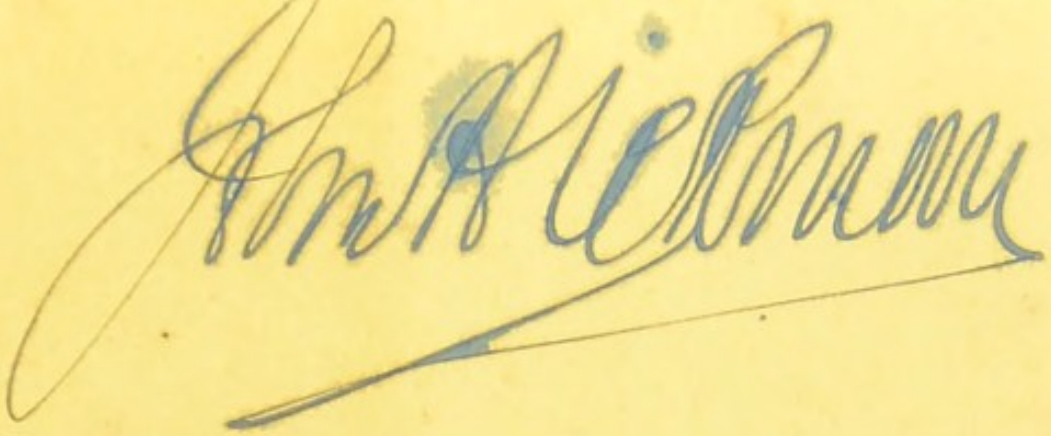
On the use of perchloride of iron and other chalybeate salts in the treatment of consumption : being a clinical inquiry into their physiological action and therapeutic properties with a chapter on hygiene / by James Jones.



THE USE OF

PERCHLORIDE OF IRON

IN

CONSUMPTION.

ON THE USE OF

PERCHLORIDE OF IRON

AND

OTHER CHALYBEATE SALTS

IN THE TREATMENT OF

CONSUMPTION:

BEING A CLINICAL INQUIRY INTO THEIR PHYSIOLOGICAL ACTION AND THERAPEUTIC PROPERTIES.

WITH A CHAPTER ON

HYGIENE.

BY

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ἡ γὰρ ψυχὴ πάσης σαρκὸς αἷμα.—LEVIT. xvii. 11. *Septuagint.*

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PREFACE.

At a time when so many works on the nature and treatment of Consumption are in the hands of the profession, some explanation may be thought necessary, on my part, for adding another, albeit a small one, to that goodly number. I would observe, therefore, that my little work is not intended to take the place of any, but rather to be supplementary to all.

Convinced by clinical experience that cod-liver oil, however inestimable its value, is insufficient to meet all the requirements of the phthisical constitution, and believing that iron is, from its properties and physiological action, capable of supplying that deficiency, I have taken advantage of the opportunities which I possess of clinically testing its therapeutic power, with the hope of assigning to it its proper place in the materia medica for Consumption. The results of these experiments were so satisfactory in support of this view as to justify me in laying them before the profession.

In advocating the use of iron in Consumption, I, of

course, make no pretension to the introduction of a new medicine, for iron has always been a favourite remedy for that disorder. The only claim of novelty, on this point, which I make, is in the mode of its administration; in pointing out, with more precision than has hitherto been attempted, its true use, and the causes of its failure.

My readers will pardon the introduction of a good deal of familiar matter, it being necessary to give completion to the subject. I would also impress upon them, whatever judgment they may form of the theoretical portions of this work, that the facts, from which the conclusions have been drawn and the tables constructed, were collected with a rigorous regard to accuracy. The cases enumerated are those only which came publicly under my care at the Metropolitan Free Hospital and at the Infirmary for Consumption.

A considerable portion of this treatise has already appeared, in a condensed form, in the "Medical Times and Gazette."

26, Woburn Place, W. C.,
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CHAPTER I.

INTRODUCTORY.

Phthisis, or Consumption, are terms so closely associated with the idea of the presence of tubercle in the lung as to make them objectionable for the indication of a constitutional malady, which may begin, progress, and end in death without the presence of any pulmonary affection whatever.

But these names being so generally accepted as indicating the most common physical lesion which attends the constitutional dyscrasia, it will be most convenient to retain them in that connexion. I shall, however, use the terms tubercular or phthisical cachexia, or dyscrasia, to indicate the constitutional condition preceding and attending on the presence of tubercle.

The recognition of a condition of the constitution tending to the development of pulmonary phthisis is

as old as the knowledge of the disease itself, but we are indebted to modern pathology for a cognizance of the fact that a disordered condition of the system, definite in its character, although uncertain in its duration, always precedes the formation of tubercle, and constitutes a necessary stage of that disease.

CHAPTER II.

DIVISION INTO STAGES.

For the purposes of treatment the following division is suggested:—

1st Stage. The constitutional condition of ill-health which precedes the formation of tubercle.

2nd Stage. The exudative stage, or that in which tubercle is formed.

3rd Stage. The expulsive stage, or that in which the tubercle softens and is expelled.

This division, like all others, must be accepted as an approximation to accuracy, for the various stages are often so intermixed and intercurrent that no strictly correct division can be made. Thus the stages of deposition of tubercle, and of softening and expulsion, may be proceeding simultaneously in different parts of either or both lungs, and the stage first mentioned is not necessarily succeeded by the second, but may run on so as to constitute the whole disease, a condition known as latent phthisis. It is only for the purposes of treatment that any division becomes useful, but

for this purpose its utility is obvious, and especially so is the recognition of the pretubercular cachexia as a stage of the disorder. The term pretubercular may appear objectionable when used to indicate a condition which may continue after tubercle has been formed; but inasmuch as its relation in such circumstances is not to the tubercle already, but to that which is about to be deposited in another part, it is sufficiently indicative and applicable.

FIRST, OR PRETUBERCULAR STAGE.

The recognition of this stage is a matter of paramount importance, as it is that in which treatment may be adopted with a good prospect of effecting a cure. Without in any way undervaluing the curative power of drugs, aided by a proper system of hygienic management, in the second and third stages of the disease, it must be acknowledged that the arrest of the disease and restoration to a certain plane of health, which oftentimes reward our efforts, is not a *perfect* cure; for, even granting that the tubercular deposit is got rid of either by absorption or by expectoration, still an amount of physical injury has been sustained by a portion of the lung or other organ which unfits it for a resumption of its functions, and to that extent the term cure must be accepted in a qualified sense. Not so, however, in the first stage of the disorder. In this stage the structures have, as yet, sustained no injury

beyond that which results from imperfect nutrition. They preserve their integrity, although reduced in vigour, and they may, by the establishment of a vigorous nutrition, be restored to *perfect health*.

EXAMPLES OF TUBERCULAR CACHEXIA.

In the subjects of this constitutional cachexia, the attack of phthisis frequently begins with cough and irritation of the air passages, attended with low, or adynamic fever. The symptoms are not unlike those of ordinary catarrh, but the excessive watery discharge from the nostrils and eyes is seldom present. There are occasional chills, followed by flushing and perspiration, but not to any great degree. The pulse is quick and weak. The cough, at first dry and hacking, soon becomes attended with a semi-transparent, mucilaginous-looking expectoration. These symptoms, it will be seen, closely resemble those of an ordinary catarrhal cold, and, in truth, they are what they seem to be, but they are something more, inasmuch as they are modified by a tubercular diathesis—a pre-existing condition of constitutional dyscrasia. Thus, two persons shall be exposed to the exciting causes of an attack of catarrh, or ordinary cold, and each contracts the disease. In the one it runs its ordinary course, and soon subsides; in the other the attack appears to be prolonged; the symptoms continue; the cough, expectoration, chills, heats, and perspirations not only do not cease, but not uncommonly increase in severity.

The patient grows weaker and loses flesh. After a while blood appears in the expectoration, and, on examination, tubercular deposit is found in the apex of one or both lungs. The disease is now phthisis in one of its acute forms.

Here we have two persons suffering from the same disease, produced by exposure to the same cause; the one of a healthy constitution, the other cachectic. The first recovers his usual health, the other lapses into phthisis. It is evident, therefore, that a condition of non-health existed, which required but the addition of a disturbing element to induce the deposition of tubercle in the lung.

Again, take another example. Several young girls, from the ages of fourteen to eighteen or nineteen, are schoolfellows. The dietary is bad, or insufficient for growing persons; the dormitory is ill-ventilated and over-crowded. Some of the girls maintain a fair amount of health under these unfavourable circumstances; others are, after a longer or shorter period, found to fail in health, and, although not decidedly ill, are not in a state of vigour. They continue at school until the completion of their education. Their parents attribute the failing health to too rapid growth and to close confinement to study, and look forward to its restoration when the education shall have been completed. On the arrival of that period means are liberally used for "recruiting their health;" they are taken to watering places, the diet is managed with care, and all available resources are tried, but with-

out effect; *phthisis* is slowly and steadily at work, soon to be recognised by the appearance of its well-known symptoms.

Here we have two classes of constitutions exposed to the same noxious influences. In the one no permanent injury follows, in the other the health fails, and, after a time, tubercle begins to be formed, the amount of vital energy being insufficient for the maintenance of a condition of health under the unfavourable circumstances in which they are placed. The one is healthy and vigorous, the other the subject of dyscrasia.

Such illustrations might be multiplied, but the above will exemplify what I wish to be understood by the term tubercular cachexia, or pretubercular stage.

There is, then, a condition of system, inherited or acquired, during which the presence of unfavourable circumstances, incapable of effecting any permanent injury on a healthy person, may, after a longer or shorter time, excite the deposition of tubercle. To arrive at a correct knowledge of the symptoms and pathology of this condition is a matter of very great importance.

The features of this state most prominently manifest are a general failure of bodily energy; incapability of undergoing the amount of fatigue ordinarily endurable by persons in health. Perspiration is easily induced; the heart's action readily excited. There is greater susceptibility to the influence of atmospheric changes, and sudden alterations of temperature. The muscles

are soft and flabby; the skin thin, the veins more transparent than normal, showing the blood through their coats: in a word, a condition of the system manifestly resulting from imperfect nutrition; a failure of *metamorphic action, both constructive* and destructive, and apparently nothing more.*

* I have, in this sketch, confined myself to those features which I consider to be sufficient to indicate a failure of nutrition.

CHAPTER III.

CAUSES OF IMPERFECTION IN NUTRITION.

In the investigation of the conditions on which this failure of nutrition depends, our attention is naturally directed to the state of the blood, as the fluid which supplies the materials of nutrition to the various structures, conveys oxygen to every part, and gives transit to effete matter to the eliminatory organs. It is evident that mal-nutrition must depend on one or more of three causes. 1st, An imperfect condition of the blood; 2nd, a diminution of the supply of blood; 3rd, inability on the part of the structures to draw nourishment from the blood. But as the two latter conditions may be, and often are, results of the first, the nature of this imperfect condition of the blood, and its mode of influence on nutrition, must be the first subject of investigation.

FIRST CAUSE OF MAL-NUTRITION.

The blood may be described as consisting of two proximate elements; 1, *organized* corpuscles; and, 2,

an *unorganized* saline fibro-albuminous fluid—the liquor sanguinis. The corpuscles are the vital or living part of the blood, there being no life where there is no organization. The fluid part, or liquor sanguinis, holds in solution the plasma from which the structures are formed, but is not itself organized or living. In health there is a pretty constant correlation of these elements or parts. The degree of vital force is in direct relation to the amount and perfection of the organized or vital part of the blood—the red corpuscles. When these abound, there is, as a general rule, great constitutional vigour; but when they are reduced much below their normal proportion, there is languor, lassitude, and weakness; in a word, the condition of atrophy, or imperfect nutrition.

We shall now examine the manner in which a deficiency of red corpuscles in the blood influences nutrition.

First, with reference to the supply of nutritive material. On this point little is really known. When, however, we consider the remarkable analogy which exists between the muscular juice and the red corpuscles of the blood in their chemical composition, it seems reasonable to infer that the latter are in some way subservient to the nutrition of muscle. In the muscular juice, as in the red corpuscles of the blood, the potash salts and phosphates preponderate over the soda salts and chlorides; whereas in the liquor sanguinis the latter are greatly in excess of the former. This correspondence of the constituent saline elements

of the red corpuscles of the blood and the muscular juice cannot reasonably be understood as a casual coincidence; and when we consider the highly elaborated structure of muscle, and the fact that it is the only structure in the body whose colour resembles the blood corpuscles, the existence of some relation between muscle and the red corpuscles is not an unreasonable conjecture. It is not improbable that one of the functions of the red globules is the elaboration of fibrin. Lehmann (Phys. Chem., vol. ii., p. 278) says—"As far as we are at present able to form an opinion on this subject, we think we shall not be deviating very widely from the truth, if we regard the blood-cells as organs; that is to say, as laboratories in which the individual constituents of the plasma are prepared for the higher function of aiding in the formation and reproduction of the tissues."

Secondly, with reference to the vection of oxygen to the capillaries. The necessity of a constant supply of oxygen for the due performance of the functions of nutrition is unquestionable. The agency of oxygen appears to be necessary, both for constructive and destructive metamorphosis. Most of the solid constituents of the body contain more oxygen than the protein bodies from which they are formed; it is therefore to be inferred that the oxygen introduced into the blood in the lungs takes an active part in converting fibrin, albumen, &c., into the various structures. Of the individual steps of the process, however, we know but little.

The action of oxygen in the destructive metamorphosis can be more definitely traced. The conversion of the hydrocarbons into carbonic acid and water—the formation of urea from either albumen or the effete nitrogenous structures, are proved to depend on the agency of oxygen conveyed by the blood. In a paper of this kind, having for its object the examination of the utility of a particular mode of treating phthisis, it is unnecessary to enter on the details of the changes which take place in the system through the agency of oxygen. I shall therefore merely state the well-ascertained fact, that the capacity of blood for oxygen, and its ability to convey it, are in direct ratio to the amount of red corpuscles which it contains. It has been proved, by the experiments of Magnus, that the liquor sanguinis has but little, if any, greater capacity for oxygen than water; whereas defibrinated blood, which contains nearly the whole of the corpuscles, is capable of absorbing from 10 to 13 per cent. of oxygen. Dr. Harley, "On the Condition of the Oxygen Absorbed into the Blood during Respiration," (Proc. of Royal Soc., vol. viii., p. 82) has shown, by direct experiment, that hæmatin is capable of absorbing a large amount of oxygen. The question as to how the oxygen enters into combination with the red corpuscles, whether the union be chemical or mechanical, it is not necessary to enter on. It is sufficient, for the purpose of my argument, to show that it is a well-proved fact that the vection of oxygen, in sufficient quantity for the necessities of a healthy

metamorphosis, depends on the presence of a normal amount of red corpuscles.

It is evident therefore that a deficiency of corpuscles, being attended with a corresponding decrease in the supply of oxygen, the deposition of new material, the removal of the old, and the production of animal heat, must be proportionally impaired. From this state of things must result a weak and imperfect condition of the system, a low tone of health, a deficiency of vigour, and an incapacity for the perfect performance of the functions of life. The body is, as it were, badly built up, the structures imperfect, and the vital powers below the standard of health.

The average quantity of oxygen inhaled by a healthy man, under the influence of an ordinary amount of exercise, is probably about twenty-four ounces in twenty-four hours; a fact sufficiently significant of the importance of maintaining a large amount of red corpuscles for its vection.

