Phthisis pulmonalis / John Hughes Bennett, M.D.

PHTHISIS PULMONALIS.

By John Hughes Bennett, M.D., F.R.S.E.

Definition.—By the term Phthisis or Consumption (from $\phi\theta\iota\omega$ to waste or consume) has been understood from the earliest times, a disease characterized by wasting or emaciation of the body. The cultivation of morbid anatomy having determined that this condition was frequently dependent upon the deposition of little grains or nodules of a peculiar substance in the lungs; these received the name of tubercles. Thus the terms tubercle, tubercular disease, or tuberculosis, gradually came to be regarded as synonimous with Phthisis, which may now be said to comprehend all kinds of disease essentially connected with or dependent upon pulmonary tubercle.

It is this important morbid condition which we propose to describe in the present article, under the general heads of Pathology, Symptoms, Diagnosis, Prognosis, and Treatment.

I. Pathology of Tubercular Phthisis.

The pathology of Phthisis involves a consideration of the histology, chemistry, and general pathology of tubercle—of the morbid anatomy of the disease—of its causes—of its natural progress—and of the theory of its production.

Histology, Chemistry, and General Pathology of Tubercle.—The term tubercle, literally implies a little swelling, and in this sense it still serves to distinguish a class of skin diseases. As applied to the peculiar deposits so frequently found in the lungs and other organs, it now means not only those products when they present a tubercular form, but when they are infiltrated in masses, or exhibit appearances wholly opposed to the original signification of the word. At present, by tubercle is understood a peculiar morbid deposit, sometimes grey, but more frequently of a yellowish colour, varying in size, form, and consistence, which sometimes softens, and causes ulceration in the surrounding te tures, but which at others dries up, becomes cretaceous or calcareous, and produces induration and cicatrization.

The ultimate structure of tubercle varies according as it is soft or hard, or as it has been recently or for a long tim deposited. If we mix a minute fragment of yellow, tolerably soft or cheesy, tubercle

with a drop of water, and crush it between glasses, so that it may be thoroughly broken up, and capable of being examined with a magnifying power of 250 diameters linear, it may be seen to consist of a number of irregularly-shaped bodies, and of numerous molecules and granules. The bodies are called *tubercle corpuscles*, and approach a round, oval, or triangular form. Their longest diameter varies from the four thousandth to the two thousandth of an inch. They are solid, having a distinct external outline, and have embedded in them generally three or more granules and molecules, varying in size from a point scarcely measurable to the six thousandth of an inch in diameter. Acetic acid causes partial solution and transparency of these bodies. Æther and alcohol produce little change. Ammonia and Liquor potassæ cause them to break down and dissolve with varying rapidity. The molecules and granules differ greatly in various specimens of tubercle, sometimes being very minute, and at others, half the size of the corpuscles themselves. Chemically, they may be albuminous and partially soluble in acetic acid,—fatty when they are soluble in æther and potash—or mineral when they are dissolved by the mineral acids.

The corpuscular and molecular elements of tubercle are always present, but in different proportions. Generally speaking in indurated or grey tubercle there are few molecules, and the corpuscles are so compressed together as to be scarcely distinguishable. On the other hand, in soft tubercle, the molecules are numerous, and the corpuscles easily separable. The more tubercle softens and becomes diffluent, the more the relative amount of the molecular element increases.

In chronic tubercle, and especially when it has undergone the cretaceous or calcareous transformations, the elements described become mixed with hard, gritty particles of earthy salts. These are of irregular form and size, and are large and numerous in proportion as the tubercle is more and more calcareous. They are often associated with crystals of cholestrine, and not unfrequently with black pigment granules and masses. When tubercle is converted into a mass of stony hardness, a thin section of it presents an irregular granular appearance, made up of a congeries of minute earthy particles without any distinct form.

Tubercle corpuscles may be associated with pus and granule cells, as well as those peculiar to glandular organs or mucous surfaces. From pus corpuscles they are readily distinguished by the action of acetic acid, which in them causes no granular nucleus to appear. From the fibre or plastic cells found in recent lymph they may be separated by their irregular form, smaller size, and the absence of primitive filaments. With the granule cell they can scarcely ever be confounded on account of its large size, brownish appearance, and granular structure. From gland or epithelial cells they are distinguished by their smaller size and the absence of nuclei. Cancer cells also are at once recognised by their size, transparency, and oval nuclei. The only elementary structures resembling tubercle corpuscles are those constituting the

reticulum of cancer and the disintegration of fibro-nucleated growths. The former, although often, even to the naked eye, resembling tubercle, and under the microscope composed of irregularly-shaped nuclei, and numerous molecules, resulting from the histolysis of cancer, are almost always associated with the more recent cell forms of that growth, while the fragments, or presence of fibres, serve to distinguish the latter. It should be remembered that all forms of exudation, and many kinds of growth, at an early period of development, present a molecular and nuclear structure throughout, and might by inexperienced histologists be confounded with tubercle. A careful consideration of all the circumstances connected with tubercle, and of the distinctive structures associated with it, however, will seldom deceive the skilful observer.

Tubercle has been made the subject of special chemical analysis by numerous chemists, from which the following conclusions may be drawn:—1. That it consists of an animal matter, mixed with certain earthy salts. 2. That the relative proportion of these vary in different specimens of tubercle. That animal matter is most abundant in recent, and earthy salts in chronic tubercle. 3. That the animal matter consists principally of albumen, occasionally mixed with a small amount of fibrin. Fat also exists to a slight degree, and becomes more abundant as a constituent as the disintegration of tubercle progresses. 4. The earthy salts are principally composed of the insoluble phosphate and carbonate of lime with a small proportion of the soluble salts of soda. 5. That very little difference in ultimate composition has yet been detected between tubercle and other albuminous compounds.

From the preceding structural and chemical facts tubercle must be regarded as a morbid product, having a very low degree of vital power, seldom proceeding beyond an imperfect degree of nuclear formation, and having a constant tendency to fatty or mineral degeneration. It assumes four forms:—

1. *Miliary Tubercle*, when the morbid deposit is scattered throughout an organ, or on the surface of a membrane, in isolated grains like millet seeds. Sometimes they are sprinkled indiscriminately throughout a tissue; at others, they are in groups or clusters more abundant in one part than in another. Occasionally they are minute, of greyish colour, semi-transparent, and hard to the feel—the so-called *grey granulations* of Bayle. More frequently they are of a yellow colour, about the size of a millet or mustard seed, and of soft consistence, so that they can be easily crushed between the fingers. In consistence they may vary greatly, being sometimes hard, or, as they are then called, crude, or they may be so soft as to resemble cheese and cream. They may have undergone the cretaceous or calcareous transformations, and still preserve their miliary form.

2. *Infiltrated Tubercle* occurs in diffused masses, varying in size from that of a bean to that of the entire organ affected. Thus a lymphatic gland, or the lobe of a lung, may present a uniform deposition of the substance throughout its whole extent. Between these two

extremes every variety in extent of deposition may be observed, masses being frequently formed by the agglomeration or condensation of miliary tubercle. Like it, also, this form of the deposit may be grey or yellow, crude or soft, and undergo the cretaceous and calcareous transformation.

3. *Nodular and Encysted Tubercle.*—This form of tubercle exists in rounded, isolated masses, varying in size from that of a small pea to a bean. It may present all the characters of the other forms, but is frequently seen to be surrounded by a capsule, more or less dense, of fibrous tissue.

4. *Cretaceous and Calcareous Tubercle.*—This form of tubercle is distinguished by its white appearance, and its putty-like, gritty, or stony consistence.

All these forms of tubercle run into one another, and may exist in the same individual, and often in the same organ, especially in the lungs. They indicate no further essential difference in the nature of the deposits than is concerned with its amount and extent, its hardness or softness, its colour—whether white, yellow, grey, or black, or its being recent or old—miliary and infiltrated tubercle being generally new, while encysted and calcareous tubercles are always chronic. In the last, the animal matter has been absorbed, while the mineral matter remains to form a concretion.

Great discussion has taken place as to whether tubercle is peculiar to any particular elementary tissue, and as to how it is produced. Like all forms of exudation, it may occur in every vascular texture, and readily coagulates in the minute spaces between or outside the textural elements immediately external to the vessels. Of this we may easily be satisfied by studying its special histology in various organs.

