vulnerable. It would thus share the blame of predisposing to disease with any other debilitating disorder. The facts that dyspeptics are not specially prone to fall victims to consumption, and that, as Sir H. Holland has shown, acute gastric suffering is not only compatible with, but even favourable to, long life, prove that there is no essential relationship between them. But we cannot afford to neglect this possible source of weakness, and in our efforts to strengthen the bodily vigour of our phthisical patients we are bound to notice any failure of the rootlets of nutrition.

It has been shown by Dr. V. D. Harris¹ that the digestive ferments are, in phthisis, often both wanting in quantity and deficient in activity, and there can be little doubt that in many of the cases of dyspepsia met with in this disease this is at least an important cause of trouble. It can only be met by artificially assisting digestion, by giving tonics, such as the vegetable bitters, calumba, cascarilla, gentian, quassia, &c., with nux vomica, and either acids or alkalies, for which I subjoin some useful formulæ.

¹ *Lancet*, Nov. 10, 1894.

No. 1

℞	Ac. hydrochlor. dil.	. .	℥x
	Ac. hydrocyan. dil.	. .	℥ij
	Tinct. aurant. co.	. .	ʒss
	Succi taraxaci	. .	ʒj
	Spt. chloroformi	. .	℥v
	Inf. cascarillæ ad	. .	ʒj

M. ft. haust. t. d. s.

No. 2

℞	Ac. hydrochlor. dil.	. .	℥x
	Tinct. nuc. vom.	. .	℥x
	Spt. chloroformi	. .	℥vij
	Tinct. gent. co.	. .	ʒss
	Inf. gent. co. ad	. .	ʒj
	M. ft. haust. t. d. s.		

No. 3

℞	Ammon. carb.	. . . . .	gr. v
	Lact. bismuthi	. . . . .	ʒj
	Tinct. nuc. vom.	. . . . .	℥x
	Spt. chloroformi	. . . . .	℥v
	Inf. calumbæ ad	. . . . .	ʒ

M. ft. haust. t. d. s.

In cases of this kind, recourse must be had to the various forms of peptonised foods introduced by Sir W. Roberts, and especially to the peptonised milk, which can be readily made of any degree of peptonisation, by using the convenient 'peptonising powders' of Benger, or Fairchild. It is often best not to fully peptonise the foods, so that the stomach may still have something to do, and may not still further lose the habit of digesting. Thus Sir W. Roberts often recommends that the peptonising agent should be mixed with the warm milk only a minute or two before the patient commences to drink it. This plan has the further advantage of causing very little change in the taste of the food, avoiding altogether the bitterness that is often so disagreeable to the invalid. When ordinary foods are again commenced, which should be done as soon as possible, it is desirable that they should be thoroughly cooked, and that they should be taken in small amounts at a time, so as to give the diminished ferments more chance of doing their work.

In many cases it will be well to supplement the

stomachal feeding by the use of peptonised nutritive enemata. I have several times succeeded in inducing patients to take food in a natural way, by administering, twice a day, an enema composed of a beaten-up egg, 2 ozs. of warm milk, and 1 teaspoonful of liq. pancreaticus. This food was absorbed, and seemed to give strength to the stomach, thus enabling it to do its duty.

Another, and, in the later stages, more common form of dyspepsia is the catarrhal state of the stomach, as it has been called. This is characterised by the red, or sometimes, but rarely, furred tongue, with large and irritable-looking papillæ; thirst; heartburn; and pain in the stomach immediately after food; flatulence; sometimes nausea and vomiting. This condition also needs bland, unirritating food, very little if any stimulant, and the immediate cessation of creasote, iodoform, or of any other drug likely to increase the irritation.

Rest in bed, and the application of mustard poultices, or of cold water compresses, are desirable, but the quickest way of giving relief is to administer, at bedtime, a pill containing $1\frac{1}{2}$ gr. of calomel, and $\frac{1}{2}$ gr. of opium; or, if the bowels are at all confined, the same dose of calomel, combined with $1\frac{1}{2}$ gr. of pulv. ipec. co. This followed, if necessary, by a mild saline purgative, such as effervescing phosphate of soda, will clear the bowels, and go far towards relieving many of the troublesome symptoms. After this, the old-fashioned mixture of sub-carbonate of bismuth, with dilute hydrocyanic acid and an alkali, will bring the patient back to comfort. He must be warned, however, to be cautious about overloading the stomach in future.

The most serious form of dyspepsia is, however,

chronic gastritis, accompanied by ulceration. This has been carefully studied by Dr. Soltau Fenwick, and he believes it is associated especially with cases of chronic phthisis, in whom cavities had formed in the lung.¹

He describes it as an interstitial inflammation of a chronic type, affecting in a varying degree of severity the whole of the gastro-intestinal tract, from the stomach to the rectum, with secondary changes in the glandular structures. It usually commences in the pyloric region, and is always most advanced in this position.

He believes that it is 'due to the chronic absorption of certain toxic substances, which are manufactured in the pulmonary cavities.' It does not seem to be a direct result of the tubercular affection, and is not to be confounded with the true tubercular ulceration which occurs chiefly in the ileum, and which is so common a cause of the intractable diarrhœa which comes on at the end of a case of phthisis. The treatment of this form of dyspepsia should be similar in the main to that of the second variety, except that, as it is more chronic in character, the patient must be encouraged to eat small quantities of white fish, chicken, finely minced meat, &c., and artificial peptonisation should be resorted to, so that the system may obtain its necessary degree of nourishment.

In medicines also, antiseptics, such as creasote, salol, iodoform, &c., instead of doing harm, often do some good; and as the bowels are irregular, diarrhœa alternating with constipation, at one time purgatives, at another astringents, or even opium, have to be given.

¹ *The Dyspepsia of Phthisis*, Lewis.

Diarrhœa and Vomiting.—As we have seen, both these accidents are common in the course of phthisis, and attempts must be made to relieve them. Where they arise from simple derangement of the gastro-intestinal tract they may usually be arrested by appropriate remedies. I have often found the simple calomel and opium pill, 1 gr. of the former to $\frac{1}{2}$ gr. of the latter, act like a charm in relieving both these symptoms, but if they persist, a few doses of a sulphuric acid and nepenthe mixture according to the following formula will often do much good.

R _y	Ac. sulph. dil.							
	Nepenthe .	.	.	.	.	.	.	āā m x
	Syrup. aurant.	.	.	.	.	.	.	3j

M. ex aq. s.

If there is much acidity, however, it will be better to adopt No. 3 (p. 186). Bismuth is a valuable medicine in these cases ; but, as I believe that it often acts mechanically upon the surface of the inflamed mucous membrane, as well as medicinally, I prefer to order it when the stomach is nearly empty, or immediately after an attack of vomiting. Symes' milk of bismuth is a good form, and it may also be given separately in drachm doses, either in water or milk.

When there is much pain, and the stools are mixed with mucus, showing that the lower bowel is becoming irritated, an enema of starch or thin arrowroot and laudanum, 10 to 20 minim doses, will usually afford relief.

When the vomiting arises chiefly from an irritable condition of the pharynx, and follows any attempt to swallow food, or is excited by coughing, great comfort is obtained by a brief spraying with cocaine, 2 to 3 per

cent. solutions, just before food ; and a few doses of one of the bromides, especially of the bromide of ammonium, may be given with advantage. It is scarcely necessary to say that, in the treatment of diarrhœa, rest in bed is absolutely essential ; and, if pain be present, hot fomentations, or linseed and mustard poultices, or turpentine stupes, must be applied to the abdomen. Hot drinks should be avoided ; but milk that has been boiled, mixed with a little lime-water, may be given in small quantities ; and a little brandy, previously diluted with water, may be added to it, and will often enable the stomach to tolerate it. Pounded raw meat, flavoured with lemon and disguised with toasted bread-crumbs, will sometimes be of service ; but the main part of the diet should be well-cooked farinaceous foods.

In the more serious forms of diarrhœa, due to tubercular ulceration, we can only have resort to opium ; but full doses of bismuth may be tried, or the vegetable astringents, such as kino, catechu, or tannin itself, combined with opium. In other cases, the acetate of lead and opium pill, or sulphate of copper, will be still more useful. In cases of ulceration of the rectum, Dr. Walshe recommended enemata of nitrate of silver ; and enemata of bismuth with laudanum are also useful in this case.

In several cases of obstinate vomiting I have found 3 gr. doses of oxalate of cerium succeed when everything else failed.

Fever and *sweating* are symptoms that frequently require treatment ; but inasmuch as they both arise from causes widely differing at different times, the

measures to be put in force necessarily depend upon the conditions from which they arise.

The fever, that is so common in the early stages of phthisis, and in most of the temporary exacerbations that occur at intervals in its course, is undoubtedly an inflammatory pyrexia. Nowadays we regard tubercle itself as an inflammatory product, and we know also that it often gives rise to true localised pneumonia.¹ Accordingly, the treatment of fever arising from these causes must be a modified and carefully adapted anti-phlogistic treatment. It resolves itself into means for combating local inflammation.