EFFECT OF DEFICIENCY OF RED CORPUSCLES ON ANIMAL HEAT.

The production of animal heat is so closely connected with nutrition, that we may here notice the effect of a diminution in the numbers of the red corpuscles on that function. The heat-generating power is now known to depend on a process of oxidization of certain materials of the body which takes place both in the blood and in the various structures. It was supposed by Lavoisier that animal heat was a direct consequence of

respiration; but G. Von Liebig has shown that the blood is 0·2° lower in temperature in the left than in the right side of the heart, consequently that it is actually cooled in passing through the lungs; the amount of heat liberated by the absorption of oxygen being more than counterbalanced by the heat rendered latent and withdrawn by the exhalation of carbonic acid and watery vapour from the lungs. The experiments of Dr. Harley, before alluded to, prove that the formation of carbonic acid, and consequently the production of heat, is a function of the red corpuscles. Lehmann has demonstrated by positive experiments that free carbonic acid may be extracted by the air-pump from every living structure. In insects, a class of beings having no true blood, nor blood-vessels, except the dorsal, carbonic acid is formed by direct contact of oxygen with the tissues by means of the tracheæ, which ramify in every direction.

In man, and in the higher animals, the red corpuscles of the blood act as the carriers of oxygen to every structure and tissue of the body, and on them alone depends the necessary supply of that element, without which the vital processes cannot go on, nor animal heat be maintained. The importance, therefore, of maintaining, as far as we are able, an abundance of blood corpuscles is as evident in reference to the production of animal heat, and the continuance of a healthy temperature, as for the nutrition of the body.

CAUSES OF DETERIORATION OF THE BLOOD.

Having thus briefly sketched the modes in which a degenerate condition of the blood exercises its influence on nutrition, and the various forms of metamorphosis, the next subject for inquiry is the causes of this vitiation in its constitution.

The blood may be rendered poor in corpuscles and solid elements, or its various constituent parts may be deteriorated, by—

1st. A deficiency of materials, arising from an insufficient supply of proper food, want of light and pure air, from wasting discharges, and imperfect digestion.

2ndly. Defects of innervation, consequent on over-anxiety, depressing passions, and mental wear and tear, want of sufficient sleep, exposure to cold and wet.

3rdly. The toxic effects of foul air, checked exhalations, and the retention of effete matter, the introduction of animal and other poisons from without, or the generation of poisons within the system.

The question whether the blood contains within itself all the elements necessary for the production of new red corpuscles, and the power of generating them, or whether the genesis of the blood, and especially its morphological elements, is accomplished by the lymphatic glands, the spleen, or other organs, however interesting in a physiological point of view, in no way affects the correctness of these remarks.

There is good reason for supposing that in all

diseases there is a diminution in the number of red corpuscles. In acute disease, running a short course, this diminution is not very observable. In chronic disease it is always manifest. The condition of hyperæmia is not disease; it is healthy nutrition in excess.

SECOND AND THIRD CAUSES OF MAL-NUTRITION.

With reference to the second cause assigned for mal-nutrition—the insufficiency of the blood supply—it is almost superfluous to make any remarks. It is evident that it may result from either a physical obstruction to the current of the blood, or from a deficiency in the quantity of that fluid with reference to the requirements of the system. The first cause is in phthisis usually local, and the obstruction generally arises from the pressure of tubercle acting either directly, or, as not unfrequently happens, indirectly, by its disorganizing effects on the adjoining structures. The deficiency in the whole mass of blood in circulation is, I believe, a constant result of the cachexia of tuberculosis. Its effect on the general nutrition is obvious.

With regard to the third cause of mal-nutrition, the inability on the part of the structures to assimilate the supply of nourishment afforded by the blood, nothing positive is known. How each organ accomplishes the appropriation of the materials suited to its nutrition is a question still unanswered; but the fact that such a power exists is sufficiently evident, and its converse logically inferable.

CHAPTER IV.

PATHOLOGY OF PHTHISIS.

PHTHISIS, viewed as a constitutional malady, is eminently a condition of debility—a negation of vital energy rather than an erroneous or abnormal action. Its essence consists in a deficiency of power consequent on a defective tonicity—the result of imperfect rather than of disordered nutrition; a condition of non-health rather than a disease; a result of imperfect and not of abnormal metamorphosis. Its products are in their constitution corroborative of this view of its nature; they consist of imperfectly developed normal elements. Thus, tubercle in its most frequent form is but a normal cell-growth imperfectly developed. It passes through its phases of growth, maturity, and decay in an imperfect manner, and not assuming any abnormal form, such as might result from a disordered activity, but simply an imperfection of development. The characters of inflammatory action also are different in phthisis from those of a healthy subject. The inflammation is adynamic, and its products are incapable of assuming a degree of organization usual in, so to speak,

healthy inflammation. The latter are capable of assuming a vital organization sufficient for their existence for an indefinite period; the former either take the form of tubercle, or of a product of low vitality incapable of prolonged existence, and rapidly tending to degeneration into tubercle or pus. To investigate the cause of this condition, whether in every instance of the phthisical dyscrasia there be an original deficiency of vital power transmitted from one or both parents, or whether, in a person born free from any such defect, this condition may be induced by unfavourable circumstances, would be, in the present state of pathological knowledge, a hopeless task. My own observations lead me to accept the latter as not unfrequently occurring. In such an investigation one would probably take the blood which is defective in one or more of its elements as a starting point, and proceed in a retrograde direction, through the lacteals, and the lymphatics with their glands, and through the various stages of digestion of food and drink from the mouth to the rectum, examining the condition of every gland or secreting apparatus in connexion with them, to the analysis of the food we eat and the air we breathe. It is to be hoped that this herculean task may be accomplished at some future time by the union in one comprehensive whole of the many facts observed by independent investigators, which now appear isolated and useless, but which, nevertheless, are links in a chain, each of which, however small, is necessary for its completion. Until that time shall have arrived, we must be content with the exponents which we

possess of the causes of the imperfect nutrition of which tuberculosis is the expression.

In examining the relation of the proximate elements of the blood to the phenomena of constructive and destructive metamorphosis, we have seen that a deficiency of red corpuscles is incompatible with a perfect nutrition. The next point for inquiry is whether there is in phthisis such a deficiency. That such is the condition of the blood in that disease is shown—1st. By direct evidence. The blood taken from the arm in phthisis is always characterized by the small size and great firmness of the clot. I have satisfied myself on this point by actual experiment on the blood in the various stages of phthisis, and in the different temperaments. 2ndly. By indirect evidence. The imperfect performance of the functions of respiration, as manifested in the natural history and the symptoms of that disease.

The florid colour of the cheeks and lips in many phthisical persons, which has induced some writers to divide phthisis into the florid and the languid forms—a useless, and perhaps even an injurious distinction—is no evidence of the abundance of red corpuscles. It is a proof of the opposite condition, and is the result of the thin, and therefore semi-transparent condition of the vessels consequent on the atrophy of their tissues, the colour of the blood showing through them. In those who have dark or sallow, and therefore opaque skin, the pallor of phthisis is well marked.

In 207 cases of phthisis in which the character of the complexion was noted, 189 were *fair*, and 98 were *dark*. In 221 cases, 196 were *pale*, and more or less anæmic in aspect, and 25 were *florid*.

Viewing phthisis, or the consumptive dyscrasia, through its *physiological manifestations*, it appears to be a condition of constitution, inherited or acquired, in which the various functions of organic life are feebly and imperfectly performed. It is not the result of a new and abnormal action set up in the system, but the insufficient performance of normal functions The physical structures, feebly built up, are defective in vigour and energy. Without being abnormal in their anatomical or histological details, they are imperfect as to their vigour and capacity for action. The muscles, although sometimes capable of powerful action for a brief period, are easily fatigued and incapable of prolonged exertion. The nerves, although capable of transmitting the most delicate impressions; the brain and nerves of special sense, although organized for the reception of the most refined sensations, are unable to exercise their functions for more than a brief period without rest. They soon become wearied, and require relaxation.

The digestive organs are easily deranged, the secretions of the gastric and intestinal glands are often disordered, as we see evinced in the excess of acid, the pyrosis and water-brash, and the frequently capricious appetite. The mucous membranes are frequently disordered by causes which would be inoperative in health.

Diarrhœa is easily induced by improper food, and constipation from a weakened state of the intestinal muscles. The badly nourished skin is readily excited to pour out its simple secretion in unnatural profusion.

In its pathological phenomena, there is evidence of a like feeble and imperfect action. Thus inflammation in the phthisical constitution differs from that which occurs in a healthy system. Its products in the one case are low in type, and to a great extent incapable of organization; in the other, they are fully capable of becoming organized, and of forming a living addition to the body—a new and vital structure. The term inflammation is perhaps not strictly applicable to the phenomena in phthisis to which that term is generally applied, so entirely do they differ from those of inflammation in healthy subjects. It may, however, be convenient to retain it. It is true the plasma exuded is capable of organization so far as to act as a bond of union between contiguous surfaces—as is seen in the pleuritis and peritonitis of phthisis—but the organization is imperfect, and tubercle is often formed contemporaneously with the plasma, or is soon developed in it by a process of degradation.

But the chief and all-important phenomenon of the phthisical constitution is the production of tubercle. The condition of dyscrasia may exist for an indefinite period without the occurrence of this formation, for tubercle is not a necessary consequence of it. When, however, any disturbing cause comes into operation, such as would in a healthy person give rise to in-

flammation, or to an increase of cell genesis on a free secreting surface, then, instead of the exudation of plastic lymph in the one case, or of an excessive but normal cell-growth in the other, there is a formation of tubercle.

This leads to the question of the nature and origin of tubercle. *Tubercle* occurs in *two forms—the grey*, which is found chiefly in the parenchyma of organs, and *the yellow*, or *soft tubercle*, the chief seat of which is the free surface of the air-cells and capillary bronchi, the intestinal gland structures, and other eliminating organs which have outlets from the body.

These two forms, although arising from the same constitutional cause, are not identical in their nature. The grey or crude tubercle is probably always the result of a quasi-inflammatory action. It is, in fact, a low or debased form of what would in a healthy person have been the ordinary exudation plasma which occurs in inflammation ; it is a debased or imperfect product of an imperfect inflammatory action. The yellow or soft tubercle, on the other hand, is a degenerate cell-growth, on the free surface of the air-cells or other organs lined by epithelium. This degeneration from a normal cell-growth may be the result of the disturbing influence of a low or quasi-inflammatory action excited in the part by any cause, or of the irritation produced by the transit of effete matter through those structures in the act of its elimination. We see a somewhat analogous action on the epithelial cells of the urinary tubules, in the desquamative nephritis after scarlatina.

It is worthy of notice that the favourite locality of yellow tubercle is where there is a supply of highly impure venous blood, as in the lungs and intestines.

Thus there appear to be *two kinds of tubercle:* the one a form of imperfect plasma, the result of a quasi-inflammatory action; the other a degenerate cell-growth on the free surface of tubes or cavities communicating with the external air, resulting either from the like imperfect inflammatory action, or from a state of irritation closely allied to it, and produced by effete matter in the process of its elimination.

SUMMARY.

1st. The constitutional condition which precedes the formation of tubercle—which is described as phthisical cachexia, or tubercular dyscrasia—is a negation of health rather than a state of actual disease; no abnormal elements yet exist, no *new* and strange products are yet formed. It is simply a condition in which all the phenomena of healthy action are performed, but insufficiently, and without due energy. This condition of non-health may continue for an indefinite time, and is not necessarily followed by the formation of tubercle.

2nd. That in tubercular dyscrasia the blood is found to be deficient in at least one of its elements—the red corpuscles. These little organs, having certain functions to perform, the system suffers from their diminution in numbers, and the consequent defect in the performance of those functions. The functions of the red

corpuscles are probably twofold: first, the elaboration of nutritive material, and secondly, the vection of oxygen. The first, although as yet but hypothetical, is highly probable; the second is a well-established fact.

3rd. That owing to the deficient supply of oxygen consequent on the diminished numbers of red corpuscles, the oxygen carriers, the process of metamorphosis is imperfect. Metamorphosis and vital force being convertible terms, the amount of the latter is, *cæteris paribus*, in direct proportion to the sum of the red corpuscles up to the normal standard.

4th. That in the condition of tubercular cachexia the phenomena of inflammation differ from those which occur in the inflammation usual in healthy persons. The type is asthenic, and the products are aplastic, or at least indisposed for organization. That one of the products of this quasi-inflammation is the crude or grey tubercle which is usually found in the parenchyma of organs. That the yellow, or soft tubercle, may also be traced to a like cause, or to an allied condition of irritation, produced by the presence of effete matter in the blood and carried to the seat of the tubercular formation, for the purpose of elimination. That this latter form of tubercle is found on the free surface of cavities opening externally, as the air-cells, bronchi, intestinal glands, &c. That thus we find *two forms of tubercle*, the one the imperfect plasma of an imperfect inflammatory action, the other a degenerate cell-growth on a free excreting surface. That in neither form of tubercle can we find any new material, or new combination of

elements, but simply imperfect development of normal products.

5th. That viewing phthisis and tubercular dyscrasia as a condition of imperfect metamorphosis dependent on a deficiency of red corpuscles, and perhaps other elements of the blood—the restoration or establishment of a healthy condition of that fluid, by a supply of the materials necessary for the development of those elements, is the mode which reason indicates for its cure.

6th. That the principal, if not the only, absent element of the blood being that which forms the contents of the red corpuscles, hæmatin and hæmato-crystalline, our efforts should be directed to the supply of those elements.

7th. That iron in some form being an indispensable constituent of hæmatin, its employment as a blood-food is clearly indicated.

8th. That the recognition of the early manifestations of phthisis, which I have ventured to call its first stage—the state of tubercular dyscrasia—is of very great importance, as being the only stage admitting of *perfect cure*. That the restoration to health which occurs in the *second stage* of my division, when tubercle has been formed, must always be attended with some lesion of the lung, and consequently be imperfect; but that that which follows the stage of softening and expulsion, or the third stage, is very imperfect, inasmuch as a portion of lung must necessarily be lost.

CHAPTER V.

ON IRON AS A REMEDY IN CONSUMPTION.

My object in reviewing the pathology of phthisical dyscrasia is to show the constitutional necessity which exists in that state for the use of those agents which assist in developing a healthy sanguification, and to point out the principles on which the use of iron, a necessary element in that process, is recommended.

I will now endeavour to show how far the action of iron in other, and to some extent analogous diseases, supports this position, and then conclude with a statement of the results of an extensive experimental inquiry into its curative powers in consumption.

EFFECTS OF IRON IN DISEASES ANALOGOUS TO PHTHISIS.