With regard to its mode of production, tubercular matter is first separated from the blood-vessels as a fluid exudation, forming by its coagulation a molecular blastema. The molecules of which it is composed then aggregate or melt into each other to produce the tubercular corpuscles. These, if compressed together and formed slowly, constitute the indurated dense granulations described by Bayle; but if separated by soft molecular matter, produce the more common yellow miliary tubercles. The idea that these bodies are invariably the result of cell proliferation originates from the erroneous hypothesis maintained by Virchow and his followers, viz. that all morbid products are derived from cells. In their attempts to maintain this view, they have mistaken the occasional enlargement and proliferation of fibre cells in areolar tissue first described by Lebert, as fibro-plastic cells, for tubercular granules, which they describe as the essential elements of the lesion. It is not in the pleura or peritoneum, however, where such fibrous growths are occasionally seen, that the real manner in which tubercle is formed can be well observed, but in the lung, where the disease is most common and best characterised. There, all observation demonstrates that it originates in a molecular exudation, which, in consequence of diminished vital power, seldom passes beyond the

nuclear stage of growth. It is this low type of *hysto-genesis* that communicates to the exudation those essential characters which form the foundation of tubercular or phthisical disease.

MORBID ANATOMY OF PHTHISIS PULMONALIS.—Although tuberculization of the lungs is a constant and essential element of Phthisis, it rarely, if ever, happens that the disease proceeds to a fatal termination without affecting other organs. Nothing, also, is more common to find, during the examination of dead bodies generally, that the lungs are often the seat of tubercle to a greater or less extent, although during life the presence of the disease has never been suspected. So common, indeed, is this lesion, and so many have been the able investigators of the alterations it produces in the various organs of the body, that all the anatomical facts connected with it may be said to be thoroughly known. We shall notice the morbid changes observed in cases of Phthisis in the different parts of the frame, *seriatim*.

The Lungs.—These are the organs in which, according to the researches of Louis, tubercle is sure to be discovered, if it occur in the body at all. This law, though now known to admit of some exceptions, especially as regards tubercular peritonitis, is still so generally true as to be one of the most valuable generalizations ever arrived at in pathological science. To the same distinguished physician we are indebted for another fact of no less importance, viz. that when tubercle occurs in the lungs it attacks the apices of those organs first. The exceptions to this law are so few as in no way to invalidate its great practical value.

The morbid changes found in the lungs of those who die labouring under Phthisis pulmonalis vary according as the disease is acute or chronic, as it is advancing or retrograding, and as it is associated with other lesions. In acute cases miliary and infiltrated tubercle are more or less general in one or both lungs. The deposit is generally soft, and frequently diffluent, causing ulcerations and irregular anfractuous cavities. The intervening pulmonary texture is often engorged with blood, is more or less pneumonic, while the bronchi are loaded with purulent matter. The acute disease in many respects resembles anatomically grey hepatization of the lung, and like it is more frequently most developed in the lower lobe.

In chronic phthisis, constituting the vast majority of cases met with, all the forms of tubercle previously described are met with. The tubercle is most abundant at the apex, but may invade the greater portion of one or both lungs. In the latter case, it will most often be observed that one lung is more affected than the other, so that an examination of them displays all stages, either of the onward or retrograde progress of the disease; these, although often associated together in very chronic cases, are so distinctive anatomically as to require a separate description.

The appearances of the lung during the onward progress of the disease are—1. The presence of miliary tubercle to a greater or less extent. 2. The softening of this tubercle so that it readily breaks

down under the finger or a current of water, and forms small cavities or irregular ulcerations communicating one with another. 3. The existence of distinct ulcers, excavations, or cavities, as they are named. These vary in size from a pea until they involve nearly the entire lung. There may be one or several. They may be isolated or anfractuous, that is, communicating with one another. If recent, the internal walls are irregular and rough; but if chronic, the ulcerative process has dissected out the fibrous tissue, leaving irregular bands stretched across the interior, composed of blood-vessels, the bronchi or indurated fibrous tissue. When very chronic, the interior is lined with a smooth membrane. These cavities may be filled with air and fluids in varying proportions; the latter being viscous, purulent, occasionally sanguinolent, and not unfrequently ichorous, of a dirty-green colour and offensive odour. These changes in the lung may be associated in varying proportions with many other lesions to which the organ is subject. Pleuritic adhesions, by means of fibrous lymph, are very common, the pleuræ, at the apices of the lung, often being united to each other by a dense, tough substance which renders their separation impossible. Bronchitis, in all its forms and stages, may exist together with more or less emphysema, dilated bronchi, and collapse of the lung. There may be pneumonia or extravasation of blood, involving varying amounts of lung tissue.

There is a disease frequent in coal miners, called carbonaceous lungs or Black Phthisis, in which there is no tubercle, but a deposition and infitration of lamp-black or carbon in a finely, molecular form, and which gives rise to cavities and disorganization of the pulmonary tissue, also commencing at the apex. It is accompanied by black spit, and is generally fatal.*

The retrograde progress of the disease is characterised anatomically, first, by the horny induration and cretaceous or calcareous transformation of the tubercular matter; secondly, by puckerings and cicatrices of the lung tissue; and thirdly, by contractions, loss of substance, and more or less induration of the organ. It may be observed in about one-fourth of all those who are examined after death in our public hospitals, that the apices of the lungs contain one or more masses, varying in size from a millet-seed to a coffee-bean of cretaceous or calcareous matter. That these masses were originally tubercle cannot be doubted by those who have had any experience in post-mortem examinations, the more so as in various cases such tubercle, whether in the miliary, infiltrated, or nodular forms may not unfrequently be seen to present the various stages of induration and horny hardness, approaching towards the calcareous substance. Such hard masses if dug out and allowed to dry, indeed, become cretaceous, the animal matter having shrunk away, leaving the mineral substance unaltered. In old persons above seventy years of age, it has been shown by Rogér and Boudet that the presence of these concretions in the lungs

* See the author's Clinical Lectures, 5th edit. "On Carbonaceous Lungs," p. 756.

increase to the extent of from one-half to four-fifths of all those examined.

If these concretions or masses of indurated tubercle occur at the surface of the lungs, the pleuræ covering them and subjacent tissue are frequently drawn in and puckered. If they occur deeper they are surrounded by indurated pulmonary texture, more or less tinged of a black colour. Occasionally, also, linear and radiating cicatrices indicate the disappearance and closure of pre-existing ulcerations. Sometimes, however, tubercular cavities, instead of closing and forming cicatrices, remain permanently open and filled with air. They are lined by a smooth membrane, and almost always communicate with a bronchial tube. In this condition we discovered, in 1842, in such a case, associated with pneumo-thorax fungi growing in the infiltrated matter lining the chronic cavities, and have found them frequently in similar excavations since then.[1] At other times the bronchial tubes are permanently dilated, by the contraction and induration of the pulmonary tissue between them. This occurrence, conjoined with the other lesions referred to, gives rise to that condition described by Dr. Corrigan as cirrhosis of the lung.[2]

The various alterations now described may be associated with other lesions, especially chronic adhesions of the pleuræ, emphysema, chronic bronchitis, and dense pigmentary deposits. Not unfrequently it may be observed that whilst one portion of the same lung presents a marked example of the retrograde progress of phthisis, another portion as decidedly shows the progressive changes. In such a case the former indicates tolerably well the older and more chronic transformations of the pulmonary tissue.

It would thus appear that there is nothing essentially destructive or necessarily fatal in phthisis, and that in all stages of the disease it may be checked, and enable the individual affected to live many years subsequently, and die of old age or other disorders. Attention to morbid anatomy in recent times is demonstrating that this occurs far more frequently than was formerly supposed, and is due not only in many cases to the spontaneous efforts of nature, but in not a few, to the direct interference of art.[3] This latter termination, however, is materially interfered with should other organs participate in the disease, and the morbid changes observed in them, therefore, next demand our attention.

The Pleuræ.—We have already pointed out that the whole progress of phthisis the pleuræ, as well as every other part of the lung, are apt to be affected. This, however, may not only be exhibited by adhesions more or less dense, but not unfrequently by the deposition of tubercle

[1] Description of a Cryptagamic Plant found growing in the sputa and lungs of a man who laboured under pneumo-thorax. Trans. of Royal Soc. of Edinburgh. 1842.