Most of the older writers, following Broussais, advise the application of leeches, or wet cupping, over the seat of incipient deposit of tubercle ; and Dr. Pollock² says, 'A few leeches followed by the cupping glass over the seat of dulness, saline medicines, perfect repose, and a non-stimulant diet offer the best chance of ensuring quiescence of the deposit which has already taken place.'

I think that it is quite possible that we are now too timid about recommending even small local bleedings, and it is likely that benefit has come of this treatment in the past ; but at the present time it is certain that we can generally do very well without it ; and, in an asthenic malady like phthisis, it is not well to lay ourselves open to the charge of 'weakening' our patient.

But there can be no doubt as to the value of the other measures mentioned by Dr. Pollock, and they should be rigorously carried out, especially the confinement to bed. Only I would add to them, as per-

¹ *Milroy Lectures for 1890*, p. 11.

² *Prognosis in Consumption*, p. 399.

haps of the greatest importance, an abundance of fresh air. Perhaps the most striking part of our experience in the hospital treatment of these cases is the cessation of fever two or three weeks after the patients have come into the wards; and this occurs often without any more special treatment than rest in bed for the greater part of the day. It is certain also that we meet with exacerbations of temperature far more frequently in private practice than in hospital. I cannot help ascribing the absence of feverish symptoms, therefore, mainly to the rest and fresh air¹ But we may often quicken the recovery of the patient by the use of some effervescing medicine such as the following, and by the application of derivatives to the chest.

No. 1			No. 2		
R _x	Ammon. carb.	. . . ʒij	R _y	Ammon. carb.	. . . ʒij
	Potass. bicarb.	. . . ʒiij		Potass. bicarb.	. . . ʒiij
	Tinct. aurant.	. . . ʒiv		Vin. antimonialis	. . . ʒss-ʒj
	Aquæ ad	. . . ʒviiij		Spt. chloroformi	. . . ʒj
M. ft. mist. Two tablespoonfuls				Aq. ad	. . . ʒviiij
with one of the acid solution every four			M. One eighth part with a powder		
hours, if required.			of citric acid (ʒj) every four hours. One		
			hour after meals.		
R _x	Quininæ sulph.	. . . ʒss			
	Ac. citric.	. . . ʒiij			
	Aq. chloroformi ad	. . . ʒiv			
	M. ft. sol. ac.				

Or, if the fever runs high, and the skin is dry, tinct. of aconite in ʒij-iiij doses may be added to No. 2 for a short time.

These measures will also be found usually sufficient for the treatment of the simple *catarrhal affections*, to which consumptives are sometimes liable. As soon as the catarrhal feverishness has subsided, however,

¹ 'La cure à l'air et au repos pouvait seule mettre le phthisique à l'abri de ces terribles dangers [pneumonia and bronchitis], parce qu'elle supprime les fatigues et les imprudences.'—Daremborg, *Traitement de la Phthisie*, vol. ii. p. 183.

quinine should be freely given, and a generous diet should be enjoined.

Notwithstanding Laennec's unfavourable pronouncement against the use of antimony, and Dr. Wilson Fox's omission to mention it as a remedy for fever, it is necessary to remark that many, not only of the older writers, but also those of the present day, uphold it as a valuable drug in the treatment of active localised pneumonias.

Amongst the latter, perhaps the most careful observers are Fonsagrives and Bucquoy. They have given tartar emetic in large doses, and they speak in the highest terms of its effects. Bucquoy especially declares that tartrate of antimony not only lowers the temperature, as the other antipyretics do, but that it relieves congestion of the lung, limits the local injury, and leads to a distinct amelioration of the general health; improving the appetite, and, after the first nauseating effect has passed off, it fattens and strengthens the patients. We cannot forget that Dr. Graves, who was a master of observation, also pointed to the tonic influence of this drug in small doses, and Dr. C. T. Williams prescribes it in a febrifuge mixture. I must say that, prescribed as in the following formula, I have seen nothing but good from its use, and have noticed none of the depressing effects that have deterred so many from its employment. Its action, however, should be most carefully watched.

R ^x	Vin. antimonialis . . .	℥ss-℥j	R ^y	Ac. citric.	℥ijss
	Ammon. carb.	℥ij		Aq. ad	℥vj
	Potass. bicarb.	℥iij		M. ft. sol. ac.	
	Spt. chloroformi . . .	℥ss			
	Aq. ad	℥vj			

M. ℥ss c. ℥ss sol. ac. 3tiis hor. s.

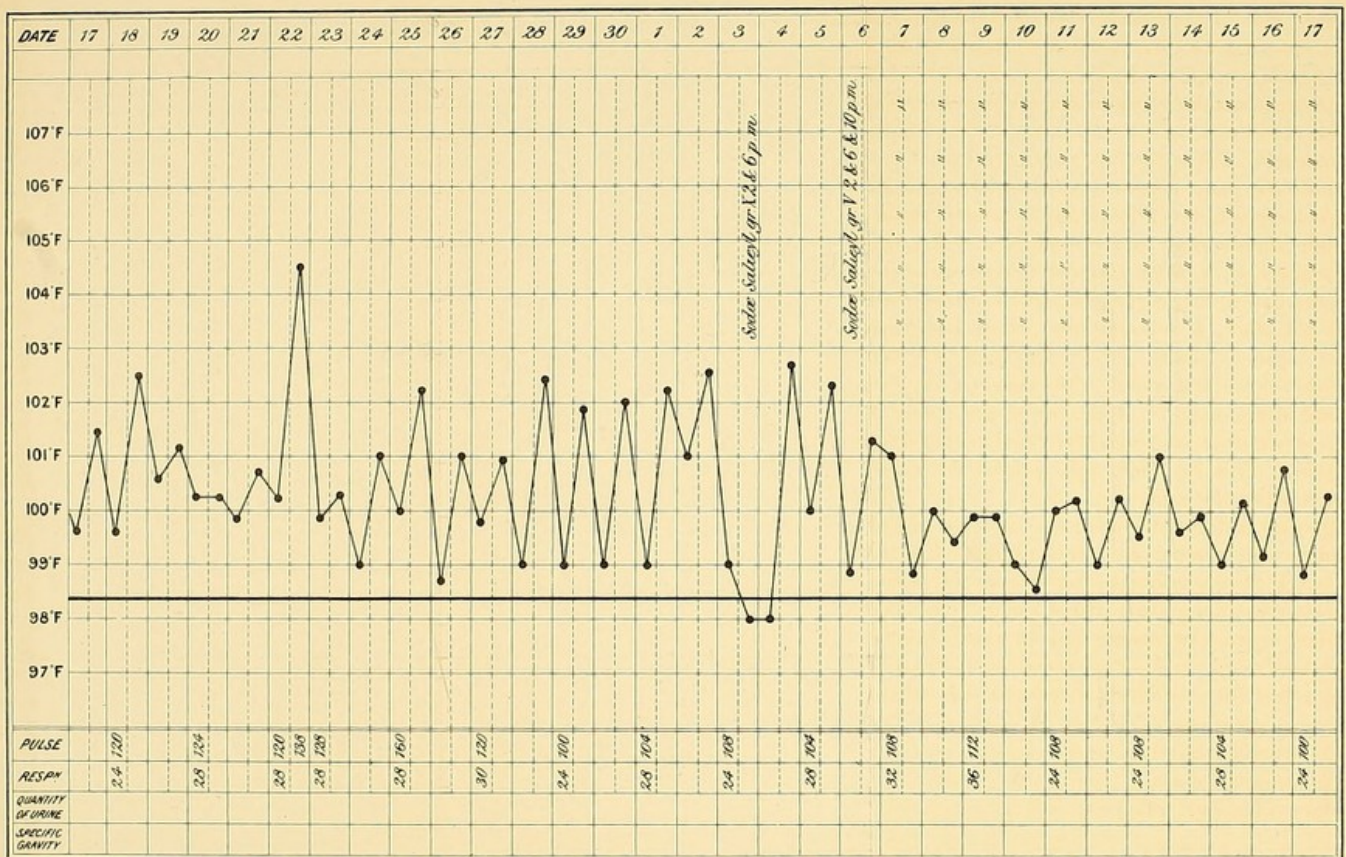
Although the abstraction of even small quantities of blood may not be desirable, nevertheless dry-cupping, thoroughly but carefully carried out, is often of great service; and after a few days have elapsed, it should, in every case of local inflammation, be followed by the application of flying blisters, either by means of liq. vesicans or liq. epispasticus, or by the empl. lyttæ, guarded by tissue paper, and left on for not more than from six to eight hours. In every case where blistering applications have been made, the surface should be immediately covered with a layer of cotton-wool, which should be left on until the blister has risen. The bullæ should then be simply pricked with a clean needle, and dressed with lanolin of zinc or simple lard; and should be healed as soon as possible. I cannot say that I have seen any special benefit from issues or setons, so much in vogue at one time; and the annoyance they occasion has caused me to banish them from my practice.