Chlorosis.—In the condition of anæmia co-existing with disorder of the uterine functions in young females the administration of iron is found to restore the blood to a healthy state. Under its influence the pallid cheeks, lips, and gums recover their healthy appearance; the feeling of languor ceases, and the vigour and buoyancy

of spirits natural to that period of life return, and the uterine functions regain their healthy state. In this well-known and familiar disorder we have a striking example of the power possessed by iron on the genesis of red corpuscles in the blood. In these cases no other agent than iron is necessary to recovery; there is, from some cause, an insufficient production of red corpuscles, some element necessary for their growth is absent, or in insufficient quantity; that element appears to be iron, for, on its exhibition, the production of corpuscles proceeds with normal energy. That iron alone is required, is evident from the fact that on its exhibition, singly and without any other aid,—without any alteration of diet or regimen,—a healthy sanguification is established, and the functional derangements dependent on the condition of anæmia terminate. Here, then, is a disease having in one point, at least, a close analogy to tubercular cachexia. In both these disorders there is a defective process of sanguification, an insufficiency of red corpuscles. It is true that in the anæmia of chlorosis there is not usually a failure of nutrition evinced in a loss of flesh, as in the dyscrasia of phthisis; but the disease, it must be observed, is usually of brief duration, and does not afford sufficient time for any manifest waste of flesh. But in cases protracted by neglect and mismanagement, there is evidence of imperfect nutrition in the flabby muscles and generally relaxed fibre. It is by no means uncommon to find such cases lapse into pulmonary tuberculosis. I have met with instances

when the one followed on the other so closely as to admit of little doubt of the close connexion, if not identity, by continuity, of the two disorders.

In the *tubular desquamation of the kidneys*, so frequent after scarlet fever, and in all forms of nephritic tubular exuviation, we have a condition in some respects analogous to phthisis in its most common form. In both there is an abnormal action of a delicate secreting membrane, in cavities having an external outlet, viz.:—in the air-cells of the lungs in the one, and in the urinary tubules in the other. In both there is abortive cell-growth, and a development of granular matter, &c., requiring expulsion.

In both *phthisis* and *Bright's disease* there is an impoverished condition of the blood, both in relation to its corpuscles and the solid constituents of the serum. In both there is an increase of fat in the blood, in the form of cholesterine. The improvement which takes place in the general health, and in the condition of the kidneys, as is shown by the disappearance of the exuvial casts under the use of perchloride of iron, would warrant the inference that a similar effect would result from its exhibition in the most common of the forms of tubercle, — the yellow, or soft variety, having its seat in the air-cells of the lungs.

In cancer, although broadly differing from phthisis in the malignancy of its action, we have a disease which bears a strong analogy to it in the development of an abnormal cell-growth, and in the attendant condition

of anæmia. In that disease, so intractable to the influence of therapeutic agents, iron has often been found to accomplish so much good, as to lead to the hope that it might prove a remedy for it.

The above examples of the curative influences of iron in diseases characterized by abnormal, or imperfect cell-growth, conjoined with a constitutional dyscrasia, will afford sufficient evidence in support of its use in phthisis.

We shall now take one or two examples of its influence in abnormal action of the capillary blood-vessels.

Purpura, in some of its forms, is cured by the exhibition of the salts of iron, especially by the perchloride. But it is in the effects of the perchloride of iron in *erysipelas* that we have the most convincing evidence of its power in controlling the abnormal action of the capillaries of the skin—a structure which, like the lungs and kidneys, is actively engaged in the functions of elimination. Those who have visited the wards of the Middlesex Hospital must have often witnessed its happy effects in subduing that disease.

Again, in *diphtheria*, the perchloride of iron is found to exercise great curative power; it checks the formation of the diphtheritic exudation, restores a healthy action to the capillaries of the part, and probably assists in the elimination of the toxic element which is assumed to be present in the blood.

These examples will be perhaps sufficient to show the influence exercised by the perchloride of iron in

diseases bearing in some one or more points an analogy to phthisis, and on those functions in the derangement of which the analogy consists.

EXPERIMENTAL TRIAL OF IRON IN CONSUMPTION.

It now remains to show, by the test of experiment, the therapeutic power of iron in tubercular consumption.

Notwithstanding the impossibility of proving, in all cases, the existence of tubercle in its early stage of formation, or even that the condition of ill health preceding its formation is the cachexia of tuberculosis, every physician engaged in the treatment of chest disease will admit that there are many cases in which hereditary predisposition, physical conformation, and a combination of auscultatory signs and general symptoms unite in forming a mass of evidence practically as convincing as actual demonstration. From the study of the influence of perchloride of iron in many such cases, I have deduced what to my mind is a most convincing proof of its power in arresting the development of tubercle, and in altering the constitutional condition which precedes and attends its development.

It is only by the experimental use of a remedy, in a large number of cases, that evidence of its power can, with any degree of certainty, be obtained; but results thus educed possess a high degree of trustworthiness. It is on such grounds that I would advo-

cate the use of preparations of iron, but especially the perchloride, in the treatment of consumption. I have taken advantage of the opportunities afforded me, as one of the physicians to an Infirmary for Consumption, and to a General Hospital at which the attendance of out-patients is very large, to subject the remedy to the test of practical experience. I have used it in all stages of the disease, and under every variety of circumstances, and have carefully watched its effects from week to week. The treatment has extended over periods varying from a few weeks to eighteen months, or longer. I have given it alone, and in conjunction with cod-liver oil. The results of this extensive and protracted trial of its powers have convinced me that iron, but especially the perchloride, possesses highly remedial virtues, and merits great confidence in the treatment of every stage of phthisis. In the early stages of the disease, but more especially in the condition of pre-tubercular dyscrasia, I have found it to be capable of establishing a state of perfect health. In the more advanced stages, even where cavities existed, I have seen numerous recoveries take place under its use; the patients being able to resume their business engagements and occupations, from the performance of which they had long been disabled. Even in the very advanced and hopeless stages, the distressing night-sweats, and the sense of exhaustion and sinking have been to some extent relieved by its use. The following summaries will show the result of the treatment by perchloride of iron alone, and conjointly with

cod-liver oil. The whole number of cases treated on this plan amounted to about five hundred.

Of these, careful notes have been taken of above three hundred cases in which tubercle existed in one or both lungs. Many of the remainder were in the pre-tubercular stage, or the condition of phthisical dyscrasia. I have not attempted to tabulate that division, for obvious reasons. A considerable number of them were the offspring of phthisical parents, or of those in whose blood relations consumption had existed. In the treatment of those cases, the exhibition of perchloride of iron was almost invariably successful in the restoration of health and strength. Of the remainder of the two hundred, my notes are not sufficiently detailed and extensive to allow of their being included in the following Tables, which are therefore constructed from three hundred cases of which notes have been carefully made :—

TABLE I.

Under the use of Perchloride of Iron and Cod-liver Oil.

Health much improved.....	in 120 cases.	Total 200.
,, improved.....	,, 50 ,,	
No improvement	,, 30 ,,	

TABLE II.

Under the use of Perchloride of Iron alone.

Health much improved.....	in 62 cases.	Total 100.
,, improved.....	,, 32 ,,	
No improvement	,, 6 ,,	

In the next, and all succeeding tables in which stages of the disease are mentioned, the usual division—according to the state of the tubercular development—is used, and not the division suggested in the first pages of this paper. I give the number of cases in the second and third stages in one sum, as I consider the usual division into the stages of softening and of expulsion to be practically useless and impossible of demarcation. (See page 34.)

In Tables III. and IV. I have not enumerated any portion as cured, for the reasons I have already stated in page 4, although a considerable number of those under the head of "Much Improved" are to all appearance quite recovered. In those in the first stage of tubercle—before the process of softening had commenced—the progress of recovery was attended by a gradual diminution in the amount of dulness on percussion, and by subsidence of the stethoscopic signs of disordered respiration. The cough and expectoration gradually decreased in severity, and finally ceased; the night-sweats disappeared, and flesh and strength were recovered; the appetite was restored, and the countenance assumed the aspect of health. In the second and third stages, a free expectoration of muco-pus and *débris* of tubercle—in which the curdy yellow fibre was often to be found—preceded, or went on concurrently with improvement in health. On recovery, auscultation revealed the presence of one or more empty cavities, over and around which percussion produced a dull note. In several instances, I have

TABLE III.

Under the use of Iron alone, and in conjunction with Cod-liver Oil.

Much Improved.	Stages.		Improved.	Stages.		No Improvement.	Stages.		Total.
	1st	2nd and 3rd		1st	2nd and 3rd		1st	2nd and 3rd	
Males....	53	52	Males....	17	23	Males....	3	13	161
Females..	44	34	Females..	13	29	Females..	4	15	139
Totals..	97	86	Totals..	30	52	Totals..	7	28	300

TABLE IV.

Ages of Patients treated by Iron alone, and Iron with Cod-liver Oil.

MUCH IMPROVED.

Ages.	Under 20.	20 and under 30.	30 and under 40.	40 and under 50.	50 and under 60.	60 and under 70.	Age not known.
Males	31	38	19	9	5	1	2
Females.....	19	39	13	6	..	..	1
Totals.....	50	77	32	15	5	1	3

IMPROVED.

Ages.	Under 20.	20 and under 30.	30 and under 40.	40 and under 50.	50 and under 60.	60 and under 70.	Age not known.
Males	10	13	8	8	..	..	1
Females.....	8	17	8	4	2	..	3
Totals.....	18	30	16	12	2	..	4

found this dulness gradually to diminish, and finally to become almost imperceptible. Flesh and strength were regained, and cough, expectoration, and night-sweats ceased.*

* Of 300 patients treated by perchloride of iron, with or without cod-liver oil, 143 gained in weight.

CHAPTER VI.

THE SYMPTOMS OF CONSUMPTION AS INDICATING THE USE OF IRON.

I SHALL now consider some of the leading symptoms of phthisis, in order to examine whether, and to what extent, they support the principles on which I have endeavoured to establish the necessity for the administration of iron. It would be foreign to my purpose, in writing this paper, to enter on a complete history of the disease, and a description of its manifold phenomena, my object being merely the establishment of a proposition in the therapeutics of consumption, by showing that the symptoms, taken as exponents of the pathological condition of the system generally, or of some organs especially, are in accordance with the propositions which I have endeavoured to support; and that the effect on those symptoms, of the treatment which I have advocated, is corroborative of the truth of that position. I will take the symptoms without any arrangement, but simply in the order of their prominence or importance. The most prominent symptom, loss of flesh, does not require separate notice.

Dyspepsia of Phthisis.—The imperfection of the physical structure, and the want of tone, or diminution of

vital energy, which constitute the condition of tubercular dyscrasia, prominently manifest themselves, as might be expected, in disorder of the functions of digestion as well as in those of assimilation. It is rare to meet a phthisical person who is not also dyspeptic. Dr. Hughes Bennett, if I understand him aright, considers dyspepsia to be the first of deranged actions constituting phthisis, and a prime agent in the production of that disease. He thus indirectly adds the weight of his experience to show the constancy of its presence in the cases that came under his observation.

The most prominent symptoms of the dyspepsia attending the phthisical dyscrasia are capriciousness of appetite, pain after taking food, acid eructations, and not unfrequently vomiting of acid or tasteless viscid transparent fluid, flatulence, and headache. In a paper on this subject, by Mr. Jonathan Hutchinson, (*Medical Times and Gazette*, Nos. 251 and 253,) it is stated that dislike to fats was a prominent symptom in 71 per cent. of the cases examined by him; a symptom of much significance in its bearing on the rapid absorption of hydrocarbons already stored up in the body.

It is evident, from a consideration of the more prominent symptoms of this form of dyspepsia, that there is an imperfect or vicious elaboration of the fluids engaged in the function of digestion. Now, this condition must depend either on a physical imperfection of the organs concerned in the elaboration of the gastric and intestinal juices, or of the blood which sup-

plies the material for their formation, or on both. It is evident, therefore, that dyspepsia cannot be accepted as the first link in the chain of diseased action, inasmuch as its presence implies an antecedent disorder in the nutrition of structure; and this brings us back to the condition of the blood, as the source from which all organs are formed and all secretions derived. At this point we are forced, in the present state of our knowledge, to make our stand. To the blood we must look for the sources of disordered function, and through it attempt their restoration to health. The empirical treatment of dyspepsia by tonics and alteratives is, perhaps without intending it, a practical acknowledgment that the blood is the seat of the disorder.

Accepting, as I do, the dyspepsia as one of the many forms in which the defective blood, and imperfectly vitalized solids, to which we give the name of tubercular dyscrasia, manifests itself, it appears to me that no treatment is calculated to produce permanent effects in its subjugation but that which addresses itself to the restoration of the blood to its normal condition, both as a carrier of oxygen and a storehouse of plastic material. For the accomplishment of this purpose I have found the exhibition of the perchloride of iron to sustain its character for usefulness. Under its influence the appetite improves, and acid eructations cease to be troublesome. The flatulence which results from the fermentation of the food, consequent on an insufficient supply of pepsine, gradually abates. In a

word, the secretions become more normal, and digestion consequently more perfect. In this disorder, therefore, and in the result of the treatment, we have a further confirmation of the views I have been endeavouring to support.

The facility with which cod-liver oil may be borne, and its action assisted by the use of the perchloride of iron, is worthy of notice. Many persons whose stomachs cannot be made to tolerate its use by any other means, take it easily and without discomfort in combination with the perchloride; and from the steady increase of weight which often follows their conjoint use, the iron would appear in some way to assist its absorption into the circulation. For the immediate relief of urgent symptoms, we have many valuable aids at our disposal. Thus, as a remedy for heartburn or pyrosis, the trisnitrate of bismuth is very trustworthy. For gastric neuralgia, opium is most useful. The treatment of phthisical dyspepsia, so far as the use of local appliances, must be conducted on the same principles as the ordinary forms of that complaint, an account of which may be found in all books on the practice of medicine.

In the following table I have given the results of the use of perchloride of iron on the appetite in 292 cases of which notes have been taken. By first stage I mean that of tubercular formation, and not the pretubercular stage. The second and third stages of authors, *i.e.*, the stages of softening and expulsion, I have combined for reasons before stated.

TABLE V.

APPETITE MUCH IMPROVED.

	Under 20.	20 and under 30.	30 and under 40.	40 and under 50.	50 and under 60.	60 and under 70.	Age not stated	Total.	Stage.
Males.....	23	9	5	1	2	..	..	39	First Stage.
Females	11	15	4	1	..	..	..	31	
Totals....	34	24	9	2	2	..	..	70	

	Under 20.	20 and under 30.	30 and under 40.	40 and under 50.	50 and under 60.	60 and under 70.	Age not stated	Total.	Stages.
Males.....	3	17	9	8	1	1	3	42	Second and third Stages.
Females	4	13	6	4	..	..	..	27	
Totals....	7	30	15	12	1	1	3	69	139

APPETITE IMPROVED.

	Under 20.	20 and under 30.	30 and under 40.	40 and under 50.	50 and under 60.	60 and under 70.	Age not stated	Total.	Stage.
Males.....	5	11	..	..	..	..	..	16	First Stage.
Females	3	9	3	1	7	..	..	23	
Totals....	8	20	3	1	7	..	..	39	

	Under 20.	20 and under 30.	30 and under 40.	40 and under 50.	50 and under 60.	60 and under 70.	Age not stated	Total.	Stages.
Males.....	5	7	7	4	2	..	1	26	Second and third Stages.
Females	6	6	6	1	1	..	1	21	
Totals	11	13	13	5	3	..	2	47	86

NO IMPROVEMENT IN 67 CASES.

INTERCURRENT DISEASES.