[2] See Dublin Medical Journal, vol. xiii. 1838; Laennec, vol. i. p. 201; Reynaud, Mémoires de l'Academie, tome 4me; Cruveilhier, Anatomie Pathologique, livraison 32, planche 5, fig. 3; and the author on Pulmonary Consumption, 2d edit. Case 3, p. 57.

[3] See the author's work on Pulmonary Consumption, in which several such cases are recorded, and the post-mortem appearances figured.—Figs. 21 to 26.

in a miliary or infiltrated form, the latter of which assumes a laminar or stratiform character. Effusions and exudations into the pleural cavity may also occur, giving rise to more or less hydro-thorax and empyema. Further, the pulmonary pleuræ may be ulcerated and communications take place with tubercular cavities, or with the bronchial tubes, in which last case pneumo-thorax is the result.

The Trachea and Larynx.—The trachea and larynx are very commonly the seat of congestion and ulceration in cases of phthisis. In the mucous membrane of the former the ulcerations are frequently small numerous, and round, as if dug out with a small point; at others, they are larger, deeper, and lay bare the cartilaginous rings. In the larynx they are generally irregular, varying greatly in size, and sometimes involving both vocal cords and the whole interior of the organ. Their edges are occasionally studded with indurated tubercles, and sometimes there is thickening with œdema of the cellular tissue, tending to close the glottis. In chronic cases of laryngeal ulceration, which is often called *Phthisis laryngea*, caries, and necrosis of the cartilages may occur.

The Bronchial Glands.—It is seldom in cases of chronic phthisis that the bronchial glands escape being affected with tubercle which assumes the infiltrated form, and causes in these considerable enlargement. On section they may be almost colourless, but they are sometimes more or less loaded with black pigment.

Heart and Pericardium.—It is very rarely that tubercle is deposited in the heart or pericardium, but when this does occur, it takes place in the nodular form. The heart, however, is very liable to become atrophied, and smaller than usual. In lingering cases of the disease, with extreme emaciation, it may be found after death not larger than a duck's egg. The bulk appears to be adapted to the diminished amount of blood in the body, and the little work it has to do.

Alimentary Canal.—Very rarely ulcerations may exist in the pharynx, but enlargement of the follicles is common. The œsophagus and stomach are organs which are remarkably free from tubercular disease; but, according to Louis, the mucous membrane of the latter viscus is liable to softening, mammilation, and attenuation, in the majority of cases. In the small intestine the glands of Peyer are very liable to enlargements and ulceration, especially in its lower third. The enlargements are owing to the deposition of tubercle in and around the solitary and aggregated glands, often accompanied by considerable redness and vascular congestion. It presents the miliary or granular forms, although occasionally it may exhibit small nodules the size of peas. Tubercular ulcerations of the small intestines are common in the last stages of phthisis, and occupy the seat of the solitary and aggregated glands. In the first case they are rounded, with abrupt or tuberculated margins, with a yellowish or dirty-grey base. In the latter case they are oval in form, running transversely round the gut, so that they are readily distinguished from typhoid ulcerations, the long axis of which is in the opposite direction. Their

margins are smooth, sometimes tuberculated; the base sunk, and covered with a purulent or dirty-greyish substance. Above the ilio-colic valve the ulcers have a tendency to run into one another and produce an ulcerated surface, more or less broad, surrounding the gut. These ulcers occasionally are so deep as to perforate the intestine. Similar tubercular granulations and ulcers may also be found in the large intestine.

Peritoneum.—In rare cases the intestinal ulcerations perforate the bowel, almost always giving rise to fatal peritonitis. Not unfrequently, however, chronic adhesions exist to a greater or less extent, on the peritoneal surface outside these ulcers, uniting coils of intestines to one another, or to the abdominal walls. Chronic tubercular peritonitis may also occur when the intestines are covered and agglutinated together by coagulated exudation, studded throughout with miliary tubercle. This lesion, though it may accompany pulmonary phthisis, may, sometimes exist as a primary and independent disease.

Mesenteric and other lymphatic glands.—These are very liable to be enlarged in Phthisis, when they may present greater or less induration and enlargement, according to the recent or chronic condition of the disease. Tubercle usually is present in them in the infiltrated form, at first yellow, cheesy or soft—afterwards white and indurated, and, in a few cases, cretaceous and calcareous.

Liver.—In children the liver is not unfrequently the seat of miliary and infiltrated tubercles, but in the adult this is very rarely observed. More commonly the organ is enlarged, a result previously supposed to be owing to fatty degeneration, but now known to depend upon a peculiar albuminous transformation known as the waxy disease, from its resemblance to bees'-wax. In this condition it maybe so enlarged as to weigh eight or ten pounds. It presents a peculiar density to the feel, a pale fawn or yellow-brownish colour; and on section the cut edges, when held up to the light, are semi-translucent, We were the first to examine this disease of the liver microscopically in 1845, and found the hepatic cells to be condensed together, shrivelled, colourless, and of peculiar transparency, with the nucleus absent, or evidently disappearing. It has been supposed by some to be related chemically to starch, and therefore called amyloid degeneration. But it is never changed blue on the addition of iodine, although we have found that like certain other forms of albuminous compounds it possesses the property of fixing colours, such as the reddish-brown tint of iodine, or the peculiar pigments of indigo and carmine.[1]

Spleen and Kidneys.—Both these organs, like the liver in early life, may become subject to tubercular deposits in the miliary form, which in the adult are very rare. The kidney further is liable to extensive tubercular deposits, causing abscesses, or what is known as scrofulous pyelitis. Like the liver also, it is commonly affected in Phthisis with the waxy degeneration, causing induration and enlargement of

[1] See the author's Clinical Lectures, 5th edit. Case clxi. p. 731. Also remarks on the waxy degeneration, Idem, p. 249.

its substance, and the same translucent albuminoid degeneration of the cells and vascular elements.

Other textures and organs.—In the foregoing summary we have only shortly alluded to the morbid changes most commonly found in cases of Phthisis. It should be understood, however, that almost every vascular tissue in the body may, under particular conditions, be subject to tubercular deposits in conjunction with the disease of which we are treating, and thus in special cases, the bones, muscles, the brain and its membranes, skin, the bladder, testes, &c. &c., may be occasionally involved.

CAUSES OF PHTHISIS PULMONALIS.—The various circumstances which predispose to Phthisis have been most anxiously investigated. All we can venture to offer in this place is a very general summary of the numerous researches undertaken in connexion with this subject.

Age.—Phthisis is not a disease that is common in early infancy or in advanced age. It is more frequent during childhood and youth, although cases may be seen in many persons of middle age, as well as among young children. From the returns of the Brompton Hospital for Consumption, it would appear to be most frequent between the ages of twenty and thirty. Age unquestionably greatly influences the progress of Phthisis, the acute being most common in young, and chronic in elderly persons. We should not forget, however, that Phthisis in advanced life is frequently the termination of a prolonged case, which commenced many years previously.

Sex.—It is generally supposed that Phthisis is more common in females than in males, but this does not appear to be an invariable rule. It is certainly not the case in the Royal Infirmary of Edinburgh, Dr. Home having pointed out that in the years 1833, '34, and '35, 185 cases were males, and only 112 females. The same excess of males labouring under the disease has prevailed in that institution ever since, as in the years 1843 to 1846 inclusive, they were—males 356, females 217; and in the latest reports for the year 1865, the numbers are—males 126, females 64.

Hereditary tendency.—Instances are not uncommon in which members of the same family are observed to become affected one after another with Phthisis, on arriving at a certain age. This, however, may depend not so much upon weakness inherited from parents, as it does upon a vicious method of rearing the infants and children of certain families. We have seen the children of many families become phthisical, in whom no hereditary taint could be traced, and have frequently pointed out, in the clinical wards of the Royal Infirmary, that among the six or eight cases of Phthisis then present, not one could be traced to hereditary causes. Although, therefore, there can be no doubt that weakness in parents is a cause of weakness in the offspring, we are of opinion it is by no means so general or influential a source of Phthisis as is usually supposed.

Vitiated atmosphere.—This has been concluded to be a powerful

cause of Phthisis by numerous authors, and there can be no doubt that the habitual breathing of deoxidized or impure air, must greatly impede nutrition. Among the poor there can be little difficulty in attributing its effects to close or overcrowded rooms, in which they work and sleep. Among the higher classes this is not so obvious a cause, although Baudeloque, in support of this his favourite theory of the origin of tubercles, accused them of lying in bed too long, and said that the children slept with their heads under the bed-clothes.