Where cantharides is judged to be contra-indicated, as in great dryness and heat of the skin, the stimulating liniments or mustard leaves, or, still better, the mustard and linseed poultice, may take its place; but I have latterly discarded entirely the old-fashioned croton oil and turpentine liniment, ung. antim. tart.; and even the lin. iodi is used comparatively seldom.

It is not often, as I have said, that the direct antipyretic drugs have to be used in hospital, but when the temperature persistently rises high, say to 102 or more, in the evening, it is advisable to anticipate this rise, by a dose or two of antipyrine, antifebrin, phenacetin, or salicylate of soda; I prefer, however, to give them in comparatively small doses, 5 to 10 gr. of antipyrine, 2 to 3 gr. of antifebrin, 6 to 8 gr. of

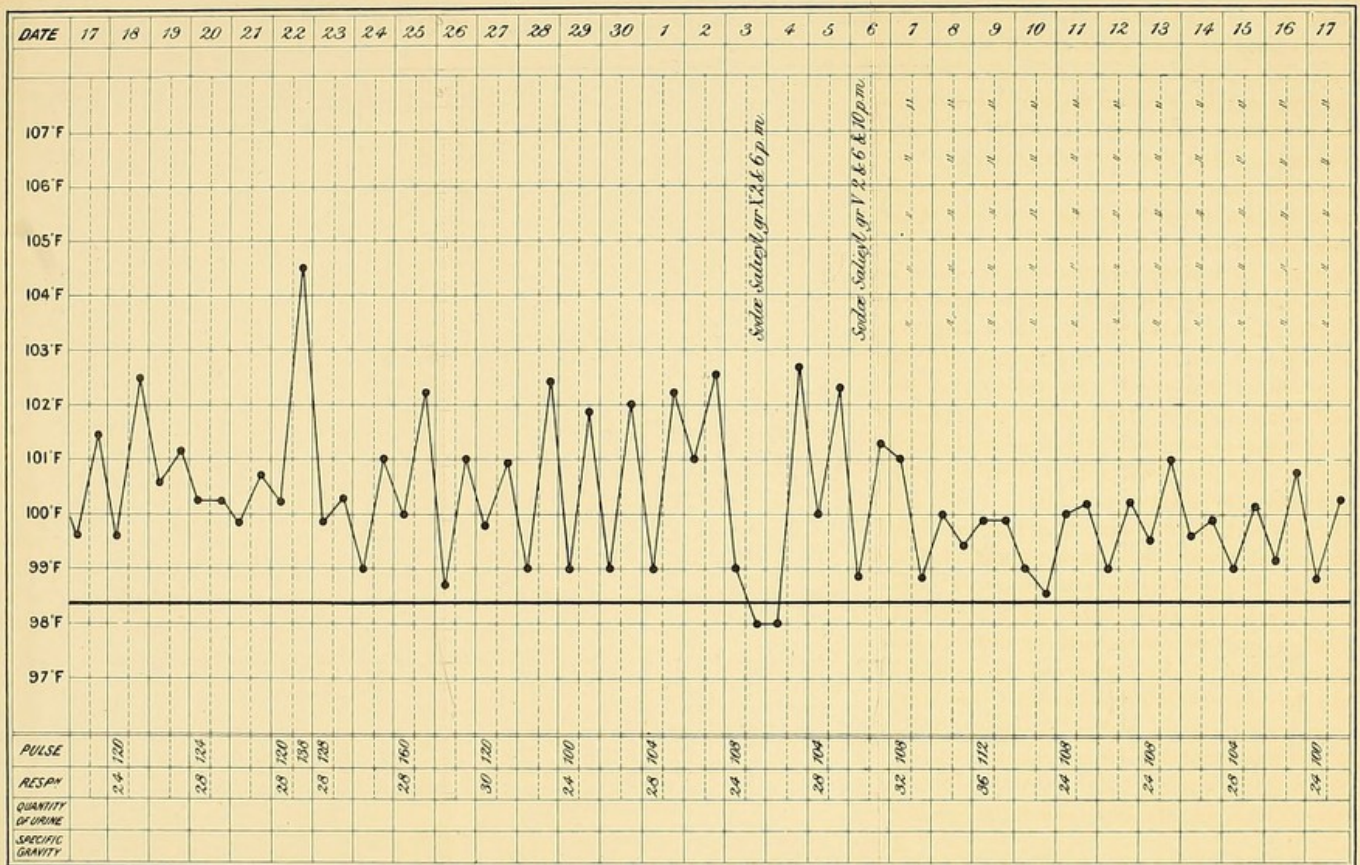
TEMPERATURE ETC. CHART.

Name, *T G* Age *38.* No *1* Ward.



TEMPERATURE ETC. CHART.

Name, *T G* Age *38.* No *1* Ward.



phenacetin. Phenacetin and salicylic acid have usually proved the most satisfactory in my hands; and I prefer to give salicylate of soda in 10 or 15 gr. doses, repeated at short intervals of two hours, just before the expected rise of temperature. I append two charts, copied for me by Mr. Edwards, Resident Medical Officer at our hospital, showing the action of this last-named drug in taking down the temperature, and its persistent influence afterwards; a result that I have not often found to follow the other antipyretics.

But these patients probably belonged to the second group of cases of fever in phthisis, namely, those that are not simply due to inflammatory action, but in which there is a toxic element, either some toxine from the bacilli themselves, or some septic derivatives from the foci of suppuration. This last class of cases is much more intractable than the former, and, in not a few cases, the hectic fever lasts to the end of life, in spite of all our efforts. Still, even here, as we may see from the cases adduced, something may often be done, and at least we may give much relief to the sufferer.

Quinine with hydrobromic acid, salicine with dilute sulphuric acid, arsenic in various forms, iodoform, and the other antipyretics are sometimes of use; and Niemeyer's pill, a grain each of quinine and digitalis with half a grain of opium, may be tried, as it sometimes does good; but, of all remedies, nothing in my practice has done so much to relieve the patients as fresh air, and sponging with cold vinegar and water. Fresh air, night and day, before everything else.

Sweating in phthisis, like fever, is probably due to more than one influence, and its treatment must

accordingly vary with the assumed cause. In some cases it seems to be the natural consequence of the fever, especially when this is of the malarial type, and, as Wunderlich has shown, is of a quotidian, tertian, or even a duplicated quotidian, character. The sweating then seems to be the consequence of the previous high temperature; and the obvious course to pursue is to treat the fever. Or it may be due to the absorption of toxins; and it is in these cases that belladonna or atropine seem to be of such distinct service. But I would put in a word of warning, as to the rapid deterioration of most of the preparations of these drugs, especially the tincture. The extract of belladonna is comparatively stable, and a third of a grain of this substance in a pill is often very useful; or, again, some of the little gelatine discs of atropine, $\frac{1}{60}$ th of a grain, are fairly reliable when fresh.

But much of the sweating in phthisis is the effect of nerve weakness, and must be treated as such. It was pointed out by Dr. E. Smith, that the most profuse perspirations occur during sleep, when the pulse is lowered; and he accordingly administered food, with wine or cold tea, in the night, with great advantage. It is perhaps partly owing to its action upon the nervous system, that belladonna is of so much service in these cases also. Bark, gallic acid, acetate of lead, and other astringents, have been used in order to check perspiration; but, after belladonna, I have found the best results from doses of 2 to 3 gr. of oxide of zinc, combined with as much Dover's powder, in the form of a pill, two or three times a day. All these medicaments are, however, of comparatively little service compared with the hygienic means of

fresh air; sponging with salt water and vinegar; careful feeding; &c. It is of great importance also, that the clothing during sleep should be entirely of porous woollen materials, light woollen night garments, woollen sheets, light porous silk or woollen coverlets. The windows should be open night and day; and, in case of frost or fog, a fire should be kept burning in the room, and draughts carefully warded off the patient. Sponging the body with weak solutions of belladonna, guaiacol,¹ or chloral, have sometimes proved useful, and should be tried in obstinate cases.

Next in order will come the treatment of *cough* in phthisis. When cough is due, as it usually is, to the presence in the lungs of mucus, or muco-purulent matter, it is generally purely beneficial, and no attempt should be made to interfere with it; but the patient should be warned not to cough voluntarily; on the contrary, to control it as much as possible. There can be little doubt that Dr. Dettweiler is right, though perhaps a little imperious, in his command that patients are not to be allowed to cough during meal times. It is surprising how great a control can be obtained by phthisical patients over the cough. I have often been struck by the absolute silence that has prevailed in an audience of consumptives, whilst an entertainment for their amusement was going forward; but at the conclusion of a recitation, or of a song, there was often a perfect chorus of coughing suddenly let loose. A long delay, in answering the first impulse to cough,

¹ Dr. Moritz writes to me: 'I have applied guaiacol externally (10 to 30 minims rubbed into the skin) in a few cases of tubercular pyrexia. It certainly produced a reduction of temperature, but the reduction did not exceed 1·5, and was only of short duration. There were no symptoms of collapse or cyanosis, as described by some authors.'

is often followed by a comparatively easy expulsion of the offending fragment of phlegm. When, however, it is spasmodic in character, and when there is an overpowering irritation in the larynx, and it interferes with the patient's rest, measures must be taken to allay it as much as possible without interfering with, or deranging, the digestive organs. Very seldom, indeed, is it necessary to have recourse to the old-fashioned opiate linctus, which used to be the stock prescription in all cases of the disease.