The influence of the phthisical dyscrasia in modifying the various diseases which may arise in the course of consumption, and which are distinguished by the name of "Intercurrent diseases," is a subject of great interest, and one calculated to throw much light on the pathology of that disease. In its relation to the subject of this paper, however, one or two remarks only will be necessary. I have already observed that the inflammation, so called, of the phthisical is not attended with the same phenomena as those which occur to healthy persons; its products are different to a wide degree, not in their chemical constitution, but in their organizability. In these it may become an organized addition to the body; in those it is an unorganized excretion; or, if capable of possessing any, it is an imperfect organization, and soon lapses into a lower condition. These phenomena we constantly see examples of in the exudations on serous membranes. The bearing of this condition of the system on the treatment of the quasi-inflammatory intercurrent diseases should always be kept in mind. The use of active depletory measures must be avoided, and those means only resorted to that are calculated to support the strength and prop up the vital powers, which, always feeble, are now suffering from the additional embarrassment of a new disorder. I have given the perchloride of iron in these cases of so-called inflammation with results similar to those which accrue from

its use in erysipelas—the prompt arrest of the disordered action.

PERSPIRATION OF PHTHISIS.

One of the earliest manifestations of the tubercular dyscrasia is the disposition of the skin to exhale moisture on the slightest increase of bodily exercise. A very slight exposure to any of those causes which, in a normal state of health, give rise to a gentle perspiration, will, in the consumptive constitution, produce a profuse sweat.

As the disease progresses, and tubercle becomes deposited, night perspirations frequently come on. With increasing debility they become more distressing, the patient being unable to take even a short sleep without a profuse amount of perspiration setting in. It usually comes on within a few minutes after the patient falls asleep, and continues until he awakes. I have found many patients to use all their efforts to remain awake, through dread of the perspirations which, they know by experience, will be sure to accompany sleep.

In a portion of cases the perspirations are preceded by rigors and a hot stage—in fact the regular phases of intermittent fever. It would naturally be expected that the like regularity of stages would occur in every case, modified, perhaps, by circumstances, but always present; but trusting to the evidence of patients on whose intelligence much reliance may be placed, the sweating stage is not always, nor even I believe in the

majority of cases, preceded by either or both rigors and flushing. The want of proportion also between the degree of rigor, heat, and sweating is very significant; the most profuse sweating being often preceded by chills and flushes of the slightest kind, or a very moderate amount of sweating, and in many cases no perspiration whatever succeeding the occurrence of sharp rigors and heat. It is not uncommon to hear patients complain of being tormented by "hot flushes," a dry and burning skin, with or without rigors, but passing off without perspiration.*

It would appear from these facts that the perspiration in phthisis is not in every case a constituent part of a paroxysm of fever, that it is frequently a transudation wholly independent of antecedent vascular excitement, and that its cause must be sought for in some peculiarity of the phthisical condition unconnected with febrile action.

It is the opinion of some pathologists that the perspiration of phthisis, and the diarrhœa which so frequently attends that disease, are vicarious the one to the other. Although this dogma cannot be maintained, the fact that it ever came to be entertained is a proof that the perspiration of phthisis presents some striking characters of an act of elimination, which, if interrupted through the skin, require a compensating discharge from some other eliminatory organ.

* Louis found that rigors and heat of skin, not followed by perspiration, occurred in 1 in 10.—P. 181.

That the perspiration in this disease is fundamentally an elimination of effete matter, with the aqueous vehicle abnormally great, in consequence of the easy filtration of fluid through the vessels weakened by insufficient nutrition, I shall endeavour to show.

It will be necessary, in the first place, to consider the nature of some of the constituents of the discharge.

Sweat, besides its well-known saline elements, contains a considerable amount of fixed fat, some of which no doubt is a secretion of the sebaceous follicles, but a not inconsiderable quantity is yielded by the sudoriferous glands. This is evident from its presence in the sweat of the palm of the hand, a part in which no sebaceous follicles exist. Its presence may be proved by the experiment of placing the warm hand on a piece of glass, and examining the deposit on it with the microscope. The principal part, however, of the organic constituents of the sweat consists of the volatile fatty acids which escape by the sudoriferous glands. The sebaceous follicles take no part in this excretion; Lehmann was unable to detect any trace of those acids in the fat secreted by them.

Of the volatile fatty acids, the most abundant is the formic, which can always be detected in large quantity; the next, but in far diminished amount, is the acetic; next, but still less, is the butyric acid. Capric and metacetonic acids are also probably present. Lactic acid cannot, as was supposed, be detected in normal sweat. Funke found urea to be present in sweat in no inconsiderable quantity. In one of his experiments the

whole body yielded 7 oz. of sweat in one hour, and this quantity contained 7·5 grains of urea.

The volatile fatty acids being the result of an incomplete oxidization of the fixed hydrocarbons, the perfect oxidization of which gives carbonic acid and water as its products, it is evident that their presence in the sweat is an indication of imperfect oxidization. Whether in perfect health that complete transformation would be the normal state of things, or whether a certain amount of fatty acids always exists, are questions most difficult to determine; but that in certain conditions of the system their quantity is greatly increased is a point already ascertained. Schotten found that the amount of volatile fatty acids in the sweat was increased by the occurrence of any impediment to the process of respiration, and the consequent *diminution of the supply of oxygen* to the system. The sweat in phthisis, as might therefore be expected, contains an excess of those acids.* The diminished supply of oxygen, from which the excessive formation of the volatile fatty acids arises, must depend either on

1st. A diminution in the aerating capabilities of the lungs, or

2ndly. A lessening of the oxygen-carrying powers of the blood.

With reference to the *First Cause*, it appears to me very improbable that the loss of a small portion of lung structure can seriously influence the amount of oxygen

* This escape of hydrocarbon from the system, probably to some extent, may account for the waste of fat in that disease.

absorbed by the blood. It is contrary to all analogy to suppose that the extent of aerating surface in the lungs is apportioned to the requirements of the system with such delicate precision as not to allow ample margin for occasional impediments to its action. Clinical experience is continually affording evidence to that effect, by cases in which the aeration of the blood is abundantly accomplished by a single lung. I have now under my care, at the Metropolitan Free Hospital, a case of empyema in which the fluid was so abundant as not only to carnify the left lung, but to trench considerably on the space belonging to the right, yet there was no indication of insufficient oxygenation of the blood. The patient is now, although the fluid has found vent by a free spontaneous opening, dependent on the right lung for the aeration of the blood, and yet she gains flesh and strength; can walk a distance of a mile and a half to the hospital, looks ruddy and well, and all the functions of the body are well performed.

With regard to the *Second Cause*—a diminution in the quantity of red corpuscles, the oxygen carriers of the blood—I have already given in detail the proofs which we possess that the vection of oxygen to all parts of the system is accomplished by the red corpuscles, and also the evidence that in phthisis there is a diminution in the amount of red corpuscles always to be found, although varying in extent. It is to this deficiency in the proportion of red corpuscles—the oxygen carriers—to the requirements of the system, that the imperfect

oxidization of the hydrocarbons and the development of the volatile fatty acids is due.

The skin being the natural emunctory of those acids, their excess in the economy must act as a stimulus to the sweat glands, exciting them to excessive action. Add to this the easy transit of the aqueous element of the sweat through the attenuated capillary walls, and we have all the factors necessary for the production of the profuse perspiration of phthisis.

Viewing this phenomenon as an act of elimination of effete matter, the presence of which in the economy must be injurious, it is evident that the adoption of any measures for its arrest, other than the means which remove the necessity for it, must be improper. This observation must not be understood as referring to the excessive transudation of watery fluid already noticed. This may with advantage be moderated by such measures as may be used without effecting its complete arrest, such as free ventilation, a careful regulation of the temperature of the sleeping room, the amount of clothing, &c. A skilful use of these means will add much to the comfort of the patient without in any way checking the excretion of the effete elements of the perspiration.

For the efficient treatment of the perspiration in phthisis it will, however, be necessary to alter the constitutional condition, on the presence of which the excessive development of the volatile fatty acids, &c., depends. This state being the result of imperfect oxidization of the hydrocarbons, our measures must be

directed to the supply of oxygen. As it is evident that the insufficiency of the supply of this gas depends not on imperfection of the respiratory organs, but on a deficiency of the blood corpuscles, the receivers and carriers of oxygen, the restoration of these little organs to their normal number must be the aim of our treatment. I have shown that this end can be best accomplished by the use of iron.

In the experimental exhibition of iron in phthisis I was not prepared for the good effects which I have found to result from its use in diminishing perspiration. It exercises a very great control over this secretion, reducing the profuse sweat to the condition of gentle diaphoresis. On the perspiration of early phthisis, especially in young persons, its action is most rapid. In the more advanced stages of the disease, and in older persons, it is less effectual, and also more slow in its action. Few cases have occurred to me, except in the last stages of the disease, in which I have not found good results from its exhibition, and in those cases in which the sweats were not totally subdued, they were generally so far reduced in severity as to be endured without complaint.

As recovery progresses, in all stages of the disease, the perspirations become less and less severe, and finally cease. The diminution of the perspirations is a good omen, and may in some measure be taken as a guide to prognosis. The converse also holds good.

The preparation of iron which I have found most active in the subjugation of phthisical perspiration is

the perchloride. It is much more effective than the supersulphate generally in use. In 300 cases, night sweats occurred in 232; of these 149 were more or less relieved under the use of the perchloride of iron, the perspirations sometimes completely subsiding for longer or shorter periods, and in no case recurring with much severity; in 49 cases there was no return of the perspirations; in 34 cases no influence appeared to be exercised by that treatment.

COUGH AND EXPECTORATION IN PHTHISIS.

The cough which precedes or accompanies the development and progress of tubercle in the lungs is of a very mixed character. Its forms are so various, and differ so much in different individuals, that no history of its characteristics can be given which would be applicable to a majority of cases. This might be expected as a consequence of its dependence on a variety of pathological conditions, each of which may exercise a varying amount of influence in its production. The presence of tubercle, vascular congestion, irritation of the pulmonary mucous membrane, irritability or great susceptibility to impressions of the pulmonary nervous system, reflex or eccentric irritation of the vagus by dyspepsia, hepatic congestion, affections of the larynx and pharynx, &c., may all be more or less concerned in the development of the cough of phthisis, and, according to the preponderance of one or more, the character of the cough becomes modified.

The cough of phthisis is usually described as "dry and hacking," but these characters, even if they were constant, are not peculiar to phthisis. The nervous or hysterical cough, and the cough arising from reflex irritation, as in dyspepsia, intestinal worms, pregnancy, uterine irritation, &c., possess the same characters.

But although the cough of phthisis cannot be accepted as peculiar and pathognomonic, it is not to be disregarded as an aid to diagnosis when taken in conjunction with other symptons. It is often the first symptom that excites suspicion on the part of the patient or friends, and thus leads to an examination and the adoption of measures for the arrest or palliation of the disease. The presence of a dry hacking cough in a person in whom there is a suspicion of a tendency to consumption, should always lead us to make a careful physical examination of the chest. If the signs of tubercle are found, and especially if the patient inherit a predisposition to consumption, the cough must be considered as a symptom of grave significance. But, on the other hand, we must not accept the absence of the physical signs of tubercle as a proof that the cough is unimportant, for, waving the uncertainty of the physical indications, the cough may be the natural expression of the condition of the lung which precedes the deposit of tubercle, a condition of nervous irritability and of local congestion depending on a weak, ill-nourished state of the vessels, which, if allowed to continue unremedied, will probably be followed by a deposition of tubercle.

It is asserted by writers on phthisis that the severity of the dry "hacking" cough, the cough described as characteristic, bears a direct relation to the quantity and rapidity in the deposition of the crude tubercle. The influence of the locality in which the tubercle is located in giving rise to cough, and modifying its characters, is perhaps not sufficiently estimated. When the tubercle is formed on the free surface of the air-cells or bronchi the cough is most violent ; it is then an effort on the part of nature to expel that substance by the channels provided for its elimination. When the tubercle is deposited in the parenchyma of the lung it rarely, perhaps never, acts as an irritant to the nerves, for they cannot be irritated by the presence of the semi-liquid matter of freshly deposited crude tubercle in so yielding an organ as the lung, and even when the tubercle becomes more indurated, there can be no pressure from its presence in the yielding pulmonary parenchyma. The nerves are rapidly reconciled (so to speak) to its presence, and cease to feel it, just as the tactile nerves of the finger cease to take cognizance of the presence of the ring which encircles it. But when the tubercle is deposited on the free membrane of the air-cells and bronchi, the conditions are altogether different. The function of this membrane is elimi-natory, and any foreign body interfering with that function must act the part of a constant irritant, exciting the instinctive effort for its expulsion — cough.

This view is supported by the character of the sputum

which sooner or later follows the primary or dry phase of the phthisical cough. This consists of a *ropy, semi-transparent fluid*, not unlike the white of a raw egg—a secretion common to all mucous membranes when suffering irritation from the presence of a foreign body, though varying with the structural peculiarities of the membrane. Baffled in its efforts to get rid of the tubercle, the next phase appears; the semi-transparent sputa give place to the puriform. At first there is a mixture of the two kinds, the well-known *streaky sputa*.

The cough excited by the presence of crude tubercle has therefore no pathognomonic characters, it simply shows the presence of an irritant, to determine the nature of which we must seek for other indices.

The cough which attends the expulsion of softened tubercle is more characteristic, as by the aid of the microscope we can often determine the presence of tubercular matter and yellow elastic lung-fibre in the sputa accompanying it; the flocculent globular masses, or nummular sputa, found in these stages are very characteristic.

As the stages of the disease may all co-exist in the same person, or even in the same lung, it is not to be wondered at that the character of the sputa may vary from day to day, and from hour to hour; this inconstancy destroys its utility as a symptomatic guide.

The pathognomonic value of the presence of blood in the sputa, as well as its influence on the odour, is stated under the head of hæmoptysis.

As the phthisical patient is liable to the various affections to which, independent of tubercle, the lungs of all are subject, it is hardly necessary to observe that the cough and expectoration may be modified by the presence of any such intercurrent disorders. We may thus have the bronchitic, pneumonic, pleuritic, &c. characters superadded. There is one condition, however, which so frequently accompanies phthisis, and masks its symptoms, that it deserves notice; I refer to spasm of the bronchi. It is naturally to be expected that the bronchial muscles should participate in the morbid irritability which attends the progress of phthisis, and we find it is so. The cough is often characterized by spasm and dyspnœa of a decidedly asthmatic kind, which, by masking the other symptoms, tends to mislead the patient and friends into the supposition that the case is one of pure asthma—an error of serious import, as leading to the neglect of those measures which are necessary for the welfare of the patient.

Cough is so constant an attendant on consumption that its absence is regarded as a proof of freedom from that disease, but even this negative evidence is not without occasional exceptions. Cases are now and then met with in which phthisis passes through all its stages, to the formation of cavities, and even to death, without cough or expectoration. The subjects of such cases are generally (indeed, so far as I have had experience of them, invariably) of an apathetic, immoveable temperament, sluggish, and indolent.

I have lately watched a case of this kind conjointly

with my friend and colleague, Dr. Francis Webb; the diagnosis was that of a cavity in each lung, and enlargement of the liver. There was much disorder of the digestive organs, frequent vomiting, and complete loss of appetite; during five weeks preceding death the patient took nothing but port wine and small quantities of beef tea and jelly. There was no cough and no expectoration; Dr. Webb and myself were present at the post-mortem examination; a cavity of considerable size was found in the apex of each lung. There was no appearance of any healing process taking place in the walls, which were formed of lung-structure, somewhat infiltrated with tubercle, and undergoing the softening process; there was a small quantity of the semi-fluid matter usually present in newly-formed cavities. The liver was greatly enlarged, and in an advanced stage of fatty degeneration. The stomach was large; the mucous membrane softened throughout its whole extent, but without ulceration.