Climate.—It is an undoubted fact that Phthisis is more frequent in temperate climates than in very cold or very warm ones. It is by no means common in Russia and Canada, notwithstanding the long continued cold, nor does it prevail among the nations of the tropics. These last, on the other hand, are peculiarly liable to Phthisis on coming to Europe. Some favoured spots are stated to be free from Phthisis; among these, it has been recently pointed out by Drs. Macrae and M'Coll, are the islands of Lewis and Mull, among the western isles of Scotland. Dr. Hjaltelin has informed me that Iceland enjoys a like immunity.

Contagion and Infection.—Several of the older writers were of opinion that Phthisis was contagious and infectious, an opinion still widely disseminated in certain countries, more especially Spain and Italy. We have too frequently seen the death of a phthisical patient in Italian hotels give rise to the most extortionate demands for the pretended destruction of bedding and furniture, all of which should be firmly resisted. It has occasionally been observed that Phthisis in a wife or husband has been followed by the appearance of the disease in the husband or wife. The frequency also with which young women become phthisical after pregnancy has given rise to the idea that they may have been infected by the opposite sex through the uterus. These ideas have received no support from the profession. In 1865, however, it was announced by M. Villemin[1] that the cause of tubercle was a virus, and that he had succeeded in inoculating it in healthy rabbits, by inserting gray granular tubercle below incisions in their skins. These experiments appear to have been carefully performed. They have been successfully repeated by Lebert, and also by others with varying results. The experiments of Drs. Andrew Clark,[2] Wilson Fox,[3] and Burdon Sanderson[4] have further shown that not only tubercle but a variety of other morbid products, and even local irritation of the tissues, may produce deposits in the glands, lungs, and various organs in rabbits, and especially in guinea-pigs. Thus the introduction of a seton produced them in one case, and pieces of putrid muscle in no less than four out of five inoculations.[5] These facts show that the lesions described as tubercle are analogous to the secondary deposits

[1] For a good summary of M. Villemin's views and experiments, see Edinburgh Medical Journal for February, 1867, p. 756.
[2] Medical Times and Gazette, 1867.
[3] On the Artificial Production of Tubercle in the Lower Animals. 4to. London, 1868.
[4] Tenth Report of the Medical Officer of the Privy Council. London, 1868.
[5] Wilson Fox, p. 5.

occurring in pyæmia, and which are known to result from the poisoning of the blood by absorption and injection into it of putrid fluids, and in no way support the hypothesis that Phthisis ~~morbid and~~ Pulmonalis is contagious or infectious. But we shall again allude to this matter under the head of Theory of the Production of Phthisis.

Occupation.—Phthisis is unusually common among the workers in certain trades, more especially stone masons, grinders and polishers of steel, dressers of flax and feathers, cotton carders, china scourers and potters, tailors, sempstresses, straw plaiters, lace makers, silk workers, and iron and coal miners. On the other hand, cooks, butchers, tanners, tallow chandlers, and soap boilers, enjoy to a great degree an immunity from the disease. In the first class of cases the inhalation of foreign particles into the lungs excites local irritation, which proves injurious to the respiration, and deteriorates the constitution; or the result is occasioned by the combined operations of sedentary employments, impure atmosphere, exhaustive work, and bad food. In the second class of cases there are good wages, and as a concomitant, good food, while a constant contact with oil is supposed to offer an additional explanation of the fact.

Humidity has been supposed to exercise a considerable influence in the production of Phthisis. Majendie thought he had produced tubercle in rabbits by confining them in damp cellars. Baudeloque points to numerous localities, such as morasses, houses surrounded by ditches, and so on where the disease is rife. It is also common in Holland, and other countries liable to damp fogs, and an atmosphere saturated with moisture. Phthisis has been shown to prevail in the damp soils of the United States by the careful investigations of Dr. Bowditch of Boston, U.S., and of England, by those of Dr. Buchanan.[1] On the other hand, in elevated dry regions, it is said to be comparatively rare. In the Seventh Annual Report of the Registrar-General for Scotland, it is pointed out that for every 100,000 inhabitants there died annually from consumption 206 persons in Leith, 298 in Edinburgh, 310 in Perth, 332 in Aberdeen, 340 in Dundee, 383 in Paisley, 399 in Glasgow, and 400 in Greenock. In these towns, therefore, the death-rate is diminished in proportion to the dryness of the site.

Diet.—Of all the causes producing Phthisis and tubercular diseases generally, a low diet, or imperfect assimilation of food is the most obvious and unequivocal. Among the lower orders we observe this to be the case in all large cities among the ill-fed and half-starved poor, in orphan and foundling institutions, and whenever from any cause the food of the people is rendered scarce or dear. In the higher classes we observe it following the system of nourishing infants by hired nurses, or bringing them up by hand, and in early childhood from a pampered indulgence in indigestible or non-nutritious substances. Not unfrequently it results from allowing weak children to reject the fatty con-

[1] Tenth Report of the Medical Officer of the Privy Council, 1868.

stituents of food. Most of the other causes to which we have referred will be found on examination to have influenced the economy, by diminishing appetite, and impeding digestion and assimilation of food.

Other diseases.—It has frequently been observed that Phthisis follows attacks of previous diseases, which by either affecting the lungs, or strongly depressing the system, and not unfrequently by both, appears to have caused the disease. Thus it has followed pneumonia, bronchitis, measles and hooping cough in persons previously healthy. Want of appetite and dyspepsia in the young is a fertile source of Phthisis. Indeed, all disorders which permanently lower the strength in the young, and interfere with the nutrition so necessary at that period of life, for developing the growth of the body, may be regarded as a cause of tubercle. The weakness resulting from parturition and prolonged lactation in feeble women is a striking example. For the same reason it occurs in some rheumatic and gouty persons.

Predisposition.—Seeing that none of the causes mentioned invariably produce the disease, and that striking exceptions may be cited of persons who exposed to one or all of them have yet escaped the malady, the difficulty has been attempted to be got rid of by recourse to predisposition. In the same manner that many persons exposed to fever or small-pox are not affected, or that certain plants only grow on particular soils or patches of ground, so it is said there must be a something superadded to other causes in tubercular cases, which is called predisposition. It is unnecessary to enter upon the subtile argument which has thus been raised, and which appears to us, in the present state of science, as reasonable as is the calculation of chances concerning the probability of escape to any particular soldier who exposes himself to the fire of an enemy. In neither case is it predisposition nor chance, but rather the operation of fixed laws, which it is not given to us as yet to recognise, or regarding which we cannot so calculate as to avoid their operation.

It may be observed, especially among the lower classes, that vitiated air, humidity, want of cleanliness, bad diet, drunken habits, and a variety of debilitating causes, all concur apparently to produce the effects, so that it becomes very difficult to attribute the disease to any one especially. In the higher classes two causes more especially are found, viz. an hereditary taint, and improper nutrition. On looking at the whole train of causation, it seems to me certain that they may all converge in mal-assimilation or deficiency of food. As far as the strength of the economy and constitution of the blood are concerned, it matters little whether deficient vitality be caused by the food being deficient, or if abundant its not being digested, or again, if digested, it being deteriorated in the lungs by noxious gases, by inoculation of morbid matters, or by constant congestion, the result of tissue irritation. As a general conclusion we hold to the belief that the great cause of tubercle is weakness of constitution, or diminished vital power, however produced; a theory which has the merit of teaching mankind to avoid all causes which may exhaust the frame and to establish

as remedies everything that can communicate to it strength and vigour.