Rest in bed, for an hour after meals, a little counter irritation, a few whiffs of cocaine spray, demulcent drinks acidulated with lemon, iced water, gelatine lozenges, all these simple means should be tried before recourse is had to more powerful drugs.

When sedatives are actually needed, I have generally found codeia quite sufficient, in doses of one-half to one grain, either in a pill or, better, mixed in syrup, to the dose of one drachm ; or, again, in a jelly made with gelatine and sweetened with saccharin, if sugar is likely to cloy the palate. Codeia very seldom upsets the stomach or constipates the bowels.

Towards the end, however, when the case is hopeless, it would be cruel to withhold the preparations of opium, a dose of a quarter of a grain of morphia at bedtime may be administered, or a linctus, such as one of the following, to ease the cough, and to give some repose.

℞ Ac. hydrocyanic. dil. ℥xxiv
Nepenthe . . . ʒij
Spt. chloroformi . . ʒj
Magnes. carb. . . ʒj
Mist. acaciæ ad . . ʒiij
M. ʒj p. r. n. s.

℞ Ac. hydrocyan. dil. . . ℥xxiv
Ac. hydrochlor. dil. . . ʒj
Morph. muriat. . . gr. j
Spt. chloroformi . . ʒj
Syrup. mori ad . . ʒiij
M. ʒj p. r. n. s.

R _x	Nepenthe	ʒj
	Ac. sulph. arom.	ʒj
	Syrup. aur. ad	ʒjss
M. ʒj pro dosi.		

I have also found tincture of gelsemium very useful in some cases, and a very simple and soothing preparation is a pill of lactucarium; or Conium, combined with pulv. antimonialis, or true James' powder, as in this prescription.

R _x	Pulv. Jacobi veri	gr. ij
	Ext. Conii	gr. ij
M. ft. pil. j. j. ter die, s.		

When the cough is accompanied by, and is partly due to, excessive bronchial secretion, a pill, containing oxide or sulphate of zinc, as in the following formula, will often be of service :

R _x	Zinci sulphat.	gr. j
	Codeiæ	gr. $\frac{1}{2}$
	Ext. hyoscyan.	gr. ij
M. ft. pil. j. j. post cib. ter die, s.		

Again, I would insist that fresh air, and plenty of it, is the best remedy for cough, especially when this is at all spasmodic in its character. Over and over again I have noticed the cough cease entirely, as long as the patient was in the open air, and come on again on the return within doors. Attacks of cold or bronchitis are also thus warded off.

Although *hæmoptysis* is not perhaps the most serious of the accidents that can befall a phthisical patient, it usually causes more alarm and perturbation of body and mind than any other, with the exception possibly of perforation of the lung. And yet I have seen cases in which the patients have preserved their courage, and presence of mind, better than any of the

attendants, and, after losing many ounces of blood, have remained perfectly calm. Still the accident always produces a profound effect upon the system; though in slight cases the bleeding may even be of some benefit.

In the treatment of this formidable symptom common as it is, there is the usual difficulty in forming an opinion, upon the efficacy of the measures used to arrest it, owing to the natural tendency to coagulation of the blood, and the consequent stoppage of the effusion without medication. Nevertheless, there can be no hesitation about putting the patient under the conditions most favourable to this natural means of cure; and accordingly, in every case, he must be put to bed, with the shoulders raised; absolute silence must be enjoined; and only cold, generally iced, drinks should be given, ice also should be applied to the chest, over the seat of the hæmorrhage, if it can be ascertained without disarranging the patient, and some authors advise ice-bags to the spine, even though this is likely to cause dilatation of distal capillaries.

The other measures to be used should be directed towards reducing the force of the circulation through the lung; diminishing the quantity of blood near the injured part; contracting the vessels of the lung; and increasing the coagulability of the blood.

The hæmorrhage may be due simply to congestion, to fatty degeneration of the blood-vessels, to ulceration through them, or to aneurysmal dilatations of vessels on the borders of a cavity. Some modifications may have to be made in the treatment with regard to these several conditions, but in all, the objects above mentioned will have to be kept in view. To

lessen the force of the circulation, nauseants such as ipecacuanha, digitalis, and even venesection, have been proposed, but they are rarely used at the present day : we rely more upon dry-cupping, turpentine to the back, mustard to the feet, and sometimes the boot of Junod, transiently applied. Mild purgation by Epsom salts, or by turpentine enemata, is of much use ; and the former drug may with advantage be combined with medicine for furthering the other objects, as in the following formula :

R.	Ac. sulph. dil.	.	.	.	.	.	.	℥ij
	Ext. ergotæ liq.	.	.	.	.	.	.	℥iij
	Magnes. sulph.	.	.	.	.	.	.	℥j
	Syrupi zingiberis	.	.	.	.	.	.	℥iv
	Aq. menth. pip. ad	.	.	.	.	.	.	℥vj

M. ℥ss ex aq. 3tiis hor. s.

The use of ergot is a time-honoured means of diminishing the calibre of the capillary blood-vessels. It may be given as above ; or, if there is urgency, hypodermically, in the form of ergotin, or ergotin ; and I have often thus administered 10 minims of the hypodermic solution of ergotin, injected deeply amongst the muscles of the gluteal region. It generally acts quickly, when thus given, and the likelihood of supuration is minimised.

Whatever be the explanation of its action, whether it really contracts the vessels or not, it has apparently often checked severe hæmorrhage when given in this manner ; and even if it fails no great harm is done.

After the attempt to stop the bleeding immediately, the so-called astringents and styptics must be tried. Of these, the most favoured are gallic acid, hamamelis, tannin, acetate of lead and opium, and turpentine. All these have been tried in turn ; but the last

to be given often gets the credit when the hæmorrhage ceases. I have myself usually given turpentine in the first instance in 20 minim doses, and in inhalations ; and I must say that the bleeding has often ceased under its use, as it has also with the other drugs ; but I have come to think that the acetate of lead is the most important styptic, and it has the great advantage of tranquillising the circulation.

There are, in fact, few cases of fatal hæmoptysis, except those from the rupture of an aneurysm ; and in these cases all our remedies will sometimes be tried in vain. Dr. C. T. Williams speaks favourably of the plan, in these desperate cases, of injecting the lung, or the vomica, where the rupture has taken place, with a strong solution of tannin ; and Dr. Cayley, in one case, produced artificial pneumothorax by puncturing the pleural cavity. Spraying with solutions of perchloride of iron, 1 to 5 per cent. of the liquor, has also been recommended. Many times latterly I have tried the hæmostatic influence of calcium chloride, in 10 gr. doses, dissolved in water, and have thought that it had a distinctly good effect.

In every case of hæmoptysis, not only should the patient be confined to bed during the attack, but for several days afterwards. Whatever opinion we may hold respecting the so-called 'phthisis ab hæmoptoe,' it is a fact that a certain amount of fever, and some pneumonia, often follow the injury to the lung ; and that these symptoms may be the commencement of fresh mischief in the lung ; mischief that may be averted by proper watchfulness and care. It has been suggested also, with good grounds for the advice, that patients who have suffered from 'blood-spitting' should

for some time abstain from butcher's meat, or at least that they should partake of this stimulating diet very sparingly.

As a further argument for the adoption of the 'open air' treatment, Daremberg remarks, 'Les tuberculeux soumis au traitement, à l'air et au repos, ont rarement des crachements de sang ;' and he points out how frequently the accident is brought about by over-exertion of any kind.

Perforation of the lung from tubercle is much more serious in its results than hæmoptysis, as may be judged from Dr. Douglas Powell's statistics from Brompton Hospital ; but even from this accident there are not a few recoveries. Dr. C. T. Williams gives several cases of recovery,¹ and I have notes of three such cases. In two of them, complete arrest of the disease took place ; and they are still alive, many years after the accident. The other patient lived for more than a year afterwards, and then the disease started in the opposite lung ; but at one time it seemed as if he too would recover. Something seems to depend upon the absence of adhesions ; for, when the lung collapses completely, the opening may become sealed ; and the complete rest of the injured organ gives time for healing changes to take place. Death may take place at once ; and in any case for a time nothing can be done except give stimulants, and support the strength. If the valvular opening in the lung opens outwards, there may be distension of the pleural cavity, and suffocation may ensue. In this case it may be necessary carefully to aspirate the cavity, sufficiently to relieve

¹ *Pulmonary Consumption*, p. 213.

the urgent symptoms, the patient being made to lie upon the injured side.

As a rule, if the patient lives long enough, empyæma follows; and it may become necessary to perform thoracentesis, with resection of ribs, and drainage of the cavity.

This operation sometimes gives a little relief from the distressing cough, and from the discharge of pus through the mouth; but, in my experience, in cases of phthisis it is of little further use, and only lengthens a miserable existence. It is better to try to alleviate the suffering by opiates and other means.