Treatment.—In the cough of early phthisis the indications are twofold—the promotion of nutrition and the removal of irritation. The latter indication is to some extent comprehended in the former, but admits also of the use of special appliances.

The treatment required for the accomplishment of the first indication is comprehended in the general management of the patient. I have very constantly found the cough to subside under the persevering use of perchloride of iron in small doses conjointly with cod-

liver oil, without the aid of narcotics or sedatives of any kind. Yet for the removal of irritation I find no medicine so useful as opium in some form. I usually prescribe the acetate of morphia in doses varying from the sixteenth to the twenty-fourth of a grain, given at intervals of two to four hours. When the cough is spasmodic, and attended with much dyspnœa, chloric ether may be combined with morphia or the compound tincture of camphor with much advantage. The local application of chloric ether or chloroform and opium by inhalation is often effectual in subduing the cough, when its administration by the stomach is unsuccessful, or disagrees with the patient. The use of alkalies is of doubtful propriety.

The intercurrent inflammatory attacks which so often complicate the course of phthisis require a modification of treatment from what is ordinarily in use in the sthenic form of these affections. The inflammation in phthisical constitutions being peculiar, the treatment of intercurrent diseases must be conducted with a view to the requirements of its asthenic type.

In advanced phthisis the cough is often the most distressing symptom the patient has to endure. The amount of expectoration is generally very great, and its expulsion is often attended with nausea and vomiting. The great bulk of the sputa consists of muco-pus formed by the chronically inflamed mucous tunic of the air-passages—a portion only, and that necessarily a small one, consisting of the *débris* of tubercle. The purulent matter formed by the walls of the cavities is

also present, and, when the latter are large, the quantity is often considerable. Portions of lung are not unfrequently to be found, as well as the curly yellow fibre. In this stage the use of tonics, but especially perchloride of iron, is followed by very good results. The excess of muco-pus is lessened, and the quantity of sputa is often reduced to the lowest point consistent with the requirements of nature in aiding the expulsion of the softened tubercle. Opium in some one of its forms may in these cases be freely exhibited.

When the larynx and fauces become ulcerated, the severity of the cough is much increased. This may often be relieved by the use of glycerine, which may be given in combination with gum-water and an opiate; a small quantity should be taken frequently, and swallowed slowly, allowing it to remain as long as possible on the base of the tongue, or the mixture may be applied to the interior of the larynx by means of a small curved probang. A strong solution of nitrate of silver (ʒj in ℥j) may also be applied locally by means of the probang. I have frequently found much relief to follow the use of a gargle consisting of chlorate of potass. half an ounce, glycerine two ounces, water fourteen ounces. It may be used very frequently. When aphthous patches exist in the mouth, tongue, or fauces, this gargle is very useful. For those who cannot use a gargle, the chlorate of potass. and glycerine, in the proportions of a drachm to the ounce, may be applied with a probang, or a portion of the linctus may be placed on the posterior part of the tongue, and retained there as long as possible. I

have tried both gallic acid and tannin in cases of laryngeal irritation, but without any benefit.

HÆMOPTYSIS OF PHTHISIS.

Hæmoptysis is a symptom of phthisis which always excites the greatest alarm in the patient and friends. It may occur at any period of the disease. It is often the first manifest sign which occurs to indicate the mischief which it so generally accompanies.

The relative proportion of cases of phthisis in which hæmoptysis occurs is not easy to be ascertained, because of the difficulty which arises from the strange dislike that patients have to admit that it has ever appeared. The patient often persistently denies that a trace of blood has ever been expectorated, and but for the accidental discovery by some observant friend of the blood-stained phlegm, the case might be registered as one in which it had never taken place. Hæmoptysis not being a persistent symptom of the disease, the first hæmorrhage may be the only one. After all, it is, perhaps, not much to be regretted that we cannot arrive at more correct statistics on the point. The fact that it is present in a large number of cases—too large to allow of its being the result of accident, and large enough to warrant us in referring it to some condition of the constitution necessarily resulting from tuberculosis—is sufficient for our purpose in relation to curative treatment.

Authors usually refer the hæmoptysis of phthisis to

two causes: 1st. Local congestion, the result of the presence of tubercle; and 2ndly, the escape of blood from a vessel passing into or through a tubercular cavity, and laid open by rupture or ulceration.

There is one factor in the production of hæmoptysis which, so far as I am aware, has not been noticed by writers on that disease, that is the weakened state of the vessels, and especially the capillaries, the result of the mal-nutrition invariably attendant on tubercular cachexia. The vessels, thinned by this cause, are unable to resist any unusual strain to which they may, from a variety of causes, be subjected, and, becoming ruptured, give vent to a quantity of blood proportioned to the size of the vessel and the degree of its over-distension. That this attenuation of the vascular coats really exists cannot be doubted. It is evident in the very aspect of the patient. The superficial vessels are abnormally transparent, showing the blood more clearly through their walls than those of a healthy person. The sub-cutaneous vessels are easily ruptured, as is shown by the susceptibility to bruise marks. Hæmorrhage from the nostrils and an excessive flow of catamenial blood are also evidences of this state. The comparative difficulty which is met with in making injected preparations of the lungs and other vascular organs in phthisical persons without numerous extravasations, can only arise from that cause, and is in itself an artificial example of the phenomenon.

I would therefore divide the causes of hæmoptysis in phthisis into *constitutional* and *local*. The *constitutional*

cause is an attenuated condition of the tunics of the blood-vessels or capillaries, resulting from imperfect nutrition. This condition is not in itself capable of producing hæmorrhage, it simply gives a predisposition to it, and requires the presence of some local congestion or obstruction to bring it into operation. The *local* or immediate cause must be referred to congestion of the vessels yielding the blood. This congestion may arise from the irritation caused by the presence of tubercle on the free surfaces of the air-cells and bronchi, or from any cause of obstruction to the pulmonary circulation, such as catarrh, violent fits of coughing, lifting heavy weights, &c.

The amount of the hæmoptysis is variable. It may occur in any quantity, from the merest trace to a profusion sufficient to destroy the patient in a few minutes. In colour it is usually florid, but sometimes, when copious, it is in large dark masses, with more or less admixture of the bronchial secretion.

In the greater number of cases the quantity is small, sometimes a mere streak in the phlegm, sometimes a florid frothy mass, varying from a tea-spoonful to two or three table-spoonfuls. When it shows itself in this form, and comes up without cough, and almost without effort, it is a strong evidence of *active* tuberculosis.

I have already remarked that hæmoptysis is not limited to any one period of the disease, but that it may occur in any of its stages. It is, however, most frequent in the first stage. This might be expected, for the circulation is then more active. The heart's power and

the amount of blood is greater than in the subsequent periods when the disease has done its work, and anæmia and exhaustion are steadily advancing.

Hæmoptysis, I believe, not unfrequently occurs in cases of tubercular cachexia antecedent to the formation of tubercle. When the condition of cachexia has existed for some time, it is not unusual for the vessels, attenuated by insufficient nutrition, to become ruptured under circumstances of temporary pressure, giving rise to even profuse hæmoptysis. The ground on which I have formed this opinion, is the continued absence, in many instances, of the physical signs, and of the symptoms of tubercle for years after the occurrence of hæmoptysis in persons who, I have good reasons to believe, had inherited the predisposition to phthisis, and who were at the time of its occurrence in failing health. I felt much hesitation in accepting such cases as proofs of pretubercular hæmoptysis, when I found so high an authority as Dr. Watson stating his belief that the fact of the occurrence of the primary symptoms of tubercle years after the hæmoptysis was sufficient to show that they stood in the relation of cause and effect. But when I found the restoration to health so *continuously complete* in the cases on which I have formed my opinion, I could not refuse to accept them as at least strong presumptive evidence, if not absolute proof, of the absence of tubercle.

I have had, as yet, no opportunity of verifying this opinion by post-mortem examination.* The hæmop-

* Dr. Watson (*Lect. Princ. and Prac. Physic*, vol. ii. page 191)

tysis in these cases effects its own cure, by removing the local congestion which produced it. Owing to the difficulty, perhaps impossibility, of discriminating between it and the hæmoptysis attending the early stages of tubercular deposit, it should always be considered a symptom of much importance and of grave omen. But even if we possessed the means of diagnosis between the two varieties just mentioned, it should never be forgotten that the first, although not attended by the actual presence of tubercle, is nevertheless a result of a cachexia, which, if not corrected, will end in the production of tubercle.

The hæmoptysis which occurs during softening of the tubercle, and also that which takes place when large anfractuous cavities have been formed, is probably of purely local origin. It is often fearfully violent, and, if life be not destroyed by it, reduces the patient to a state of great exhaustion. It cannot be always ascertained from what part the blood is extravasated, but it may possibly arise from one of the vessels

states his belief, "that if a person spit blood who has received no injury of the chest, in whom the uterine functions are healthy and right, and who has no disease of the heart, the odds that there are tubercles in the lungs of that person are fearfully high." In another place (vol. ii. page 145) he says—"There are many persons in whom the first attack of hæmoptysis precedes, even for years, the primary symptoms of unequivocal phthisis." Surely it is difficult to prove the connexion of the hæmoptysis with the presence of tubercles which do not manifest themselves even by primary symptoms for years after it. Louis states that he did not meet with a single example of hæmoptysis among twelve hundred patients, except in such as were phthisical. It is to be regretted that he used so vague a term as "phthisical," a word which may or may not imply pulmonary tuberculosis.

which are found occasionally to pass across a cavity, but which are usually rendered impervious. If by any circumstances the vessel retains its pervious state, it must, on becoming torn by the effort of coughing or the progress of ulceration, give ready vent to a copious escape of blood. This form of hæmorrhage is fortunately very rare, for even in the second and third stages of phthisis the amount of hæmorrhage is rarely great, and generally too small to require any active treatment.

It appears to me that no doubt should exist as to the dependence of every hæmoptysis on the rupture of one or more vessels. The popular definition of hæmoptysis as "a rupture of a blood-vessel" is strictly true. That there is no possibility of red corpuscles making their way through the coats of a vessel, be it artery, vein, or capillary, without a rupture or opening in its walls, must be evident to all who have examined those structures with the microscope. For red blood to escape by oozing through the side of the vessels without rupture or artificial openings is an impossibility ; there are no apertures in the coats of the vessels capable of allowing the transit of a red corpuscle ; their lining membrane is found to be smoothly uniform and structureless under the highest magnifying power to which it has been subjected.

Hæmoptysis must therefore be considered as the result of a lesion of one or more vessels, whether it occur as a minute streak in the phlegm, or as a copious discharge of blood, enough to cut off life.

The seat of hæmorrhage may be at any part where

vessels exist, but the most common position is either in the minute bronchi or in the air-cells. In most cases of hæmorrhage in phthisis the quantity of extravasated blood being small, it is expelled with the phlegm, but where the amount is considerable, a portion of the blood not unfrequently remains in the cellular structure, having either been extravasated there or drawn into the cells from the bronchi during the forced inspiration that follows a fit of coughing. In this situation it may either remain, the more fluid part being got rid of, and block up a portion of the cellular structure by its solid constituents, or it may be expelled, before it has lost its softness, in the form of a putrid black or olive-green mass. Previous to the expulsion of this, the breath is found to be very offensive, having the odour of putrid meat. I was lately consulted in a case of this kind, which was supposed by the medical man in attendance to be gangrene of the lung, but the offensive odour ceased on the expulsion of some putrid blood. I am induced to direct attention to this condition because it is by no means unfrequent, and often causes unnecessary alarm to the patient and friends.

From the attenuated condition of the walls of the vessels giving a strong predisposition to hæmorrhage, every circumstance that causes an increased flow of blood to the lungs, or any portion of them, or that acts as an impediment to its free circulation, may act as an immediate exciting cause of hæmoptysis. In this way an accession of catarrh, severe fits of coughing, singing, and loud speaking, blowing wind instruments, lifting

heavy weights, all the more violent gymnastic and pedestrian exercises, and sudden changes of temperature of the air breathed, may excite an attack.

According to the investigations of Dr. Edward Smith, there is a stronger disposition to hæmorrhage in the afternoon and evening than at any other period of the day or night, in consequence of the plethora of the vessels which then exists, as the result of the absorption of food. It seems reasonable to expect hæmorrhage to be most frequent under those circumstances, yet it is very common to hear from patients that they were awoke in the night or early in the morning by blood coming up into the mouth. It does not, however, follow that because the hæmoptysis occurred at that time, the extravasation may not have taken place at some antecedent period, and that view is supported by the sensations of the patient—a feeling of weight and oppression at the chest being often experienced for some hours before the accession of hæmoptysis.

TREATMENT OF HÆMOPTYSIS.

The treatment of hæmoptysis naturally resolves itself into two divisions—the *remote* or *prophylactic* and the *immediate*. The one has reference to the constitutional predisposing cause, the other has for its object the arrest of the hæmorrhage, and, if possible, the removal of the exciting causes. Although the latter of these divisions has no direct connexion with the subject of this paper, a short notice of it may not be considered

out of place before entering on an examination of the former.

When the quantity of blood is small there is no need of any active measures to check it. It usually ceases in a very short time; it is proper, however, for the patient to remain at perfect rest during its continuance, and for a few days after all trace of blood in the expectoration has disappeared. If the quantity of blood be considerable, absolute rest in a recumbent or semi-recumbent posture should be strictly enjoined; loud talking should be avoided; the room should be kept moderately cool and well ventilated. The drinks should be cold, or even iced, and taken in small quantity at a time, and morsels of ice may be kept in the mouth to dissolve, and repeated as long as they are grateful to the patient. The diet should be light and simple, chiefly strong beef tea and light farinaceous puddings, given in small quantities at short intervals. Much fluid should not be taken, as tending to produce a condition of vascular plethora. Stimulants should be avoided, except to meet the requirements of a failing circulation, or great exhaustion. The medicines which I have found most useful are gallic acid and opium, and acetate of lead and opium. To obtain the full effect of gallic acid it must be given freely. I have given generally ten grains with one of opium as a first dose, and five grains with a third of a grain of opium every two hours until the hæmorrhage abated, afterwards continuing it at intervals of four hours while any trace of blood continued to appear. There are some patients who cannot take

gallic acid, as it causes nausea and faintness; in such cases, as well as those in whom it fails to check the hæmorrhage, the acetate of lead is often useful; it may be given either in pill, or, perhaps better, in solution, with an excess of acetic acid, in doses of two or three grains, at the intervals already stated. It is useless to give either of those drugs in smaller doses; I have sometimes given them in much larger quantities without any perceptible injurious effects. Dr. Brinton, in a lecture on the hæmoptysis of phthisis (published in the *Lancet*, December, 1861), declares his disbelief in the power of styptic drugs to arrest hæmorrhage through the agency of the circulation. His reasoning being *à priori*, cannot be accepted in opposition to practical experience, which decidedly supports the doctrine that certain drugs administered by mouth are capable, either by acting through the circulation on the capillary and other vessels, or by producing some alteration in the condition of the blood, or by their action on the vaso-motor nerves, of arresting to a greater or less extent the flow of blood through the ruptured vessels.