Natural Progress of Phthisis.—The commencement of Phthisis may be said to be established as soon as it is distinctly shown that tubercles exist in the lung. This period, however, is generally preceded by more or less deterioration in the general health, indications of debility, and impoverishment of nutrition. It is true there are many individuals in whom the deteriorating process is so gradual, that this change has not been observed either by themselves or their friends, but it is seldom that such will escape the observation of the experienced Physician. At other times the impaired health is caused by some exhausting malady of a general character, or of one especially affecting the chest. It sometimes happens that the first obvious departure from health is a hemorrhage coming from the lungs. It is under these, or other exhausting circumstances that a matter is exuded in a fluid state from the capillaries of the lungs, which collects and coagulates in such portions of the pulmonary texture as offer least resistance. Although a small portion may insinuate itself between the elementary textures of the organ, it will principally pass into the air-vessels, so as to obstruct the entrance of air. A miliary tubercle may in this way block up from three to twenty of these air-vesicles. The amount of isolated tubercles so formed in the lung, their aggregation and union together giving to the morbid product the appearance of infiltration, somewhat impede respiration and the functions of the pulmonary organs, according to the extent of the morbid product. Their presence, also, by irritating the pulmonary nerves, gives rise to the frequent dry cough so common in the early stage of the disease. The tubercular matter having coagulated, constitutes a foreign solid body, which can only be removed by being again broken down and so rendered capable of being either absorbed or excreted. Thus the miliary or infiltrated forms, whether grey or yellow, after a time soften—a process which may commence at any part of the mass, and gradually affect the whole. This softening is a disintegration or slow death of the tubercular exudation, constituting true ulceration, which is more or less extensive, according to the amount of the morbid deposit. When recent, the pulmonary tissue in the immediate neighbourhood is more or less congested, but when chronic it is thickened and indurated, often forming a capsule, which surrounds the hardened tubercle, or a membrane lining an excavation. The other neighbouring tissues are also necessarily involved. The pleuræ are thickened, the bronchi sometimes loaded with tubercle, at others obliterated by pressure, the blood-vessels are congested, ruptured, and ultimately impervious, and the nerves compressed and irritated. As the ulcerative process extends, the elementary structures of the lung are more and more destroyed, the excavations become larger, more numerous, and unite with each other, until at length the pulmonary organs can no longer perform their functions. In most cases, however, before this is arrived

at, tubercle appears in other parts of the body, producing complications, under the united effects of which the strength is exhausted.

It is only in rapid or acute cases of Phthisis that the ulcerative tendency of the tubercular exudations pursues an uniformly destructive progress. In chronic cases this is frequently checked, and for a time slumbers, the symptoms improving and the patient exhibiting temporary signs of recovery. These arrestments of the disease may be of greater or less duration; and there can be no doubt that they are permanent in a far greater number of persons than is generally supposed. Indeed, while the more extended cultivation of morbid anatomy in recent times has demonstrated the frequency of cretaceous and calcareous concretions at the apices of the lungs, ~~as well as of~~ with pulmonary cicatrices, physical diagnosis and more careful observation has shown in the living, that corresponding with the disappearance of symptoms and physical signs the health has improved and ultimately been permanently restored. We are satisfied that there is no period in the history of the disease in which permanent arrestment may not take place, although, of course, it is far more common when it is limited in extent, and confined to one lung. The facts we have seen and recorded on this subject, however, show[1] that individuals with extensive cavities and disease on both sides, may under favourable circumstances and with appropriate management, ultimately recover.

THEORY OF THE PRODUCTION OF PHTHISIS.—It is not our intention to enter into an account, descriptive and critical, of the numerous views which have been held in past times as to the essential nature of Phthisis. It will be sufficient to speak of the two theories which are now being discussed, and of the reasons which induce us to adopt the one and to reject the other. The first theory supposes an altered condition of the blood, originating in a perversion of nutrition. This perversion, as we have seen, has been considered by some to be owing to vitiated air, by others to imperfect assimilation of food, and by others to an hereditary taint. It has also been shown experimentally, that it may be caused in the lower animals by inoculation of various morbid matters. All these, and indeed other causes may originate and co-operate in diminishing the vital power of the individual and directly or indirectly produce weakness, feeble digestion, and an impoverished blood. It is when in this condition that any accidental irritation of the lungs, often inappreciable and undetectable, causes a limited congestion here and there in the pulmonary organs which terminates in more or less exudation of the liquor sanguinis. This exudation coagulating causes the miliary and infiltrated forms

bercle previously described, which partaking of the diminished

as in pneumonia, we have numerous molecules and bodies resembling ill-formed nuclei. In short, we have a chronic exudation, in which the vitality is so lowered that it tends to disintegration and to produce the lowest kind of organic forms,—that is to say, molecules, granules, and nuclei.

The second theory is one which, instead of ascribing tubercle to an exudation from the blood, of low vital power—regards it as the result of increased cell development and multiplication of the included nuclei. According to this view tubercular matter is a new growth, which when we consider that it sometimes reaches the size of an apple, as in the brain, would demand for its production increased rather than diminished nutrition. Notwithstanding the desire of those who support an exclusive cell theory to trace tubercle as well as every morbid product to some cell transformation, the most careful and repeated investigations of histologists have failed to do so. According to Virchow, however, upon isolating the constituents of a tubercular mass "either very small cells provided with one nucleus are obtained, and these are often so small that the membrane closely invests the nucleus, or larger cells with a manifold division of the nuclei, so that from twelve to twenty-four or thirty are contained in one cell, in which case, however, the nuclei are always small and have a homogeneous and somewhat shining appearance."[1] This description of small nuclei in the interior of cells, and the appearances figured as constituting the structure of tubercle, have, so far as we are aware, never been confirmed by any experienced histologist. Tubercle is so common a morbid product that if such indeed were its constitution, it ought to be seen at once, but our most anxious and repeated efforts have failed to discover it, nor does there exist a single preparation anywhere capable of demonstrating it. Cells containing many nuclei are very rare, associated with tubercle, and when they do occur are evidently dependent on the occasional irritation of texture which is produced around the morbid products—they are a result and not a cause. As a matter of fact, therefore, not to speak of the theoretical improbability of a disease originating in weakness, commencing with increased power of vital development in the pre-existing tissues of the organism, this theory must be rejected.

In support of this last theory it is further maintained by Virchow and his followers, that the term tubercle should be limited to the minute, indurated granulations which, as Lebert originally pointed out, are the result of increased nuclear growth in the fibrous tissues—what he denominated fibro-plastic corpuscles. The larger so-called tubercular infiltrations of morbid anatomists and practical physicians they regard as chronic or, as they call them, cheesy exudations.

unfrequently of a very complex character. Notwithstanding, to the pathologist who has carefully studied the morbid anatomy, natural progress, and theory of the disease, the symptoms and physical signs of Phthisis will enable him to determine the morbid condition present in the great majority of cases with an exactitude and certainty of which the modern cultivators of medicine may well be proud.

Premonitory Symptoms.—Before any one can positively state that tubercle exists in the lung, there generally occur symptoms indicative of diminished general health, and of deteriorated constitutional vigour. In many cases it is observable in young persons that they are not good eaters, dislike fatty substances, are capricious with regard to food, become thin, pale, weak, and liable to dyspepsia, complain of indigestion, and irregularity of the alvine discharges, and to the observant eye are at once recognised as individuals ill nourished and liable to tubercular disease. This condition, however, is often not noticed by the parents or friends, who regard it as only natural to youth, or to the circumstance that they eat so little. On other occasions it creates apprehension and alarm, the physician is consulted, who, however, can detect no pulmonary disease or pulmonary symptom of any kind. If, in addition to the above phenomena, the individual complains of chills, cold feet, occasional perspirations, quick pulse, rendered more frequent at night, the general condition is one highly favourable to the occurrence of Phthisis.

In adult persons the premonitory symptoms are most commonly lassitude, incapacity for following the usual employment, diminution of appetite, with or without indigestion, and a sensible falling of in flesh. Various diseases may manifest themselves, such as gouty or rheumatic attacks, influenza, bronchitis, fever, dysentery, and others, which leave the individual in a debilitated state. There may now come on considerable hæmoptysis, although an examination of the lungs reveals no sign of tubercle, or an attack of pneumonia may appear, which if treated by lowering remedies may usher in the disease. Occasionally the skin of the face becomes grey, and a haggard and a worn expression is communicated to the countenance. Pregnancy and lactation in weak females frequently introduce phthisis, as, indeed, may everything that calls too strongly for exertion of the vital powers in weak and predisposed persons; or causes vitiation of the blood. It is in this respect that the recent experiments of Clark, Fox, and Sanderson, previously referred to, indicate how Phthisis may follow suppuration or irritating diseases of texture, and how if occasioned in one organ it may spread to others.

It is when the constitution is thus enfeebled that phthisis appears in its acute or chronic forms.