If the *dyspnœa* should be extreme, some relief may be obtained from inhalations of pure oxygen, or from 20 to 30 minim doses of Richardson's ozonic ether. I have often seen great comfort derived from the latter remedy; but it is important that it should be given alone, mixed only with a little pure water. It often restores colour to the cyanosed lips and extremities.

Inhalations of small quantities of iodide of ethyl, or of nitrate of amyl, from Martindale's capsules, may also be of some slight service.

With the exception of laryngeal phthisis, the other complications that may arise in the course of pulmonary tubercle are not the exclusive appanage of this disease, such complaints, for instance, as fistula in ano, albuminuria, phlebitis, bedsores, &c.

As a matter of personal experience, however, I may say that, although I am convinced that fistulæ should be treated surgically, I have often seen tubercle apparently spread more rapidly through the body after operation; and consequently the fears expressed by the

older writers on this subject are entirely justified. In truth, the operation needs to be performed with more care, and with more determination to destroy the tubercular focus, than is generally the case. Not only should thorough scraping be practised, but the after treatment by iodoform, and by other bacillicides, should be watched with extreme scrutiny. In albuminuria, I can confirm Dr. C. T. Williams's favourable report as to the advantage of careful dieting. Phlebitis is usually managed easily by rest, and applications of opiate fomentations, or, better still, of belladonna paint, made with extract of belladonna and glycerine, along the track of the vessels.

Lastly, bedsores should never be permitted to form, but should be prevented by good nursing ; by hardening the skin over prominent parts by bathing with brandy and borax, tannin, or other astringents ; painting with tinct. benzoin co. ; by the early use of water-cushions, half-length size ; and by taking off pressure by means of pads, hollowed out over projections ; and those made of amadou, spread with pure soap plaster, have always seemed to me to be the best. Dr. C. T. Williams speaks well of circular cushions made of down, instead of the usual air-cushions.

If the skin should break through neglect of proper nursing, I have usually found a compress of a solution of sulphurous acid, one part in four or six of water, the most rapid healing agent, better even than iodoform or boric acid.

CHAPTER XIV

TREATMENT OF DIFFERENT FORMS OF PHTHISIS

The most favourable cases for treatment—Their gravity—Management—Poor and rich—Hospitals for consumption—Sanatoria—Difficulties of home treatment—Prognosis of cases with limited cavity—Objects of treatment in these cases—Climates—Hygienic and medicinal treatment—Treatment of cases of doubtful prognosis—Cases—Supervision—‘Cures’—Medicines—Sanatoria on the grouped-cottage plan—Treatment of ‘softening’—Treatment of apparently hopeless cases—Instances—Summing up

THERE remains the application of the various means of treatment, that have been described, to the management of the several degrees of pulmonary tuberculosis which are usually met with.

(1) Perhaps the most hopeful of these cases are those with a limited small deposit in one lung, in persons without hereditary predisposition to the disease, and in whom it is, at any rate for a time, quiescent ; that is, in whom there is little emaciation, no fever, no crepitation, dry or moist, the movements of the ribs but little impaired, especially the *forward* movements of the anterior ends of these bones.¹ This last sign I consider one of the most valuable ; because by it nature tells us that such movements are comparatively safe, and that the respiratory muscles still possess a fair amount of vigour. Only in young persons, under 18, is this symptom not trustworthy.

In cases such as these, our treatment may be

¹ See *Prognosis in Lung Disease* (Macmillan), p. 55.

confidently carried out with a fair prospect of cure. In all cases, however, the extreme gravity of all forms of tubercular disease must be borne in mind; and the patient must be warned as to the importance of implicitly following the directions given to him.

These directions necessarily vary with the social position of the patient. The poor man is sadly handicapped in the struggle for cure, and it is rare to find such cases as we have just described amongst the applicants at our hospitals. Still, when they are discovered, we may urge the need of commencing the treatment as an in-patient in some hospital for consumption. Here every appliance will be at hand for improving the nutrition of the body, and for thorough hygienic treatment. They will have the necessary rest, and carefully graduated exercise, wholesome food at proper intervals, open-air treatment, cod-liver oil, and other medications. .

It is often well to begin with the hypophosphites; but, if the weight is not increasing satisfactorily, the iodoform and codeia pill should soon be substituted; or creasote should be given in rapidly increasing doses; or the changes may be rung between this and guaiacol, or the carbonates of these drugs may be administered, until tolerance of one remedy is established; and then the selected medicine should be persevered with for long periods of time.

A careful watch should be kept for any rise of temperature, or for symptoms of irritation in the lung; and if these show themselves, the measures laid down for their treatment should at once be adopted. When the patient leaves the hospital, change of residence should be enjoined; and if this is impossible, the dwelling

should be thoroughly disinfected by Prof. Delépine's method, with complete cleansing, followed by washing it all over with a 1 per cent. solution of common chloride of lime (bleaching powder) (see p. 51).

It would be best if the patient could be sent away into the country, to some high and dry situation, with little or no work to do ; but if this is out of the question he must select an occupation such as I have before mentioned (p. 81). I have several times obtained situations for such persons as stewards, or stewardesses ; and have enabled others to emigrate for outdoor employments in Canada, New Zealand, the Cape, or Natal, and the results have been eminently satisfactory.

For wealthy persons the directions are usually much simpler, but it is not always easier to have them carried out.

It would be well, in every such case as I have described, if the patient could be persuaded to place himself for a time under the charge of an enlightened medical attendant—if possible, in a sanatorium adapted to the purpose. Unfortunately, such institutions are rare in this country ; and if the patient must be expatriated, it may be better to let him take a voyage ; to let him go to the high grounds near the Cape (see p. 136) ; or to New Zealand for the winter ; or to send him to some of the other places mentioned under the head of climatic treatment.

I must, however, again express my conviction that if he can only get the requisite medical attention, and good nursing, at some of the English health resorts, he will be more comfortable, and will be quite as well off in regard to his malady, as if he were driven away from these shores. The great difficulty is to get our better-

class patients to follow implicitly the directions that are given to them.

One great object should be to prevent over-exertion ; to keep the patient from entering places where the air is impure, or where there is danger of inhaling tuberculous dust ; to secure regular alimentation, and to guard him from fresh outbreaks of tubercular irritation.

I have already expressed my opinion that most of the fatal endings of consumption are due to repeated infections from without (p. 43) ; and it is most difficult to prevent our patients from visiting places whence this infection may be gathered. Either for the sake of business, pleasure, or benevolence, the active spirits of these persons will often urge them to disregard the injunctions given on p. 105, and will lead them into danger.

(2) Next in order, for favourable prognosis, will probably come those male cases in middle life, in whom there is a limited cavity at one apex¹ quiescent, diminishing in area, with flattening of the thoracic wall over its site. Here, again, freedom of movement of the upper ribs is of most favourable import. During an acute stage of the disease, the readings of stethometric measurements over the site of a vomica are the smallest that are ever met with in chest disease ; but when the inflammatory action has entirely subsided there is, in favourable cases, a return of elasticity to the lung, increased mobility in the bones overlying the site of the cavity, and increased readings of the stethometric register. I have noticed also that the prognosis is most favourable when the forward movements of the ends of the ribs are greatest, and when there are

¹ Preferably the right lung.—Pollock, *op. cit.* p. 228.

indications of compensatory forward movements in the other ribs.

When we have before us any such case as this, our chief objects should be (1) to prevent the lodgment of fresh virus in the injured lung ; (2) to keep the existing disease quiescent ; (3) to prevent its extension ; and (4) to keep up the bodily vigour of the patient to the highest point possible.

All the injunctions with regard to hygiene, and abundant fresh air supplies, must be strenuously carried out ; a careful watch must be kept up for any signs of fresh irritation, and antiphlogistic treatment at once applied if needful ; and all over-exertion must be forbidden. Many of these patients are, however, fairly vigorous, and may be allowed considerable freedom in the matter of exercise, short of actual fatigue. They may often be allowed to ride, even to hunt, to shoot or to fish, always provided that the excitement of the chase does not cause them to exceed their powers ; and precautions must be taken against the possibility of chill.

Some of the most satisfactory cases that I have seen have been men of a sporting turn, who have been out all day, and nearly every day, in the pursuit of some one or other of their favourite occupations.

With regard to the best climates for these cases I would again venture to advert to the opinion, already given, adverse to so-called 'bracing' sea-side places. I am even doubtful as to the suitableness of sea-voyages for such persons. It is possible that they may do no harm, and even that benefit may be derived from them ; but I have so often seen cases of this kind return with infiltration around the original focus, or with softening

of the barrier of consolidation, that I have come to dread the influence of the sea air, especially when this is accompanied by much warmth. It is safer for persons with such limited disease either to stay at some pure air resort, with a dry subsoil, in this country ; or, if they must travel, to choose high places in Switzerland like Leysin, or Davos, or the Engadine ; or to go to Canada, or Colorado ; and they will do better to avoid Algiers, Egypt, Madeira, the Canaries, and even Italy or the Riviera.