I quite agree with Dr. Brinton that the quantity of styptic drugs that can be applied directly by vection of the blood to the ruptured vessel is too small to produce any direct physical action on the laceration, but I cannot on that account refuse to admit the power of the drug in controlling hæmorrhage, when I see facts to support the existence of such power, and a reasonable explanation of the action through the agency of the

vascular nerve plexus or vaso-motor nerves. It would be as reasonable to deny the power of opium to relieve local pain because of the smallness of the quantity that can be directly brought to bear on the site of the local lesion.

When the heart's action is energetic, digitalis, and those sedatives which are found to subdue its power, may be given with good effect, but owing to the tendency which so frequently exists in phthisis to a diminution in the forcing power of this organ, through a wasting of its walls, these must be used with great caution. In no disease is the heart found abnormally small more often than in phthisis; the bulk of the heart, as well as its energy, should therefore be carefully investigated before resorting to the use of such agents; for the like reasons their effects should be carefully watched.

It is important to keep the cough in check for obvious reasons; this is best effected by small doses of morphia given at frequent intervals.

The condition of the portal circulation should be looked to, and aperients, especially salines, given if required.

It is unnecessary in a work of this kind to enter on the merits of the different agents which have been used, with varying success, in the treatment of hæmoptysis, my object being merely to record my own experience. I have not tried any others than those I have mentioned, except sulphuric acid, which I have found useful in the milder forms.

It now remains to notice the *constitutional or prophylactic* treatment of hæmoptysis. I have already stated, at page 58, my reasons for believing that the remote or predisposing cause of hæmoptysis in consumption is a weakened state of the blood-vessels,—part of a general constitutional defect in nutrition. I have shown that hæmorrhage is a natural consequence of any temporary congestion occurring in vessels thus rendered less capable of resisting pressure from within. In another place (Chap. III.) I have pointed out the reasons for referring this state of mal-nutrition to a defective condition of the blood, and have endeavoured to determine in what elements that fluid was deficient.

If these positions be accepted as sufficiently established, it is evident that the only prophylactic treatment on which any reliance can be placed is that which addresses itself to the blood, and, through it, tends to a restoration of the functions of nutrition.

The importance of iron as a part of this treatment has already been considered in the preceding chapters; it is therefore only necessary to refer to what has already been stated. I would, however, remark, that the preparation of iron best suited to those cases in which a tendency to hæmoptysis exists is the perchloride. I have found the tendency to hæmoptysis to be so much diminished in those cases in which I have exhibited perchloride of iron as to force upon me the conviction that it is one of the most powerful means that we possess for its prevention.

I have in several instances given the perchloride of iron during the persistence of hæmoptysis, and have found all traces of blood in the expectoration to disappear so rapidly as to lead me to think that it possesses active styptic properties. I have used it in the form of a tincture, containing 10 per cent. of the salt, and of this tincture thirty minims were taken every four hours until all hæmoptysis had ceased.

DIARRHŒA OF PHTHISIS.

Diarrhœa has not been a frequent symptom in the cases which I have treated by perchloride of iron. The opposite condition, that of constipation, has been of more frequent occurrence. In three hundred cases, twenty-four only suffered from severe diarrhœa. Slight attacks of short duration, and not inclined to recur, I have not deemed of sufficient importance to require enumeration.

With regard to the cause of diarrhœa in phthisis, it is not easy to conceive that the mild attacks which come on once or twice in the course of this disease are the effects of tubercular ulceration, or even of the irritation caused by the presence of tubercle. Such an origin would naturally be expected to produce a more permanent condition of irritation, the diarrhœa would be more constant, and would not so readily yield to the simple treatment which so frequently succeeds in subduing it. I am inclined to refer this form of diarrhœa to the same source as the perspiration, that is, the elimination of effete matter of

some sort. The weakened and ill-nourished capillaries may, as in the skin, give transit to a larger flow of water than is required for the necessities of elimination, or than can be re-absorbed, and thus produce a profusion of watery evacuations. The escape of water in this way may, as before observed, influence the amount of cutaneous transpiration.

The true tubercular diarrhœa, that which arises from ulceration of the intestines, is usually confined to the latter stage of the disorder, when the system has become so saturated, thus to speak, with the disease that it yields up localities to the deposit of tubercle which in the earlier and less severe forms of the disease would have escaped its inroads. Under these circumstances the solitary glands of the ilium as well as their aggregations, known as Peyer's patches, become the seat of tubercular formation, which soon excites ulceration, and its attending diarrhœa. The large intestine also, but especially the cœcum and rectum, become the seat of ulceration, and in more rare cases the stomach. The mal-nutrition which results from tubercular dyscrasia predisposes to ulceration, for mal-nutrition and ulceration are but degrees of the same physiological condition. The vitality of the mucous membrane being too much depressed to resist the irritation caused by the presence of tubercle, ulceration proceeds at a rapid rate, and large tracts of that membrane perish, giving to the dejections the putrid odour so often present in this form of diarrhœa.

In this phase of the disease wasting of the body

proceeds with fearful rapidity, as might be expected under circumstances which include the destruction of so large a portion of an organ whose functions are the absorption of chyle. The intestinal fluids become vitiated, the absorbing villi disordered, and the mesenteric glands, taking on diseased action, refuse to give transit to the chyle or peptones.

The treatment of the diarrhœa will of course be shaped in accordance with the time and circumstances under which it may arise. In the early diarrhœa of phthisical patients, where there is no reason to suspect the presence of ulceration, aromatics with opium will generally be found sufficient to check its excess. Sinapisms and other stimulating applications to the surface of the abdomen will be found useful aids. The diet must be regulated with great care. The food should be reduced to the condition of a pulp; rice and milk, and other starchy food, should constitute, with strong beef-tea, the principal diet. Malt drinks of every kind should be prohibited, the only admissible stimulant being brandy-and-water, which may be taken with advantage in carefully regulated doses.

When the diarrhœa is co-existent with ulceration of the intestines, the only medicine from which I found any continued advantage to accrue is opium given in as large doses as may be necessary to subdue pain and irritation, and repeated at frequent intervals. I have seen no benefit arise from the use of sulphate of copper, acetate of lead, nor of the vegetable astringents when given without opium. I am inclined to think that when

given in that combination the opium alone is the active agent. I have rarely seen a case in which the diarrhœa was not to a greater or less degree relieved by the sufficient and persistent exhibition of this drug.

CHAPTER VII.

ON THE COMPARATIVE THERAPEUTIC VALUE OF THE PREPARATIONS OF IRON IN GENERAL USE.

For the treatment of phthisis by iron, it is important that the therapeutic advantages and disadvantages of the various preparations of that metal should be carefully investigated.

The following remarks on those preparations most usually prescribed, are made chiefly from experimental trial.

The Sesqui-oxide of Iron has always been held in much esteem. It affords a base for union with the gastric acids, the combination with which is no doubt pre-eminently suited for absorption into the circulation; but unfortunately we cannot calculate with certainty on the formation of this compound. All portions of the sesqui-oxide are not equally disposed to combine with the acid of the stomach, consequently, to produce any effect, it must be given in considerable quantities. The undissolved portion acts as an irritant, disordering the function of digestion. A chloride formed in the laboratory possesses equal therapeutic

powers, and admits of a definite regulation of the dose.

Compound Iron Mixture is a compound similar to the antihectic mixture, which, introduced into use by a Dr. Moses Griffith, obtained considerable celebrity. It consists of protocarbonate of iron diffused through an emulsion of myrrh, sugar, and spirits of nutmeg—a compound unpleasant to the taste and disagreeable to the sight. Its advantage is supposed to depend on the proto-base which it contains being more easy of combination with the gastric acids. Admitting the force of this argument, it is still open to the objections brought against the sesqui-oxide—the impossibility of defining the dose which will be absorbed. Few patients will continue to take it for more than a week or two without loathing and disgust.

Sulphate of Iron.—This proto-salt has always been a favourite. It is perhaps the salt of iron longest in use. Royle (Hind. Med. p. 44.) mentions its early use in India. It was known to the ancients as green vitriol, and under this name is still a favourite popular remedy for amenorrhœa. I have found it a useful form of chalybeate when the stomach permits its use, but the morbidly sensitive digestive organs of the phthisical will but rarely tolerate it. I have found it to cause nausea, and oftentimes vomiting and diarrhœa. To remedy its tendency to absorb oxygen from the atmosphere, pharmacy has suggested a

Saccharo-sulphate of Iron, in which the proto-salt is made permanent by combination with a harmless and

agreeable carbo-hydrate, which in no way interferes with its physiological action. It is open to the same objections as the sulphate.

Persulphate of Iron.—Notwithstanding the careful efforts of pharmacy to keep the sulphate of iron for medicinal use in a form of proto-salt, some practitioners find a persalt best to suit their purpose. In Derbyshire a solution of persulphate of iron is in much repute. It is made by the addition of nitric acid to the solution of the sulphate; I have prescribed it in several cases of phthisis, but in every instance it caused nausea, and, in many, active catharsis.

Citrate of Iron, and Ammonio-Citrate of Iron.—These elegant preparations were introduced by M. Beral in 1831. He prepared two citrates, one of the proto-, and the other of the per-oxide. To render the preparation more soluble, ammonia was conjoined with it, and the resulting triple salt has ever since been a favourite. It has the great advantage of combining with ammonia, where that alkali is indicated. As an agent of sanguification, it has generally disappointed my expectations. Being nearly tasteless, and not easily decomposed, it is often useful in the treatment of the diseases of children. With sugar it forms a very elegant syrup. It may be combined with other bases, as citrate of iron and zinc, magnesia, potass, soda, &c. In the use of all these preparations, it must be remembered that the citric acid undergoes decomposition in the stomach. Little, however, is known at present of the chemistry of these interesting salts.

Wine of Iron.—This preparation, made by macerating for a month half an ounce of filings or turnings of soft iron in twenty ounces of sherry wine, has always been extensively used both by the profession and the public, although it has not been deemed worthy of a place in the pharmacopœia. It is a solution of the tartrate of peroxide of iron and potass in wine. That which is sold in the shops is seldom prepared according to the above form, a direct solution of tartrate of iron and potass in wine being usually substituted. It is a very agreeable form of chalybeate, but is open to the same objection as the citrates, viz., the decomposition of its acid in the stomach, by which the base is set free and incapable of action, until re-dissolved by the gastric acids, and therefore possessing no advantage over the perchloride, which requires no exercise of gastric chemistry. The only advantage possessed by these vegeto-acid salts over the sesqui-oxide is that the gastric juice probably combines more readily with the fresh-formed base than with that which has been exposed to the action of the air.

The wine should contain 16 grains of peroxide in the pint.

The Tartrate of Iron and Potass possesses the same properties as the steel wine. The remarks made on the latter are equally pertinent to it.

Ammonio-Tartrate of Iron corresponds to the ammonio-citrate of iron. It is insoluble in alcohol and in ether, but dissolves readily in a little more than its own weight of water. Mr. Procter gives a formula for its prepara-

tion in the "American Journal of Pharmacy," by combining bitartrate of ammonia with freshly-prepared hydrated oxide of iron. Its constitution is open to the same objection as all the other combinations with vegetable acids (*vide* Wine of Iron), and its ferruginous taste is disagreeable to most palates.

Acetate of Iron.—The acid of this preparation also undergoes decomposition in the stomach, the base being set free to enter into combination with the gastric acids. It is much used in Dublin.

Pernitrate of Iron is also a favourite preparation in Ireland. Being compatible with an excess of nitric acid, it is useful in cases where the latter is indicated. The variation in its strength, arising from the copious precipitation of basic sesqui-nitrate when it has been kept a short time, renders the dose uncertain, and is a great objection to its use. It is, accurately speaking, a nitrate of the magnetic oxide of iron.

Pyro-phosphate of Iron is *one* of the best preparations of the metal that pharmacy has afforded us. It has nearly, if not all, the advantages which are possessed by the perchloride; and, in cases where the latter was objected to, I have found it highly useful. It is readily tolerated by the stomach, is pleasant to the taste, is absorbed with facility, and, according to the testimony of Dr. Levas, without decomposition.

Phosphate of Iron is another useful salt. Given with an excess of phosphoric acid in the form of a syrup, it is not unpalatable. We are indebted to Dr. Routh for the introduction of this syrup. It has, unfortunately,

the disadvantages of being difficult of preparation and of soon spoiling.

The phosphates are supposed, from their composition, to possess both neurotonic and hæmatonic properties; they would consequently be indicated in those cases of phthisis in which the functions of the brain and nervous system have been deranged by excessive study, mental anxiety, late hours, or a life of dissipation. They possess one great advantage, in common with the perchloride, that their constitutional elements are in chemical harmony with the fluids of the body. Iron has been found to exist in at least one organ, the spleen, in the form of phosphate of the peroxide.

Perchloride of Iron is, according to my experience, by far the best preparation of iron in the treatment of phthisis. It is highly soluble, and by no means unpleasant to the taste. It admits of combination with many of the medicines used in the treatment of consumption, without suffering any loss of efficiency; such, for instance, as hydrochloric acid, chlorate of potass, chloric ether, hydrochlorate of ammonia, hydrochlorate of morphia, quina, calumba, quassia, and phosphoric acid.

It is in chemical harmony with the gastric fluids, a matter of much importance, it being at all times desirable to avoid the disturbing effects of chemical combinations and decompositions in the cavity of the stomach. The normal gastric juice is found to contain some chloride of iron. Its saline constituents consist of a large proportion (more than half) of

chlorides of sodium and potassium, the other chief constituents being the tribasic phosphate of soda, with some phosphates of lime, iron, and magnesia. There is also a portion of free hydrochloric acid always present, and sometimes lactic acid. It is evident that, so far as the saline constituents are concerned, no decomposition is produced by the presence of the perchloride of iron when exhibited as a medicine. On the peculiar principle of the gastric fluid, pepsine, it is found to exercise no chemical action; no precipitate takes place on the addition of the perchloride of iron to a solution of that substance.

The composition of saliva is so nearly akin to that of the gastric fluid, that the above remarks are equally pertinent to it, with one unimportant exception, that the perchloride is slightly influenced by the presence of a trace of sulpho-cyanide of potassium which exists in the secretion of the submaxillary gland. Its solubility, however, is in no degree impaired, and the reaction possesses no physiological importance. The ptyaline, or diastace, the most important of the elements of saliva, undergoes no reaction from the presence of perchloride of iron.

When we consider the enormous amount of fluid secreted into the digestive canal, to be again absorbed into the blood—the daily quantity being, on the authority of Bidder and Schmidt, from 20 to 25 pounds—the importance of chemical harmony between that fluid and the remedies which we administer for absorption into the circulation, is sufficiently obvious; but this is

especially so with reference to the compatibility of the gastric juice with those medicines which are directly absorbed by the vessels of the stomach. The quantity of gastric fluid is variously estimated at from 10 to 20 pints in 24 hours.