Acute Phthisis.—This form of the disease, commonly called "galloping consumption," is generally distinguished not only by its rapid progress, but by the febrile symptoms which accompany it. There are frequent chills, followed by great heat and sweating, red tongue, nausea, loathing of food, vomiting, and diarrhœa. There is a rapid

pulse, at first of good strength, but soon becoming feeble—dyspnœa on slight exertion, cough, profuse expectoration, sometimes tinged with rusty-coloured blood. Occasionally the expectoration is trifling. There is great exhaustion, rapid emaciation, restlessness, and before death, wandering of the mind and delirium. On percussion one or both lungs exhibit unusual dulness, which rapidly extends and becomes more intensified. It is sometimes most marked at the base. On auscultation there are at first dry, bronchial sounds, and prolonged expiration, which soon pass into moist rattles, loudest with inspiration. The crepitations are now transformed into mucous râles more or less coarse, frequently accompanied with dry bronchial murmurs and pleuritic trictions. The extent of these signs indicate the area of lung-tissue involved, while the amount of increased vocal resonance points out the density of tubercular and pneumonic exudation infiltrating the lungs, or the anfractuous softening and excavations produced.

These acute symptoms occur occasionally in most cases of phthisis, and indicate the period when exudation is being rapidly deposited in the lungs, or on the pleuræ. In many cases they constitute attacks supposed to be the result of having "caught cold." Then they decline, and are absent for varying periods. The greater the number of these attacks, the more rapid is the progress of the disease, and when they are continuous, it produces that form of it denominated acute phthisis. Such cases may prove fatal in a period varying from two or three weeks to a few months.

Chronic Phthisis.—In the vast majority of cases the progress of phthisis is slow, often coming on imperceptibly, and too frequently exciting little attention until it is far advanced. I have known the the only daughter, even of a medical man, slowly pass through all the stages of the disease, the cough and expectoration failing to attract special notice in the family until three weeks before death, when on examination by a physician large cavities were detected. At other times it is ushered in by well-marked disease, such as pneumonia or bronchitis, and in some instances the first symptoms observed is hemorrhage. These different modes of onset in the disease we regard as sufficiently important to merit a separate description.

1. *Gradually-developed Phthisis.*—The first symptom which appears is cough; at first, however, so slight as scarcely to attract attention, and attributed to transient exposure to cold, or tickling in the throat. It may be observed, however, to be persistent, and of a dry, hacking character. Sometimes the cough is accompanied with pains in the shoulders, tightness in the chest, slight dyspnœa on exertion, together with all the other symptoms described as premonitory. On percussing the chest no dulness can be detected at this early period; but on auscultation there may frequently be detected feeble respiration under one clavicle, and, during forced inspiration, harshness of the breath murmur, with prolongation of the expiration. After a variable time expectoration follows the cough; at first consisting of transparent, frothy mucus in small quantity, but soon becoming opaque and puru-

lent, and often streaked with a little blood. The cough and expectoration now become gradually increased, and all the other symptoms which have preceded or accompanied them are intensified; the failing appetite is more marked, the quickened pulse and feverish excitement more evident, and the general weakness, falling off in flesh, pallor, and languor make progress. A period, sooner or later, arrives when on careful percussion a sensible dulness may be detected under one clavicle. On auscultation over this dulness, either there is increased harshness of the breath-sound on taking a deep inspiration with prolonged expiration, or a slight crepitation may be discovered during some parts of the inspiratory act. Increased vocal resonance, also, is present over the dull portion of lung. The various symptoms and signs enumerated characterise what many authors regard as the first stage of the disease.

The physical signs now assume marked importance in the history of the case, indicating, in the majority of instances, with great exactitude, the extent of the tubercular deposit, and the changes which it undergoes. The area over which dulness can be detected by percussion gradually extends from the apex downwards, until it occupies one-third, one-half, or even a greater portion of the lung. Dulness may appear at the summit of the other lung, and all the signs observed on the one side may follow on the opposite one. The crepitation on inspiration also extends, and, at first very fine, gradually becomes larger and coarser until a loud, mucous rattle is established. The vocal resonance, which at first is only slightly increased, becomes louder and louder, until at length decided bronchophony is produced. During the occurrence of these changes in the physical signs, the cough becomes more frequent and prolonged, especially early in the morning, the expectoration is more abundant, and at length consists of dense, purulent masses, some of which sink in water. These also may, from time to time, be streaked with blood, or even slight hemorrhage from the lungs may occur. There is now generally visible emaciation of the body, considerable debility, indisposition to take exercise, dyspnœa on exertion, and especially on going up an ascent. The tongue is red, often glazed, and occasionally anæmic. There is anorexia and nausea or the appetite is much diminished, and very capricious. The night sweats are often distressing; there is thirst, quick pulse, and not unfrequently marked fever at night. Sometimes diarrhœa may supervene, which invariably accelerates the progress of the disease. At others there may be various complications, such as attacks of laryngitis, pharyngitis, bronchitis, pleuritis, pneumonia, all of which produce increased weakness, and aggravate the sufferings of the patient. These occurrences characterise what have been termed the second stage of the disease.

The further progress of Phthisis is now characterised by the formation of excavations in the lungs, which are distinguished by loud, moist rattles, passing into gurgling or splashing sounds, if the cavities be large and contain fluid, or by loud, bronchial blowing, and

rarely amphoric breathing if they be dry. Percussion with the mouth open sometimes elicits a clear tone over such cavities; at others a peculiar chinking or cracked pot sound. On speaking there is a shrill vocal resonance, called imperfect pectoriloquy, and occasionally the words uttered seem to come out of the chest, and strongly strike the ear through the stethoscope, a sign termed perfect pectoriloquy. Together with the signs of a dried cavity are frequently coarse creaking sounds, indicating the existence of chronic adhesions. At the same time dulness, and the other signs audible in the second stage of the disease, are more or less extended over one or both lungs. The cough is now very harassing and prolonged, and often so violent as to occasion vomiting, and it disturbs sleep at night. There is more or less dyspnœa, and occasionally, if the lung be extensively diseased, orthopnœa. The expectoration is greatly increased, consisting of nummular masses of dense, purulent matter, often containing portions of infiltrated lung, which rapidly sink in water. Sometimes it is greenish, ichorous, and of offensive odour. In very chronic cases, on the other hand, with dry cavities, the expectoration is trifling, and brought up with considerable difficulty. Hæmoptysis is now a more common symptom, and may vary in amount from a few teaspoonfuls to twenty ounces, or even more. Such attacks invariably cause great alarm, and produce exhaustion in proportion to the amount of blood lost. The patient frequently complains of pain in the thorax, which in very chronic cases is often severe, ushering in, more or less, flattening of the chest, that may now occur to a greater or less extent. As the disease extends, and the cavities enlarge, the strength of the patient declines, the appetite is lost, and it becomes difficult to eat anything. Hectic fever appears, there is a pink blush on the cheeks, rapid pulse, occasional rigors, profuse sweating at night, and extreme emaciation. Sometimes the vital powers slowly decline, and at length become extinct; at others, a colliquative diarrhœa appears, which more rapidly closes the scene. These symptoms constitute the third and last stage of the disease.

In the majority of chronic cases the progress of the disease is not uniform, but subject to numerous interruptions, and even long pauses, in which there is decided amendment, with great amelioration and even absence of symptoms. But the physical signs, though they become modified, still indicate the existence of organic lesion. Not unfrequently, however, such pauses and ameliorations are continued for a long period, and in many cases may usher in a permanent arrestment of the disease. In such cases the expectoration gradually ceases, and the cough becomes dry. This, in its turn, becomes less frequent, and at length disappears. Auscultation indicates that the moist rattles are converted into dry blowing or bronchial murmurs. Coarse friction sounds appear, and indicate adhesions and cicatrizations. Dulness on percussion and increased vocal resonance remain, and, although seldom altogether got rid of, becomes more and more circumscribed, leaving sometimes only a trace behind to indicate the presence of disease. In

severe cases the sub-clavicular regions of the chest are retracted; dense pleuritic adhesions are formed, which circumscribe the movements of the thoracic walls, but healthy respiration is heard in such portions of the lungs as were unaffected. Under such circumstances, although full vigour of body is not restored, life is continued and enjoyed for an indefinite period and death ultimately caused by circumstances altogether independent of the pulmonary lesion.