Apart from hygienic measures, this class of cases often needs especial attention to the results of the presence of the vomica. The cough, for instance, is often troublesome, either from the secretion from the vomica, or from the irritation due to its drying up and contraction. We have, in fact, often a divided duty ; for we must facilitate as much as possible these beneficial processes, and yet we must guard against the harm that may be done by the violence of the cough. It is in these cases then that we may with much benefit resort to sedative cough mixtures, always avoiding, as much as possible, any drugs that may disorder the digestion. We may even sometimes have to make an attempt to diminish the quantity of expectoration ; for instance, with the sulphate of zinc pill (see p. 203) or carbolic acid inhalations ; and if the patient complains, as he often will, of the tightness of his cough, we should explain to him the favourable nature of the cause of his difficulty ; and he should be warned against endeavouring to overcome it by voluntary coughing. As we have already seen, he must learn to suppress his cough. No attempt should be made to check the amount of necessary morning expectoration. Much good may be

done in these cases by flying blisters ; and great benefit may be derived from inhalations of carbolic acid, pinol, or eucalyptus, and the occasional use of sprays. The internal use of creasote or guaiacol is also of much service.

(3) When more than one vomica is discoverable, or when there are indications of mischief upon the opposite side of the chest, the prognosis necessarily becomes much graver ; but even in these unfavourable circumstances our motto should still be 'Nil desperandum.'

I shall never forget one case of recovery from an apparently hopeless condition. A Greek merchant, æt. 35, had a huge cavity involving the whole of the right upper lobe, the rest of the lung being apparently in a state of infiltration ; and there were signs of commencing disease at the left apex. He was spitting up enormous quantities of pus, and often had to invert his body over the side of the bed in order to get rid of it. He had hectic fever and night sweats. It seemed impossible for him to live more than a few weeks ; but he expressed a strong wish to die in his native land. I gave him permission to make the attempt to travel, warning his friends of the imminent danger. A year afterwards he made his appearance at my consulting rooms, but I could not recognise him. He was the picture of health ; fat, ruddy, and free from cough. I could find no trace of disease on the left side, and on the right the cavity had shrunk to at least a third of its former size. He had started business in Constantinople ; and I heard some years afterwards that he was still living.

I may quote one other case, as a sample of several

others, in which life was long continued in spite of multiple vomicæ in both lungs. A married lady, æt. 30, with a history of phthisis of eighteen months, had two, if not three, cavities in the left lung, and consolidation with commencing softening at the right apex. She was sent to Davos, where she resided for a little over a year, and where she had an attack of rheumatic fever. When she returned, I found distinct improvement on the left side; but there was a vomica at the right apex, and abundant bacilli in the sputum. She took a house on the top of the sandy hill of Bowdon, and lived there for six years, without having more than one single attack of fever, which attack was due to catarrh. Her husband's business then took him to London; and she lived there about two years, her general health suffering, and both lungs becoming worse. By the advice of her London physician, her husband now gave up business, and they went to reside in Los Angeles, California, and afterwards at San Diego, enduring great hardships; notwithstanding which she still lives, twelve years after the first commencement of her illness. The experience of many other medical men could probably furnish similar histories.

The treatment of these cases must in many respects be similar to that given for the last series; but much less liberty, in the way of exercise, must be allowed.

They also require still more constant supervision, extending over long periods of time; and it would be well if they could give themselves up to the 'cure' in some establishment for the purpose. Unfortunately it is but seldom possible to do this, as few people will consent to exile themselves for months or years. If

they would, there would be many more cases of recovery than there are now. It shows what an urgent need there is for more sanatoria, on the grouped-cottage plan, than now exist.

These cases especially need the constant use of iodoform, creasote, or guaiacol, and inhalations of carbolic acid, essential oils, and ozone, with careful management of the cough.

(4) In the stage of softening, so long as this process is still going on, the outlook is necessarily much more uncertain. No one can say how far it will go, nor when it will stop; and fresh infection may be going on all around the original deposit. All our efforts must be directed towards bringing about its arrest; and one thing is certain, that no patient ought to be permitted to leave his home, except to go to the hospital or the sanatorium, while the action is still going on. Doubtless removal to hospital would be the wisest course. If the patient stays at home, the open-air treatment should be attempted, even though some degree of fever be present. Constant watch must be kept up against a spread of the disease; the body-weight must be ascertained at least once a week; the food must be judiciously chosen, and forced feeding by enemata, or in other ways, must be undertaken; blistering must be judiciously carried out; and all the resources of our febrifuge and protective treatment must be brought into play (see p. 190 *et seq.*).

It is in these cases that Dr. Dobell's method of securing rest to the injured lung by means of 'lung-splints' may be temporarily applied; and, as I have before remarked, I have often found a Salmon and

Ody truss with a large front pad very serviceable for the purpose (p. 105). When the disease again becomes quiescent a more accurate prognosis may be attempted ; but it would not generally be wise to give an opinion until some weeks or months have elapsed since the attack. When this favourable result has been attained, then the various questions of change of climate, occupations, &c. may be brought forward, and some relaxation in the rigidity of our rules may be allowed. Exposed seaside places are especially unsuitable as resorts for those who are recovering from such an attack. In my experience the disease is very likely to be lighted up afresh in these places.

Not until quiescence of the malady has been obtained should the usual course of creasote, or iodoform, be recommenced ; but inhalations of antiseptics on a respirator inhaler may with advantage be employed continuously.

(5) The most hopeless cases are those of young people with a family history of hereditary disease. These persons often go from bad to worse, in spite of all our efforts ; and many of them are the subjects of acute tuberculosis.

And yet, even amongst these, we sometimes obtain encouraging results, at any rate, for a time. I have several times noted cases, especially when they have been seen in the early stages of the disease, recover health to a marvellous extent ; they fattened up, regained their colour, and seemed as if they were going to pull through. But only in two or three instances has this promise been ultimately fulfilled. Sooner or later a fresh outburst of the disease occurs, and they rapidly fade away. Still, in some of these

cases, the fatal issue was most probably due to fresh infection ; and there still remains the possibility that, if they had more efficiently guarded against this accident, they might have remained comparatively healthy.

I remember the cases of two members of the same phthisical family, whose history illustrates both these remarks. The mother had died of consumption, and the father was the subject of chronic phthisis. The brother, *æt.* 18, was the first to come into hospital with proved tubercular consolidation of one apex. He stayed three months and gained 20 lbs. in weight. He then went out ; but he continued to gain weight, and after the lapse of a year, a careful examination by several physicians failed to discover any physical signs of disease ; there was no cough, and no expectoration. Notwithstanding this, he died eighteen months later of phthisis.

The sister, *æt.* 22, came into hospital shortly afterwards, with a vomica at one apex. She also gained 20 lbs. in weight in three months ; and went out to take up her former employment. She returned to hospital a year later with increased disease in the lung ; but she again gained weight, and the disease became quiescent. She was urged to change her occupation and mode of life. For several years she remained in service, and for aught I know she is still alive.

The lessons to be learnt from these cases are, that no case should be abandoned as hopeless, however bad the family history ; that the remedial influence of hygienic measures should be tried in every instance ; and that at least palliative treatment should be adopted, and hope inspired into patients and friends.

The general treatment should be the same as we have indicated in the preceding class.

The treatment of accidents and complications has already been fully described.

To sum up:—We have seen that tuberculosis is pre-eminently a preventible disease. Its germs can only live and thrive in the midst of insanitary surroundings, such as absence of sunlight, damp subsoils, bad drainage, filth, and especially air polluted with organic emanations from the lungs, and from the surface of the human body.

If these conditions could be removed—as they certainly will be removed sooner or later—the disease would die out of this country as surely as its congener, leprosy, has disappeared. Already the decadence of the malady has begun ; and, when the virulent products of the disease are properly dealt with, we may fairly hope for its still more rapid decline in the near future.

Phthisis is also curable, often by the unaided powers of nature ; but it will be cured still more certainly, when the dictates of medical science are consistently followed throughout long periods of time.

We have seen that the chief agents of cure are good feeding, and exposure of the patient to abundance of fresh pure air and sunlight ; afterwards, means can be brought into use in order to subdue the irritation caused by the presence of the bacillus, and to prevent its further spread. If these objects can be carried out there is good hope of recovery.

Man is one of those animals which are naturally refractory to the microbe, and his tissues are antagonistic to it. As Dr. Moxon said : ‘ The life of the bacillar parasite is difficult, easily discouraged by unfavourable

circumstances, like an aphid by an easterly wind ;' if then the first colony can be kept within bounds, and fresh relays can be prevented from entering, we may fairly expect that, sooner or later, the first contingent will be starved out ; and that the disease will disappear, even though it may leave traces of its presence behind.

APPENDIX

LEAFLET ON THE 'PREVENTION OF CONSUMPTION,'

Issued by the Manchester and Salford Sanitary Association. It contains what is essential and yet is not alarmist in tone.