I have found the stomach to tolerate the long-continued exhibition of the perchloride better than any other preparation of iron. It appears to promote the digestion of food; the appetite usually improves under its use (*vide* article Dyspepsia, page 38); the dislike to fatty foods and cod-liver oil is often overcome by it. It checks the tendency to diarrhœa; it exercises a marked influence over the night sweats, which form so distressing a feature of the disease. Unlike most other chalybeates, it may be given with benefit during the existence of hæmoptysis, over which it apparently exercises considerable control. The cough I have frequently found to subside, and the amount of expectoration to diminish during its use. In a word, all the therapeutic powers of chalybeates are pre-eminently present in the perchloride of iron.

CHAPTER VIII.

ON THE MODE OF ADMINISTERING IRON IN PHTHISIS.

THERE is nothing more common than to hear from patients that steel medicines had always disagreed with them. This is not surprising, when we consider the large doses in which it is so generally given. The digestive organs become disordered, and sickness, loathing of food, and headache, are the usual consequences.

Intolerance of iron may result from

1. The unfitness of the preparation.
2. The excess of the dose.

Of the advantages and disadvantages of the various preparations of iron I have already spoken, it remains therefore only to make a few remarks on the dose. I may be permitted again to repeat that the preparations which I have found to accomplish most good, and agree best with the digestive organs, are the perchloride and the pyrophosphate. These, however, like all other preparations of this metal, if used in over-doses, will be found to disagree; but when the doses are carefully adapted to the requirements of the system, few cases will be met with in which the most perfect tolerance

will not be found. When we consider the object in view in the exhibition of iron, viz., the promotion of a healthy sanguification by the conveyance into the system of an element indispensable to its accomplishment, it is obvious that the dose must be just sufficient to meet the requirements, as a blood-food. Any excess over the necessary quantity must act as a foreign matter, and a disturbing element which calls on the system for expulsion, and, to the extent of the effort required to accomplish this, may be considered an exciter of disordered action. The dose of iron, although it must vary in accordance with the condition of the system and the phases of the disease, need never be large. The development of the red corpuscles always proceeds slowly, and cannot be hastened by the exhibition of any of their elements in excessive quantity. Iron being one of those elements, the portion capable of being assimilated must be very limited. When the condition of anæmia is strongly pronounced, the quantity required will be larger than that which is necessary to maintain the healthy correlation of the blood elements. In perfect health, the iron conveyed into the system by the food is sufficient to keep the blood at its healthy standard. In phthisis and other wasting diseases, there is a *constant* tendency to dyscrasia of the blood, to a diminution of the normal proportion of red corpuscles, requiring the persevering use of iron and such other agents as are found to aid in the correction of that state, by supplying the element necessary for a normal crasis. For the accomplishment of this object, the dose

of iron usually required is very small, but its use must be continued as long as the tendency to dyscrasia exists. It is possible that the use of iron may be required for a very long period, possibly for years; not perhaps continuously, but yet at not unfrequent intervals. The absence of all unpleasant effects from its use would make the taking of it no burthensome task, even if prolonged for a lifetime.

For the accurate regulation of the dose, it is convenient to use the perchloride, or the pyrophosphate in a solution containing ten per cent. of the salt. Thus every ten minims will represent one grain. Having objected to the doses usually prescribed as being too large, I may state that the quantity which I would recommend as an average dose when the anæmia is strongly marked, is ten to fifteen minims of either solution three times a day; but it cannot be continued in these doses for any long period without unpleasant consequences. It must soon be reduced to a third of that dose. I give these as average doses, but it is obvious that numerous circumstances arising in the course of the treatment will alter the requirements of the system and the dose of the medicine.

I may here state that the perchloride of iron, being a perfectly *neutral* salt, is not open to the objection made to the tincture of sesquichloride of iron of the pharmacopœia, that the uncombined acid which it contains acts injuriously on the teeth.

The infusions of quassia, or calumba, form a convenient vehicle for its exhibition, being grateful stomachic

bitters. For children and very young persons I have generally given it in conjunction with syrup of orange peel, the slight alteration in colour which takes place being unimportant.

CHAPTER IX.

MEDICINAL CO-AIDS.

In endeavouring to bring prominently to view the important results which may be obtained from a judicious use of iron in the tubercular dyscrasia, and pulmonary consumption, I would not be understood as doing so to the exclusion of all other agents. My object is merely to point out its capabilities, and to indicate its proper place in the materia medica for phthisis. It will not be, perhaps, considered out of place to make a few brief comments on the drugs or medicines most useful in the treatment of this disease, and to mention the circumstances which, I think, indicate their use.

COD-LIVER OIL.

The value of this oil as a curative agent is firmly established on the foundation of a long experience. I have given it in conjunction with iron in a majority of cases. Each appears to assist the action of the other. In cases where the stomach was incapable of retaining the oil when given alone, I have often found that, used in conjunction with perchloride of iron, the oil was not

only retained, but also ceased to excite any unpleasant symptoms whatsoever. Without assuming the correctness of any of the theories which have been suggested in explanation of the mode of action of this oil, and trusting only to experience as a guide to "when and how" it should be taken, I have come to the conclusion that it is best to give it in small doses at frequent intervals; that the average dose should be a teaspoonful three times a day; that in larger quantities the whole of it is not absorbed, the excess acting as an irritant to the bowels; that its energy as a fattening food is increased by combination with iron, and that the best time for taking it is about an hour after meals.

I have not seen much benefit derived from the use of cod-liver oil in those cases where no loss of weight occurred, and therefore look upon that symptom as the indication for its use. Without asserting that the oil has no other therapeutic action than that of a feeder of the fat structures, the experience I have had of its use convinces me that it is when there is a wasting of the fat that cod-liver oil is most, if not alone, useful. It is evident, from the many forms of combination of cod-liver oil with various medicinal substances which pharmacy has recently provided, that it has, when given alone, often disappointed expectation, and that it cannot be trusted to as sufficient to meet the requirements of the system in phthisis.

QUININE.

This drug evidently possesses very powerful febrifuge qualities in the hectic of phthisis, but I have found it necessary to give it in much larger doses than those which are usually prescribed. It should be given in quantities of from ten to twenty grains a day, in divided doses, during the intermissions. It generally fails when given in smaller quantities. After a few days the dose may be decreased, small doses being sufficient to prevent the return of the febrile paroxysms.

It is as an antiperiodic that quinine is most useful in phthisis.

MORPHIA.

I have already spoken of the influence of the preparations of opium in subduing the cough. I have found it most useful in small doses, the sixteenth to the twenty-fourth of a grain, given at frequent intervals,—two to four hours. As a hypnotic, I have seldom found it necessary to give a larger dose than one-eighth to one-sixth of a grain. In large doses it acts injuriously, by determining the blood to the skin, thus increasing the already too great tendency to perspiration. As an arrester of metamorphosis, it may prove useful when the wasting of the body proceeds with rapidity, but it is necessary to guard against the influence it possesses in checking the elimination of effete matter. To restrain

diarrhœa in all its stages there is no more trustworthy medicine than morphia when given in full doses. It may be required to the extent of two or three grains in the twenty-four hours.

As an antispasmodic for the relief of bronchial spasm, which so frequently proves distressing to the phthisical, morphia is found very useful in doses the same as I have recommended for the relief of cough. As a calmative it may be given in very small doses, one-thirty-second of a grain, three or four times a day to relieve the nervous restlessness and irritability often attending this disorder.

When, through some constitutional peculiarity, morphia and other preparations of opium cannot be tolerated, I have found the extract of Indian hemp very useful. Dr. Fronmuller (Vierteljahrschrift für die practische Heilkunde, 1860) speaks highly of the virtues of this drug as a hypnotic, especially in phthisis. His experiments of its powers extended over ten years. Lactucarium may also be tried in like circumstances.

CHLOROFORM.

The use of chloroform as an antispasmodic for the relief of bronchial spasm and spasmodic cough is capable of very good effects. Given diluted with alcohol, in which state it is commonly called chloric ether, and in combination with morphia, it produces most excellent results. I have tried it very extensively,

and have not found any unpleasant or injurious effects to follow its prolonged use in small doses.

ALKALIES.

I have rarely seen any benefit, except of the most temporary kind, result from the use of the fixed alkalies; and it is possible that, by destroying the acid reaction of the intestinal fluid, their use may be attended with an arrest of absorption,—the contents of the bowels in a healthy state being supposed to pass more readily into the alkaline blood when they possess an acid reaction. The use of trisnitrate or carbonate of bismuth will generally succeed in relieving those symptoms for which the alkalies are usually prescribed.

These objections do not apply to ammonia, which, as an antispasmodic and stimulant, is an excellent medicine.

On the other drugs and medicines used in the treatment of phthisis, I have no comments to make. As a description of the various medicines prescribed in this disease may be found in any systematic treatise on consumption, its introduction here would be irrelevant to the object of my paper.

CHAPTER X.

SOME OBSERVATIONS ON THE HYGIENIC MANAGEMENT OF PHTHISIS AND THE TUBERCULAR DYSCRASIA.

CLIMATE.

THE curative influence of change of air in the disordered state of constitution which precedes the formation of tubercle, and even in the early stages of tubercular deposit, is a subject on which much has been written. The advantages and disadvantages attending residence in the various localities which, whether from caprice of fashion or from more solid reasons, have become the favourite resorts of pulmonary invalids, have been also fully canvassed in numerous books and pamphlets now before the public. I shall therefore, in the brief remarks which I shall make, omit all consideration of special topography.

That much good may result from wintering in a mild and dry climate I have no doubt, but it is only in the earlier stages of the disease that any permanent benefit can arise from it. I have seen the most striking instances of the good effects of appropriate change of residence, in cases where present symptoms and family history could leave no doubt as to the existence of

tubercle. Too much cannot be said or written in deprecation of the custom of sending patients in the advanced stages of phthisis away from the comforts of home and the society of friends and relatives, to reside among strangers, whose habits and mode of life are unfamiliar, and not likely to be congenial under such circumstances.

For the working classes, who are necessarily unable to obtain the benefits of change of air and climate at their own expense, I think the advantages offered by some of our colonies have not been made sufficiently prominent. The climate of most parts of Australia, and also of Natal, are well suited to the requirements of the pulmonary invalid. Much good might be done if the aid given by Government for the emigration of healthy mechanics and domestic servants were extended to persons in the early stages of phthisis. Many poor seamstresses and members of other useful trades might by timely emigration be rescued from an early grave, this country might be saved the cost of their support when disabled by the progressing disease, and a thinly-peopled colony enriched by their skilled labour. A large proportion of the poor patients who apply for medical aid at the hospitals and institutions for the treatment of phthisis are engaged at sedentary trades, but the dressmakers, milliners, and tailors, are by much the most numerous. Among them may be found abundant instances where the disease is fairly traceable to the pestiferous atmosphere of closely-confined and overcrowded workrooms, and want of *insolation* or sunlight operating

on constitutions already enfeebled by insufficient or improper diet, and the curtailment of the hours of sleep. I have been informed, on reliable authority, that in some of the large millinery and dressmaking establishments, when a press of business occurs, as is too frequently the case during the London "season," it is usual to keep the poor workwomen ("hands" they are called, a very significant designation) employed night and day, until, overcome by exhaustion, the needle drops from the overworked "hands." The time for meals also is so curtailed as to be insufficient for the due mastication of even their scant portion. When the "season" is over, a large number are thrown out of employment, and thus reduced to a state of want. Can it be wondered at that phthisis is a prevailing disease amongst the members of this class?

To return from this digression. In selecting a locality as a winter residence it is desirable that a position should be chosen sheltered from the east and north winds, and open to the west and south, with a dry sandy soil and mild equable climate. Nothing is more injurious to the pulmonary invalid than sudden changes of temperature, especially when conjoined with a humid atmosphere. A clay soil is decidedly bad, on account of the surface moisture which continues so long unabsorbed after rain, and the fog which is produced by the lowering of the temperature, which usually comes with sunset after warm days.

The south of England offers many suitable localities to those who, although somewhat advanced in phthisis,

are still able to take advantage of the benefits derivable from a change of climate.

TRAVELLING.

In the early stages of tubercle, and in the constitutional ill-health which is its harbinger, more benefit results from travelling abroad than from a settled residence, no matter how salubrious may be the locality which is selected. The abstraction of the mind from the one absorbing subject, the present or impending disease, is most likely to be accomplished by the succession of incidents occurring in a journey, than by any other means. The invalid is, to use a popular phrase, "taken out of himself;" the mind is occupied with novel changes of scene and characters, and the exercise in the open air, the most important of all available remedies, is insured. However amusing the society of the fashionable watering-places, or however lovely the scenery, they soon become monotonous to the invalid, who is moreover continually reminded of his ailment by the very fact that the place is selected for the purposes of health, and that the visitors are fellow-sufferers. Except so far as a knowledge of his state may be necessary for the protection of the invalid from the commission of injurious acts, or exposure to noxious circumstances, it is desirable to abstract the patient's thoughts from the contemplation of his ailments. The Swiss mountains, the uplands of North Wales, and the highlands of Scotland are well suited to invalids in the

earlier stages of consumption, a dry bracing air being generally more beneficial than that of a warm relaxing character. These general suggestions are given as only an expression of my individual opinion. I do not offer them as applicable to all cases, but I am convinced that many valuable opportunities of recovery are lost through fear of the fatigue necessarily attending a protracted journey.

SELECTION OF A RESIDENCE.

When travelling is not admissible, or for a sojourn during the winter months, it is desirable that the house selected for residence should be situated on the higher part of a slope, with a southern or western aspect. A low situation, or even a hollow on high ground, is objectionable. A crowded locality should be avoided, but, if a town be the place selected, a detached house in the environs is the most eligible. A gravel or sandy ground should be chosen, not too near a river, and far from the neighbourhood of marsh, swamp, or stagnant water. No house should be taken with a cesspool *in or near* it, nor one in which the drainage is imperfect. It is also important that the ventilation of the latrines be so arranged as to have as little communication with the air of the house as possible. A house enclosed with high walls, or even surrounded by too many trees, is objectionable; either circumstance tending to make the air stagnant and unwholesome. Its construction should be such as to admit of thorough ventilation, with

windows large enough to allow of ample illumination. The sitting-rooms should especially be light and cheerful, and warmed from the ordinary open fireplace. I may here take the opportunity of condemning the use of gas-stoves, and stoves without chimneys for burning prepared smokeless fuel, so much in use for heating halls and passages. All means of warming, in which the products of combustion are not removed by flues, are positively injurious, and carefully to be shunned by the pulmonary invalid. The floor of the sitting-rooms should not be on the ground, in order to avoid the contamination of the air by exhalations from the earth beneath it.

SLEEPING ROOM AND ITS MANAGEMENT.

The bedroom of the pulmonary invalid should always be on the south or west side of the house; the windows should be large, to allow the free ingress of the sun's rays, which should never be excluded by blinds or curtains. To counteract the pollution of the air by night, one or more panes of glass should be removed, and their places supplied by fine wire gauze; by this contrivance a constant interchange is allowed to take place between the foul air in the room and the pure atmosphere without. In winter, and at all times when the temperature falls below 55° Fahrenheit, a fire should be kept burning day and night. The use of some deodorizing fluid is advisable, especially while the room is occupied. Condy's solution of permanganate of soda or potash is

the most manageable and the least dangerous to leave in the hands of servants. A small *jet d'eau* of this salt is a useful contrivance for the purification of the air; or a vessel containing this fluid raised some distance above the floor, and allowing its contents to drip on to a piece of linen, with a receiver underneath, is, although less elegant, still more effectual than the jet. On the patient leaving the bedroom, the windows should be thrown open, and the bed-covering, blankets, &c., removed from the bed, and exposed to a free current of air for several hours. If these precautions be attended to, it will not be necessary to deprive the patient of the comfort of a feather bed; otherwise the German or spring mattress should be used, as less likely to harbour the noxious vapours, the result of the excessive exhalations from the skin in this disease. It is perhaps superfluous to add that a frequent change of bed-linen and personal under-garments is of much importance.