Hæmorrhagic Phthisis.—The peculiarity of this form of Phthisis is that it commences with hæmoptysis more or less violent. I have now seen several cases in which individuals who imagined themselves to be in very good health, and in whom, on the most careful inquiry, nothing but some slight dyspepsia or falling off in appetite could be discovered, were suddenly seized with hemorrhage from the lungs. From that moment their general health began to give way, and Phthisis was developed, of which they died. I remember the case of an extensive sheep farmer in the south of Scotland, who walking home one afternoon, as he thought, in the possession of perfect health, was seized in the road with bleeding from the lungs. I saw him a few days afterwards, and failed to detect either from his external appearance, general symptoms, or physical signs, the slightest evidence of pulmonary disease. Nevertheless in a few weeks he became pale and languid, cough appeared, and on his again visiting me, a peculiar roughness, or, what some call, a dry crackling was distinctly audible at the apex of one lung. He spent the following winter in the south of France, but, notwithstanding every care that could be exercised, he died of Phthisis at the end of three years.

So many cases of this kind have comes under my notice, that I have no hesitation in regarding it as a peculiar form of the disease, in which tubercle is deposited in such a manner as in the first instance to induce degeneration and rupture of a considerable-sized vessel in the lung. The loss of blood so occasioned from one or more attacks assists in developing the disease, which subsequently progresses in the usual way. Occasionally such hemorrhages may occur several times before tubercle deposit has spread so as to be recognisable by physical signs. Not long ago I saw an Australian who for upwards of two years had several such attacks, and who only, on reaching this country in the month of November, when I examined him, had cough developed, with the incipient harshness of respiration.

This form is most common in adults, is generally fatal, although I have seen a few instances in which, after a time, it was permanently arrested. It is allied to that class of cases in which at any period of the disease hemorrhage makes its appearance, and is recurrent.

Bronchitic Phthisis.—This form of Phthisis is more common in the young than in adults, and manifests itself in bronchitis, which attacks the apex of one or both lungs. It is a common sequence of severe attacks of influenza, hooping-cough, measles, or other disease in which the bronchi are affected, in weak persons. They do not readily throw off the pulmonary affection, are very liable to colds,

dyspnœa is readily excited by unusual exertion; they complain of a sense of tightness or constriction about the chest, which on being examined physically, is quite resonant on percussion; but there is harshness of the inspiratory murmurs on taking a forced breath, with prolongation of the expiration, without increase of vocal resonance. In short, there is slight bronchitis at the apex, which, however, is permanent, or if it disappear for a time shows a great tendency to return. Occasionally there is wheezing, more or less sibilation, and great dyspnœa on exertion, with cough, expectoration, and slight hæmoptysis. For a long time the general health exhibits no further evidence of disease; but at length frequent cough and expectoration appear, weakness, failing appetite, emaciations, and the usual symptoms of Phthisis. In some cases the ordinary physical signs are also manifested, but in others I have known death occasioned without the production of dulness on percussion, increased vocal resonance or other distinct signs of tubercular consolidation. In such cases, from first to last, bronchitis appears to be the only lesion while the patient wastes away and dies, although on inspection of the lungs afterwards they will be found to contain more or less tubercle. In 1845 I was consulted in the case of a young lady eleven years of age, who, after a violent and prolonged attack of hooping-cough, complained of dyspnœa on exertion and cough. There was no dulness on percussion, and on auscultation there was harshness of inspiration, and slight prolongation of expiration at the apices of both lungs, especially on the right side. Under this affection she laboured for eight years, in all other respects enjoying tolerable health, when the appetite began to fail, purulent expectoration became continuous, and all the symptoms of Phthisis were manifest. She died early in 1855, never having exhibited any of the physical signs of Phthisis, the disease apparently being structurally one of bronchitis and emphysema. On examination after death, however, I found circular patches of miliary tubercle about three-quarters of an inch in diameter, irregularly scattered through the pulmonary tissue on both sides, together with emphysema.[1] I have since seen several similar cases, and am satisfied that bronchitis developed in weak young persons, especially when it appears at the apex of the lungs, is a frequent prelude and accompaniment of Phthisis, communicating to it a peculiar character, which has frequently led to much error in determining the nature of the disease. This form of Phthisis is allied to all those cases in which bronchitis, in its various phases, constitutes a leading feature of the disease.

Laryngeal Phthisis.—This distressing form of Phthisis is from an early period accompanied by a tickling in the larynx, which seems to be the origin of the cough. The voice becomes weak and hoarse, and not unfrequently there is more or less pain on deglutition. On inspection of the fauces and throat, follicular disease or great dryness of the mucous membrane is common. Sometimes the laryngeal disease

[1] See the author on Pulmonary Consumption, 2d edit. Case xvi. p. 70.

completely masks the pulmonary lesion, causing a hoarse rough murmur on inspiration, which renders the physical signs at the apex of the lung inaudible, so that unless marked dulness is distinguished by percussion, it may be overlooked. Ultimately the voice is lost from destruction of the vocal cords by tubercular ulceration. Deglutition becomes difficult, and vomiting readily excited by reflex actions through irritation of the laryngeal, pharyngeal, and glosso-pharyngeal branches of the eighth pair of nerves. Under these circumstances emaciation makes rapid progress, all the symptoms of ulcerative laryngitis being added to those of Phthisis. (See Laryngitis).

Pneumonitic Phthisis.—I have now watched a considerable number of cases in which unquestionable Phthisis has originated in an acute pneumonia at the apex of the lungs, which, instead of disappearing in the usual way, has become chronic. Under such circumstances the dulness on percussion and brochophony remain, the summit of the lung is consolidated, the general health, instead of rallying, remains weak, cough and expectoration become troublesome, while loud mucous and gurgling rattles are gradually formed in the lung, indicating the existence of cavities. Sometimes the consolidated lung remains latent for a considerable time, the patient in vain endeavouring to restore his original strength. Then an attack of hæmoptysis has occurred, which, inducing him to visit a physician, it is discovered that the lung is consolidated, and all the signs of Phthisis more or less apparent. Discussion has taken place as to whether such cases should be denominated chronic pneumonia or Phthisis. In my opinion there is no difference between them. The exudation of the pneumonia degenerating and not being absorbed, is transformed into tubercle, causing softening, ulceration, and destruction of the lung, in exactly the same way as if Phthisis had been developed from tubercle at the commencement. I have also seen survivors from this form of the disease, with flattening of the chest, as in ordinary chronic Phthisis. It must not be overlooked either that intercurrent attacks of pneumonia are very frequent during the progress of Phthisis, and that at all times the two diseases exhibit a marked tendency to run into one another. This circumstance confirms the truth of the pathology previously given, and unequivocally proves that tubercle is only a low type of exudation from the blood. In healthy persons such exudation is transformed into pus, and rapidly disappears, whereas in individuals who are weak, and whose vital power is low, this process is more or less interfered with, is prolonged, and in extreme cases terminates in Phthisis. This view has recently been adopted by Niemeyer, who is one of those who proposes to call Phthisis Pulmonalis a chronic pneumonia, in the propriety of which, as applied to all its forms, I cannot concur.

Complications.—Tubercular disease of the lungs is necessarily associated with every lesion occasioned by inflammation, and tubercular exudation of the textures of the organ. Indeed it may be said to

be made up of exudation disorders, acute or chronic, affecting the air vesicles, bronchi, fibrous tissues, and serous coverings of the lungs. Hence the various symptoms of larnygitis, bronchitis, emphysema, hemorrhage, pneumonia, and pleurisy are more or less mingled together, may supervene on each other, and occasionally, as we have seen, be so predominant and permanent as to give peculiar characters or forms to the disease. Occasionally pleuritis gives such a character to Phthisis, occasioning local acute or stitching pains. Tubercular cavities in the majority of cases induce thickenings and dense adhesions between the pleuræ, but sometimes they may burst or ulcerate through the pleuræ, where there is no adhesion, causing pneumothorax, associated or not with more or less empyema.

In addition, however, to these lesions of the chest, Phthisis may be associated with turbercular deposits occurring in other organs, in which case a train of symptoms will arise dependent upon the local lesion, wherever that may be. Of these the most common, and the most to be dreaded, is tubercular ulceration of the intestines, inducing colliquative diarrhœa, and perhaps perforation of the gut, with fatal peritonitis. In the young, also, we may find the disease associated with various tubercular or scrofulous diseases of the osseous texture and sometimes of the brain or its membranes. It would exceed our limits to enter upon the innumerable complications which in this manner may arise; all that it is necessary to say is, that there is no tubercular disease of any organ or tissue, which may not be found sometimes associated with Phthisis, and which, contributing its own special symptoms to the pulmonary ones, increase the general disease and downward progress of the patient.