PREVENTION OF CONSUMPTION

IT is now well known that consumption is often caused by the breathing of matter coughed up by consumptive persons, which, when it becomes dry, is blown about in the air as dust. This dust contains the poison which is the active cause of the disease ; if it is left in contact with any filth, or floating about in foul air, it is dangerous even to healthy persons, but it is especially hurtful to those with weak lungs, THOUGH IT SEEMS TO BE HARMLESS IN CLEAN, WELL-VENTILATED, WELL-DRAINED HOUSES.

It is therefore the duty of all persons suffering from this disease to take care that all expectorated matter is destroyed at once, and not allowed to get dry and powdery, AND TO SEE THAT THEIR HOUSES ARE IN A GOOD SANITARY CONDITION.

To ensure this being done, the following rules should be observed :

1. All matter coughed up from the chest should either—
 - (a) Be spat into the fire, or
 - (b) Should be received in a vessel lined in such a way with a piece of paper, that the paper and its contents may be lifted out and burnt.
2. Rags which can be burnt should be used instead of pocket-handkerchiefs, and if a pocket handkerchief is used, it should be well boiled before the matter upon it has had time to become dry and powdery.

3. The rooms and furniture used by persons suffering from advanced consumption should be frequently cleansed by washing with soap and water, and should also from time to time be thoroughly disinfected. All unnecessary bedhangings and curtains should be removed.
4. As plenty of fresh air is absolutely necessary to persons suffering from or threatened by consumption, their houses should be kept clean, and thoroughly ventilated. If this is done it will greatly aid in the cure of the disease, and there will be no danger of contagion.

The windows, both of the living-rooms and bedrooms, should be kept open more or less, according to the weather, day and night, although direct draughts should be avoided.

If the clothing and bedding are sufficient, mere cold need not be feared ; but, if possible, a fire should be kept burning in the room to ventilate it.

THE CHIMNEY SHOULD NEVER BE BLOCKED UP.

5. Consumptive persons or persons, threatened with consumption, should spend as much time as possible in the open air, and should keep away from close and crowded rooms, whether they be concert halls, meeting-houses, theatres, public-houses, or the like.

HINTS TO PREVENT THE SPREAD OF CONSUMPTION

Manchester Hospital for Consumption and Diseases of the Throat.

The sputum must be destroyed, and must not be allowed to become dry.

A spitting cup or flask, containing just enough (5 per cent.) solution of carbolic acid to cover the bottom of the vessel should always be used for the expectoration. Out of doors a pocket spitting flask, such as Dettweiler's, or better still, a paper spittoon that can be burnt, should be employed.

Pieces of linen or calico about ten inches square may also be carried. These should be used only in case of absolute necessity ; and should be burnt as soon as possible afterwards. No piece should be used more than once.

Bedrooms that have been occupied by tubercular patients **should be thoroughly disinfected** before they are occupied by other persons ; and a declaration or assurance on the point should always be demanded from lodging-house keepers.

The following points should always be insisted on :

1. Carpets, curtains, and bed-coverings should have been exposed to superheated steam under high pressure.
2. The floor and walls of the room should have been properly disinfected. (Rubbing with new bread, followed by the application of a 1 per cent. solution of chloride of lime, is probably the most effective practical method.)

There is **no danger of infection from the breath of a tubercular patient**. The sole danger of social intercourse arises from neglect of the precautions described.

Fresh air is of the highest importance for tubercular persons. Hot and stuffy rooms have an evil influence over the disease. Except in special circumstances the bedroom window should be kept open by night as well as by day.

(A)

*PRECAUTIONS TO BE TAKEN BY PATIENTS WITH
A TENDENCY TO CONSUMPTION*

Adopted by the Bournemouth Medical Society

The expectoration must be destroyed, and must not be allowed to get dry, as it may then become pulverised and diffused through the air. If inhaled, it may thus communicate the disease to other persons, or cause fresh attacks in the same invalid. On no account, therefore, must pocket handkerchiefs be used for expectoration. If used for wiping the mouth they should be put aside after use. A spitting-cup (or pocket spitting-flask for out of doors), containing a little disinfectant solution, should always be used. Small pieces of linen or calico, or Japanese paper handkerchiefs, should also be carried, which should be used only in case of absolute necessity, and burnt as soon as possible afterwards.

Spoons, forks, cups, and other articles of this kind should be thoroughly washed before being used by other persons.

The patient should always occupy a separate bed, and if a nurse is not required, a separate bedroom.

Fresh air and sunlight are most essential. The windows both of living rooms and bedrooms should be kept open as much as possible, although direct draughts should be carefully avoided. The chimney should never be blocked up.

With these precautions no danger of infection need be feared.

(B)

*RECOMMENDATIONS AS TO THE CLEANSING OF
ROOMS OCCUPIED BY CONSUMPTIVE PATIENTS*

Adopted by the Bournemouth Medical Society

It is an established fact that consumption is sometimes caused by the breathing of matter coughed up by consumptive persons, which, when it becomes dry, may be blown about in the air as dust.

It is desirable, therefore, that rooms which have been constantly occupied by consumptive persons should be very thoroughly cleansed when vacated, so that a declaration or assurance to this effect may be given, if required, to the next occupants of such rooms.

The process of cleansing should include the thorough brushing and exposure in the open air of stuffed furniture : carpets, curtains, hangings, and bedding should be 'cleaned,' or thoroughly shaken and exposed in the open air for several hours ; during sunshine, if possible. Where facilities for this do not exist, these articles should be sent to the steam disinfecter. Floors, paint, and furniture should be treated with some disinfectant, and then washed with soap and water. Walls should be rubbed down with new bread. Ceilings should be thoroughly dusted, and every conceivable nook for dust should be carefully cleaned. The room should be freely ventilated for at least twenty-four hours with wide-open windows.

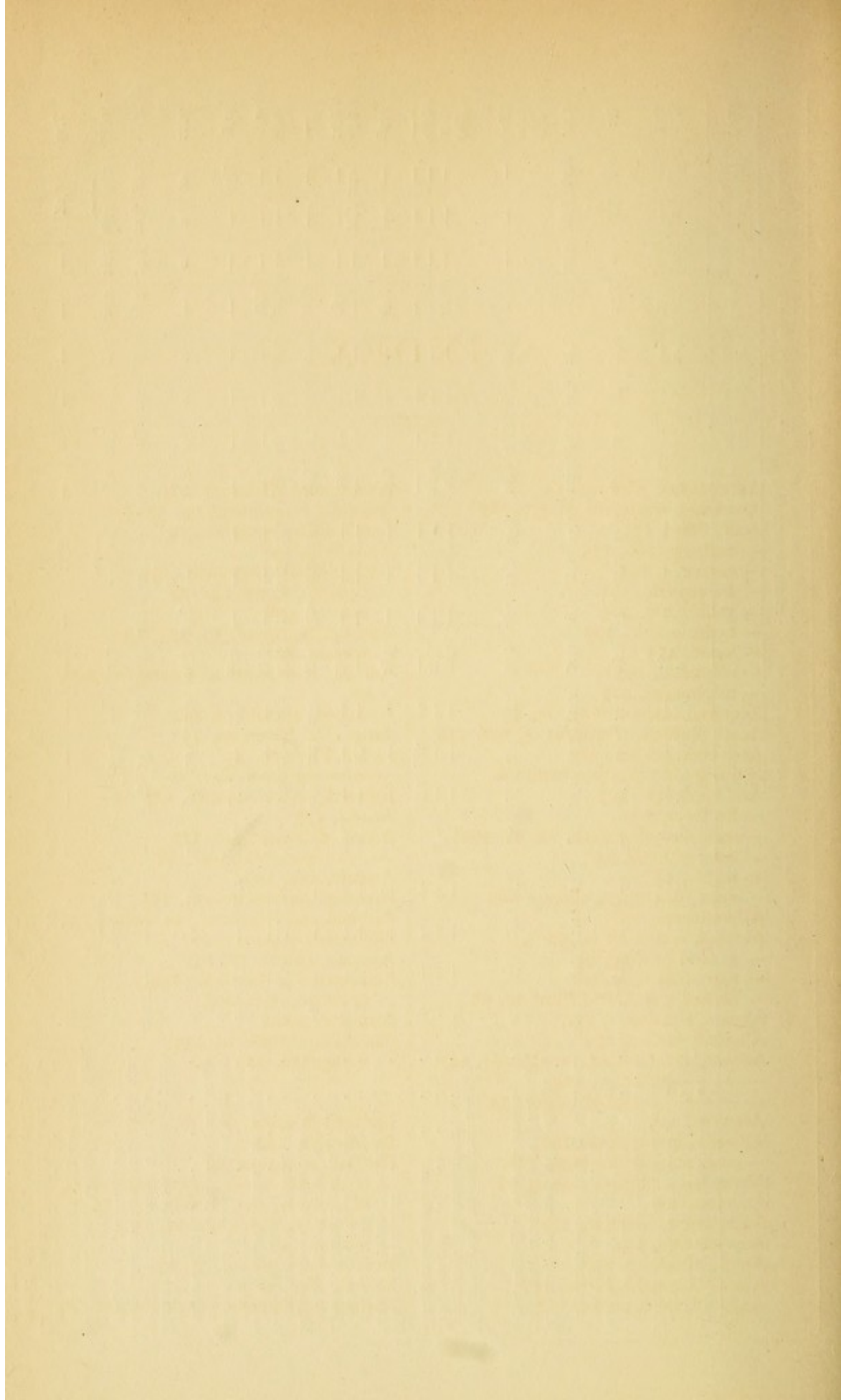
Rooms which are occasionally occupied by consumptives should be very freely ventilated every day, and kept thoroughly clean ; they should be thoroughly cleansed as above described at least twice a year.