CLOTHING.

In order to maintain as far as it may be possible an equal temperature of the surface of the body, it is necessary for the phthisical invalid to wear a *complete* suit of *flannel* next the skin. The mixture of wool and cotton known as merino, is not of equal efficacy to a garment of *wool only*. A thinner texture may be used in summer than in winter, but it is desirable that the variations in the amount of clothing required by the changes of season should be made in the outer, and not

in the under-clothing, the skin being more sensitive to changes in its immediate covering than to variations in the actual amount worn. The quantity of clothes should always be sufficient to maintain a comfortable warmth, the degree of which must be determined by the feelings of the patient. It should always be borne in mind that the heat-generating power of the consumptive is low, and that, to maintain sufficient warmth, it is proper to clothe in materials which are bad conductors of heat, in order to diminish the escape of that which is generated with so much difficulty. Woollen garments are therefore the most suitable, and light colours are better than dark, in consequence of their inferior power of radiation. It is not improbable that the heat-conducting powers, and also the hygrometric properties of woollen textures, may to some extent be modified by the process of dyeing, or by the chemical properties of the dyes. I have been informed by a celebrated *danseuse*, that scarlet flannel worn as an under-garment is more effectual in preventing chills after violent perspiration than flannel of any other colour. Care should be taken to select for clothing none but those textures that are permeable to the vapours and gases constantly eliminated by the skin, the retention of which in contact with the surface of the body is obviously injurious. The use of Macintosh and other impervious over-clothing is therefore in all cases to be prohibited.

It is commonly supposed that woollen under-clothing does not require to be so frequently changed as linen, &c. This error is likely to lead to injurious conse-

quences. Woollen textures are more absorbent and retentive of the exhalations from the surface, and therefore, when worn next the skin, they require to be often changed. This remark is the more necessary since the use of woollen shirts has become so common.

ABLUTION.

In all the stages of phthisis, the skin should be kept scrupulously clean, by daily or twice daily sponging with warm water in a room, the temperature of which is not below 62° to 65° Fahrenheit. The surface in phthisis becomes polluted by the non-volatile constituents of the perspiration, which by accumulating on the skin impair its functions. When the sponge is used rapidly, and its application is immediately followed by brisk friction, no risk can arise from its use.

The employment of warm baths in phthisis is of doubtful propriety, as they often induce languor and even faintness: in the early stages of the disease they may not be injurious. But as the only object to be fulfilled by their use is the cleansing of the surface, that can be equally well done by sponging. The use of the cold bath and of open sea-bathing is in a large proportion, if not in all cases of phthisis, injurious; the vital power in consumption is low, and the reaction on the establishment of which the utility of the cold bath depends is not easily induced. The patient remains chilly and languid, the appetite for food is lessened, and headache

and drowsiness soon follow, and distress the patient for several hours.

DIET.

The very frequent occurrence of dyspepsia, as a complication of phthisis in all its stages, indicates the importance of a careful regulation of the diet. The progressive loss of weight is sufficient evidence of the existence of grave error in some part or step of the process of metamorphosis. In what stage of the process this occurs, or whether the whole process is imperfectly performed, are questions of much practical interest; but the theory that phthisis has its *fons et origo* in some imperfection of the primary digestion has still to be proved.

Until the science of biology is sufficiently advanced to enable us to determine the point in the process of nutrition or disintegration in which the error lies, we must be content to make use of the facts deduced from empirical experience.

The first point which I shall notice, as bearing upon the subject of diet, is the progressive loss of fat in phthisis, a symptom which is one of the first to attract the attention of the patient or friends. The patient loses plumpness, the features grow sharp, the eyes sink through the removal of the fat. In the female the breasts grow flaccid. The subcutaneous fat is the first to disappear, then that which is more deeply placed, until at length all except what is a necessary part of some organs, as the heart, is removed.

The wasting of the protein structures, less obvious at

first, soon becomes apparent, and now proceeds with fearful rapidity. The skin becomes thin, feeling like paper when pinched up between the finger and thumb; the limbs become attenuated from waste of muscle; in fact, the higher or protein structures become subservient to duties fulfilled in health by lower and less valuable materials—the hydrocarbons and hydrates of carbon,—in the production of animal heat.

From this it is evident that inability to maintain the supply of hydrocarbonaceous material in the system constitutes one of the elements of the imperfection in nutrition on which the deductions of empirical experience may be brought to bear. In the restoration of the supply of fat, the exhibition of cod-liver oil is of great service. The rapidity with which it arrests the loss of flesh is a matter of daily observation, showing that in it we have a fat capable of gaining easy entrance into the system.

The hydrocarbons or hydrates of carbon which more strictly come under the head of diet are—

1. *The fixed fats*, as the fat of meat, butter, animal and vegetable oils, &c.

2. *Sugar and starch*, as bread and all cereals; also other substances, as sago, arrowroot, beans, peas, &c. &c., fresh and dried fruits, and table vegetables.

3. *Alcohol*, as brandy, rum, &c. &c., wines of every kind, cider, perry, malt liquors, &c.

From these must be selected, as a portion of the daily food of the phthisical, such as meet the requirement of his peculiar condition.

Of the hydrocarbons, as pyrogenetic or heat-producing foods, the fixed fats take the first rank; but unfortunately a strong dislike to such food exists in a considerable proportion of phthisical persons.

As soon as the patient shows a tendency to loss of weight it is proper that some one or more of the fixed fats should be taken as a portion of the daily diet. Modern cookery provides numerous formulæ for their combination with the cereals and starches, which afford ample scope for the constant variation of this class of foods. These compounds also possess the advantage of conveying the fats in a state of minute subdivision, thus facilitating their absorption. In this respect they possess much advantage over the crude fat of meat.

As an adjunct to the fats, or a substitute for them when the stomach will not tolerate them, sugar may be freely used; any tendency to acidity which may arise from its use, may be corrected by a little ammonia. The combination of sugar with cereals and starches, with milk, eggs, &c., may be used with advantage. When the powers of life are low, or the function of digestion impaired, alcohol in some form may be taken with the daily meals, a glass of good wine, or some genuine malt liquor may be taken at luncheon and at dinner. When there is a tendency to acidity of the primæ viæ, Cognac brandy may be taken instead. By the careful regulation of the diet, we may manage to convey into the system a considerable supply of the heat-producing food, and thus spare the more noble plastic or nitrogenous elements of the system, which,

in the absence of the former, are used as heat-producers, instead of being applied to the building-up and maintenance of the living structures.

As to the use of nitrogenous or plastic food, when the appetite is good, beef, mutton, poultry, fish, and eggs are instinctively taken as part of the daily diet, and little interference will be required on the part of the physician in regulating their proportions; but when, with advancing disease, the relish for such crude fare has passed away, we must take care that the patient is still supplied with a sufficient daily allowance of nitrogenous food to meet the never-ceasing wear and tear of structure. Under such circumstances, meat soups and essences may be given. The beef essence recommended by Dr. Druitt will be found a convenient and pleasant form for the exhibition of animal food in a small compass. Raw meat, with its expressed juice, is much used in Germany, in the treatment of asthenia and cachexia; it is, no doubt, highly nutritious and most easy of digestion; but independent of the dislike which English people feel to the use of uncooked flesh, it is objectionable as being probably one of the sources from which entozoa are conveyed into the body.

Besides the hydrocarbonaceous or heat-producing foods, and the nitrogenous or plastic, there is a third class to which modern science has attributed the property of arresting molecular disintegration, or wear and tear of structure. Of these the most prominent and most commonly used are tea and coffee. Tea generally agrees well with the subjects of phthisis, and may be

taken freely two or three hours after dinner. It acts as an exhilarant, and appears to exercise a neurotonic influence. It sometimes, however, when taken in large quantities, excites diaphoresis, and should, under these circumstances, be taken in a less dilute form. Coffee is an excellent beverage in phthisis. It has anti-spasmodic properties which tea does not appear to possess; hence its utility in spasmodic asthma. I have found it useful in relieving the paroxysms of spasmodic breathing which so often distress the consumptive. Coffee prepared with milk may often be used by those who dislike milk alone.

EXERCISE, ETC.

I have already mentioned the great influence of sedentary employments in ill-ventilated rooms, in the development, and probably in the genesis of pulmonary consumption. The converse is equally true; the best prophylactic to phthisis is active exercise in the open air. I have for some years strongly impressed upon my consumptive patients the importance of out-door exercise whenever the state of the weather permitted its use. When the circumstances of the patient will allow of a selection of a residence, a mild and dry air should be chosen to pass the winter and spring months in; but even by those who are compelled to remain during the inclement seasons in less favoured climates, open air exercise may, with few exceptions, be used more or less all through the winter. Although recognising the im-

portance of careful selection of the weather for going out of doors, there is, I believe, more danger to be apprehended from over-much caution in that respect than from what would be generally considered a rash indifference to the state of the skies and wind. It would be more conducive to the patient's recovery to brave all weathers, and live as much as possible in the open air, than to spend the winter in close confinement in-doors. There is no necessity, however, for either extreme; for even in the most inclement months of the winter, days suitable for going out for exercise may be found in sufficient number.

Exercise may be taken in the open air whenever the air is dry, even although the temperature be below the freezing-point of water, provided the wind blows from some point *west of the meridian.* When the wind comes from the east of that line, no advantage can arise from going out of doors. To most persons suffering from consumption, the east winds are positively injurious. I have often predicted the state in which I should find the out-patients at the Consumption Infirmary when exposed to the noxious influence of an easterly wind, and have found but few who did not suffer from its influence. In foggy weather, and when the air is cold and surcharged with moisture, the patient should remain in-doors. The amount of moisture in the air may be readily ascertained by means of the wet-bulb thermometer. A knowledge of the use of this instrument may be easily acquired. Air loaded with moisture, coming from any point east of the meridian, is to be

avoided, but especially so if the temperature be very low, and the air in brisk motion. When the wind comes from some point west of the meridian, the sky moderately clear, and the temperature not too low, even although the dew-point indicates a good deal of atmospheric moisture, the pulmonary invalid may venture abroad to walk, or ride on horseback, but not for carriage exercise.

A low temperature, provided that the sky be clear, and the air dry, and coming from west of the meridian, is not unfit for exercise out of doors. I have phthisical patients who, with much advantage, walk or ride abroad every bright frosty day,—some when the temperature is several degrees below the freezing-point of water. I have frequently seen the sufferers from the dyspepsia which often attends phthisis, and which is aggravated by confinement in-doors, restored to comfort, so far as the digestive organs were concerned, by taking exercise in frosty weather, which, until advised of its safety, they feared to attempt. The spirits also generally become buoyant from its use, and refreshing sleep follows. In the winter months a place for exercise should be selected with a southern or south-western aspect, sheltered towards the north and east; the vicinity of stagnant water or marshy ground should be avoided, as also a clay soil, which allows too much surface water to remain. A dry sandy or gravel substratum is the most eligible. In hot summer weather a less sheltered, or even a totally unsheltered ground is most suitable, such as sandy and chalky downs, and places which offer

no impediment to the free passage of the air over their surface. No shade should be sought beyond what a parasol may afford, exposure to the sunlight being one of the essentials to health. No phthisical person should go out of doors after sunset at any period of the year.

The amount of exercise must be regulated in accordance with the patient's strength, habits of activity, and time of life. The first sensation of fatigue should always determine its extent. When the patient can take active exercise, the movement should be sufficiently rapid to maintain a comfortable warmth without exciting perspiration. When unable to move with sufficient rapidity to create a healthy warmth, the clothing must be proportionately increased. It should always be borne in mind that the heat-generating powers in consumption are very low, and that an amount of clothing can be borne with comfort which, under other circumstances, would be intolerable. When the patient is too weak for automotion, carriage exercise of some kind may be taken, but the clothing must be sufficient to maintain a comfortable degree of warmth.

In advocating the advantages of exercise in the open air in all stages .of consumption, I am expressing the convictions educed from no inconsiderable amount of experience, and not an untried theory. I would urge the necessity of a steady perseverance in its use. I have seen much injury result from confinement during the winter months in rooms maintained at a high temperature, and, when the bright spring months have arrived, commencing to take exercise in the open air. Such a

course of proceeding places the patient in similar circumstances to those of an inhabitant of a warm latitude taking up his residence in this changeable climate. It is well known that such persons prove ready victims to consumption. This fact is also exemplified by the prevalence of phthisis amongst the monkeys in the Zoological Gardens. The influence of sudden changes of weather and temperature is well exemplified by the increased mortality of the phthisical in spring and autumn. These dreaded seasons might be deprived of much of their danger by a careful adaptation of the clothing to the daily and hourly variations of weather and temperature.

The system of management adopted at some of the institutions for the treatment of consumption—which to some extent converts them into instruments of evil, instead of making them, as they were intended to and might be, the means of doing unmixed good—also affords well-marked and melancholy proof of the evil effects of sudden changes of climate and temperature. The wards and corridors are maintained at a Madeira temperature, and after a two or three months' residence in them, the poor patients, accustomed to their genial warmth, are dismissed to their own homes, where they are exposed to the ever-changing weather of our variable climate, without the possibility of guarding against its noxious influence. The effects of this sudden alteration in their mode of life soon become evident. When I acted as one of the *visiting* physicians to the Infirmary for Consumption, Margaret-street, I had many oppor-

tunities of witnessing the baneful effects of that system. Poor patients, dismissed from one of the hospitals for consumption, and who became too ill and weak to allow of their attendance as out-patients, have applied for the aid of one of the visiting physicians at their own homes. It was found that the sudden change of circumstances soon began painfully to manifest its influence ; symptoms of active disease returned with increased severity, and soon ran their course. If consumption were a disease that could be cured by a few weeks' treatment, such a system of management might be highly advantageous; but there is abundant evidence that the arrest of the symptoms which often results from residence in the mild and equable atmosphere of the hospital, and the careful system of diet and management which is adopted, is of but brief duration. The constitution is made more susceptible of the influence of atmospheric changes by the careful nurture received in the well-warmed wards. The proper functions of hospital wards are to provide bed, food, and medical aid for the sick poor, too ill to attend as out-patients, *but with due regard to their habits and circumstances, and to the mode of life they will have to adopt on leaving the hospital to return to their own homes.*

FRICTION.

When the patient is too weak to take exercise of any kind, friction of the surface, either with the hand, or, if it can be borne, with a flesh-brush or horsehair glove, will act to some extent as a substitute. The rubbing

should be practised twice a day, and continued until it induces a glow of warmth.

AMUSEMENTS AND OCCUPATION.

As a part of the treatment of phthisis, the engagement of the mind in pleasurable and amusing occupations is not to be neglected. For as depressing passions and discontent of mind have a powerful influence in the production of tuberculosis, so the converse tends to its prevention or arrest. It is unnecessary to specify the kinds of amusement; they must be suited to the disposition and taste of each, care being taken to adapt them to the physical condition of the patient.

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