The Corporation have adequate arrangements for disinfection, &c. The regulations and tariff can be obtained at the office of the Sanitary Inspector.

TABLE SHOWING THE PROPORTIONS OF RECOVERY FROM, OR IMPROVEMENT IN, PHTHISIS UNDER NON-CLIMATIC AND CLIMATIC TREATMENT

	No. of cases	Arrest or cure			Much improvement, or distinct relief			Relief, some improvement, or stationary			No relief or worse			Death		
		1st stage	2nd stage	3rd stage	Total	1st stage	2nd stage	3rd stage	Total	1st stage	2nd stage	3rd stage	Total	1st stage	2nd stage	Total
<i>First Brompton Report</i> .—1st stage, 187; 2nd stage, 53; 3rd stage, 295. <i>Second Brompton Report</i>	535	9.6	3.7	3.3	5.6	40.0	26.4	14.9	22.8	45.4	58.4	26.3	36.0	4.2	5.6	22.3
Pollock, Brompton: chronic, 1st stage, 286; chronic, 2nd stage, 149; chronic, 3rd stage, 206	6,001	—	—	—	4.1	—	—	—	15	—	—	—	49.5	—	—	12.8
Williams, 1st stage, 611; 2nd stage, 102; 3rd stage, 138. This includes 235 cases who had change of climate	641	—	—	—	—	29.3	26.8	19.4	25.6	48.9	42.2	44.6	46.1	21.6	27.5	33.0
Williams, 235 cases with change of climate. 1st stage, 147; 2nd stage, 51; 3rd stage, 37. Results known	921	4.8	1.1	1.4	3.6	30.1	30.8	31.1	30.2	9.9	7.5	18.1	10.6	38.1	32.5	17.3
Williams, 700 patients remaining in England. Results known	235	5.4	3.9	5.4	5.0	37.4	45.0	35.1	38.7	13.6	11.7	18.9	14.0	43.5	29.2	40.5
Flint, various	—	—	—	—	3.1	—	—	—	27.0	—	—	—	9.8	—	—	—
Champouillon, various	74	—	—	—	12.1	—	—	—	17.5	—	—	—	25.6	—	—	—
—	78	—	—	—	—	38.0	35.0	—	—	—	—	—	—	—	—	—
—	100	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Hameau, Arcachon	110	—	—	—	7.2	—	—	—	13.6	—	—	—	38.1	—	—	—
Bottini, Mentone: 1st stage, 56; 2nd stage, 36; 3rd stage, 33	125	55.3	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Riviera, collected by Sparks	1,930	—	—	—	26.6	—	22.2	—	—	—	—	—	—	—	—	—
Riviera, Weber: 1st stage, 36; 2nd stage, 15; 3rd stage, 12	63	—	—	—	—	61.1	40.0	16.6	47.6	8.0	20.0	60.0	17.5	30.0	40.0	50.0
High altitudes, Weber: 1st stage, 50; 2nd stage, 18; 3rd stage, 7	75	34.0	5.5	—	24.5	42.0	27.7	42.3	88.6	?	16.6	14.2	25.3	24	50	42.8
Spengler, Davos	342	—	—	—	21.3	—	—	—	55.5	—	—	—	—	—	—	15.7
C. T. Williams, Davos: 1st stage, 15; 3rd stage, 7	22	66.6	—	14.2	50.0	33.3	—	57.1	49.0	—	—	—	—	—	—	—
Clifford Allbutt, Davos: 1st stage, 22; 2nd stage, 2; 3rd stage, 20; stage uncertain, 18	44	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Denison, Colorado: 1st stage, 75; 2nd stage, 42; 3rd stage, 85	62	54.5	—	10	22.5	9.0	100	20.0	14.5	36.3	—	50	48.3	0	0	0
Lund, Madeira: 1st stage, 48; 2nd stage, 24; 3rd stage, 28	202	—	—	—	—	85.3	38	17.7	64.3	14	42.8	45.8	38.1	1.3	18.6	36.4
Mittermaier and Goldschmidt, Madeira: 1st stage, 37; 2nd and 3rd stage, 244	100	77.1	20.8	17.8	47.0	—	16.6	—	4.0	—	—	10.7	3.0	12.5	16.6	7.1
C. T. Williams, English Health Resorts: 1st stage, 140; 2nd stage, 35; 3rd stage, 53	281	100	33.1	34	41.6	—	—	—	—	—	15.9	—	—	—	—	—
—	228	—	—	—	—	41.4	40.0	35.3	39.8	22.8	8.5	29.4	22.1	35.7	51.4	35.3

The letters in italics are intended to facilitate reference to the notes to this table, made by Dr. Wilson-Fox in his 'Treatise on Diseases of the Lungs and Pleura' (pp. 902-3). These notes are here omitted for want of space.



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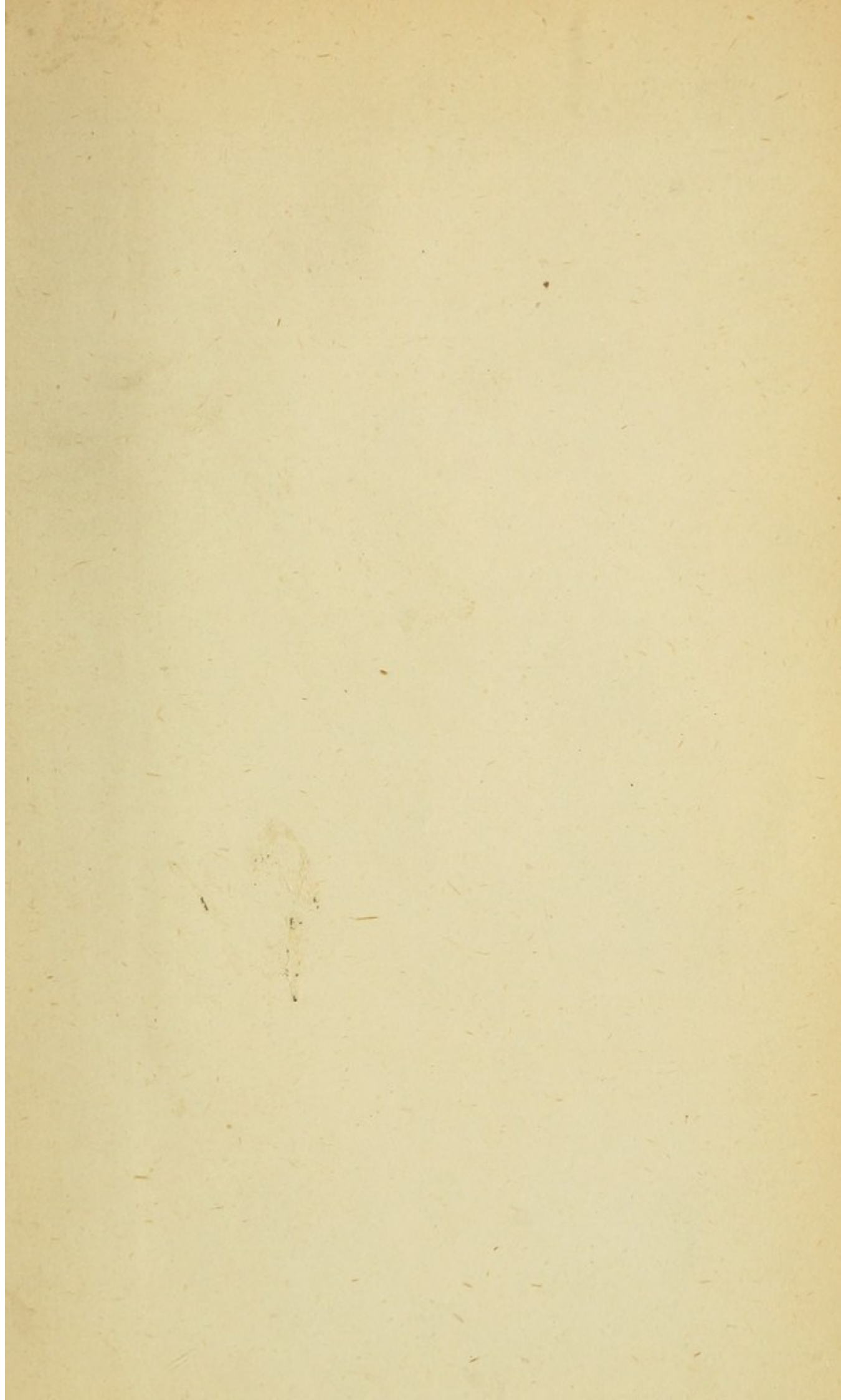
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