Besides this class of affections, there are others of importance. It is by no means uncommon during the progress of Phthisis, to find persons complaining of puffiness of the feet, or face, and on examination of the urine it will be found to contain albumen. In short, one of the forms of Bright's disease may develop itself, and usually that now recognised as the waxy form. The liver also may enlarge, and add to the distress of the patient by its pressure and bulk. Such increased growth of the hepatic organ will also generally be found to be dependent on a waxy transformation of its cells and vessels. The spleen may undergo a like alteration, although its enlargement is more rare. Pericarditis and other inflammatory diseases may occur—occasionally gout or rheumatism. Cancerous disease, it is now known, may be associated with Phthisis, but it is an occurrence of extreme rarity. In chronic cases the practitioner must be prepared to meet with a variety of other complications, which, though they may bear no essential or constant relation to Phthisis, render the disease more distressing and fatal should they occur.

III. Diagnosis of Phthisis Pulmonalis.

It has been previously pointed out that Phthisis is preceded by premonitory symptoms, which indicate diminished health, weakness, or imperfect nutrition of the individual. This condition has been spoken of by some writers as constituting a pretubercular stage of disease. All that can be said, in a diagnostic point of view, of this state of health, is that in young and delicate persons it should occasion much anxiety, as it may, or may not, terminate in Phthisis, and that it should demand great watchfulness and frequent careful examination, in order that the first positive signs of the disease may be detected.

Acute Phthisis.—The diagnosis of this form of the disease is exceedingly difficult, as all the symptoms and signs are identical with those of an acute inflammation of the lungs. It is only by careful observation of the premonitory symptoms, the existence of a marked hereditary taint, the amount of emaciation as compared with the extent of local disease, the continuity of the fever, and the rapid formation of cavities, that we are at length able to pronounce with confidence as to the presence of acute Phthisis. In all its essential features the attack is similar to acute pneumonia of the apex, from which in its earliest stages it cannot be separated. As the disease progresses, however, the excessive exhaustion and breaking down of the lungs establish the nature of the affection, while its rapid progress and the continued fever too certainly indicate its acute nature. In the present day the extreme difficulty of diagnosis is fortunately not of so much importance as it used to be, when such symptoms led to bleeding, and an antiphlogistic treatment. In the course of chronic Phthisis similar symptoms may arise, either from fresh exudation of tubercular matter, or from intercurrent attacks of pneumonia, or pleurisy, communicating to the disease for a time an acute character.

Chronic Phthisis.—In this, by far the most common form of the disease, it is of the greatest consequence to determine its commencement by the conjoined methods now in vogue. Its progress is capable of being recognised with considerable certainty, and the means at our disposal for doing this may be considered under the heads of Pulmonary Symptoms, Pulmonary Percussion, Pulmonary Auscultation, Microscopical examination of the Sputum, and Altered changes in the form and movement of the Chest.

Pulmonary Symptoms.—The earliest symptom is cough, which, at first short and dry, resembles the ordinary effort at clearing the throat. Sometimes it is attributed to the chest, but more commonly is thought to arise from dryness or tickling in the throat. Such a cough too frequently excites little attention, although its persistency and defiance of ordinary remedies, communicate to it a grave character. After a time the cough is followed by expectoration, at first of

a thin mucous fluid, which, however, soon becomes thick and opaque, or is slightly streaked with blood. There is now occasionally felt a tightness or constraint, on taking a deep breath, under one clavicle, which, as the disease progresses, becomes painful especially on coughing. This cough and expectoration, more particularly when they follow the premonitory symptoms, and are developed in the manner described, are highly characteristic of Phthisis. In the subsequent stage of the disease, the cough becomes more frequent, harassing, and long-continued. The tickling in the throat may excite vomiting. The expectoration is more abundant and prevalent, frequently tinged with blood, and forms distinct masses (nummular sputa) generally indicative of excavations, and may be so heavy that, instead of floating, it sinks in water. Lastly, it may contain masses of indurated matter, composed of portions of tubercular lung, or, in very chronic cases, fragments of cretaceous or calcareous matter. Early hæmoptysis, as we have seen, is highly diagnostic of Phthisis, and should always excite grave attention. Should it be soon followed by, or mixed up with the other symptoms, the diagnosis is considered more certain.

Pulmonary Percussion. — When miliary or infiltrated tubercle occupies a certain number of the air vesicles, careful percussion above, or under one clavicle, illicits slight dulness of the pulmonary note, especially well marked when compared with the clear note on the opposite side. As it is seldom that the disease commences at the apices of both lungs at once, this sign is one of great value, and indicates very positively, not only the existence, but very frequently the extent of the disease. The greater the dulness or flatness of tone, the more solid is the portion of lung struck, and the further over the chest, anteriorly and posteriorly, the dulness can be produced, the greater is the amount of pulmonary tissue involved. It should not be overlooked, however, that occasionally the disease exists equally on both sides, when diagnosis by means of percussion is always difficult. In the earlier stages, indeed, it is then impossible, and in the later stages even with large cavities on both sides I have known the percussion note so equal and clear as to mislead the careless observer. Sometimes also, though the lung be greatly condensed, an amount of emphysema anteriorly communicates clearness on percussion: hence the lung should always be examined posteriorly as well as anteriorly, in order to avoid error.

On percussing the chest in cases of Phthisis with the mouth open, there is sometimes elicited a pecular noise, called by Laennec the *bruit de pot félé*, or cracked-pot sound, which he thought was diagnostic of a cavity. But I have found this noise could also be produced in cases of pneumonia, in pleurisy with effusion, and even in several healthy chests. Moreover it is often absent when pulmonary cavities are unquestionably present, and cannot therefore be considered as diagnostic of their presence, unless it be co-existent with other symptoms and signs of Phthisis. When present, it seems to indicate

either healthy lungs, with very elastic thoracic walls, or else increased density mingled with confined or compressed air in the thorax. In either case, on striking the chest forcibly, the air beneath is forcibly ejected through the bronchi and trachea, producing vibrations which occasion the peculiar sound.[1]

Pulmonary Auscultation.—The first sounds audible with the stethoscope, are prolongation of the expiratory murmur and slight harshness, or a wavy interrupted character communicated to the inspiratory murmur. These signs, if clearly marked under one clavicle, following the premonitory symptoms, and accompanying persistent hacking cough, can leave no doubt that tubercle is actually present, and the disease pronounced. It frequently happens, however, that these signs are so indefinite that, although we may suspect, we hesitate to speak confidently. In all chronic organic diseases, there must be a period so nicely balanced between health and disease—in which the altered texture is so slightly altered—that our senses are incapable of appreciating any alteration that may be produced. It is in such cases that everything which enables us to determine such delicate signs with greater exactitude becomes valuable, and I have no hesitation in stating that the differential stethoscope of Dr. Scott Alison has here afforded me the greatest assistance. In several delicate young persons in whom when every precaution and care has been employed we fail to discover any alteration in the pulmonary sounds, an increased intensity in the sound of the carotid artery below the clavicle has afforded valuable indications. It is at this early and uncertain period of the disease, that the greatest skill in auscultation and diagnostic powers are required in the physician.

As the disease advances, the prolonged expirations and harsh inspirations become more marked, and at length a decided increase in the vocal resonance of the affected side is audible. This indicates considerable condensation of the apex of the lung. If the disease progresses, slight crepitation is audible at first, at the termination of a forced inspiration, and gradually it occupies the whole of that act. This is diagnostic of tubercular softening. The fine moist rattle now becomes evident, and the increased vocal resonance louder, until it amounts to bronchophony. The auscultatory signs also extend in area over the chest, preceding the dulness or percussion, and generally appearing in the order in which they were noticed over the apex. At length the crepitation passes into mucous râle. This in its turn becomes coarser and coarser, indicating the existence of greater softening, and even of cavities. As these enlarge, gurgling and splashing sounds are heard, especially on coughing, and the increased vocal resonance becomes pealing, and imperfect or perfect pectoriloquy is present. These latter sounds are diagnostic of a cavity or cavities. The sounds heard over these vary according to their size, contents, and the condition of the walls. If large, with rigid walls, and partly filled with

[1] See on Pulmonary Consumption, &c. Diagnostic Value of the Cracked-pot Sound p. 108.

fluid, and partly with air, tinkling or metallic sounds may be heard on coughing or speaking. If altogether dry, amphoric or blowing noises may be distinguished. These last, if persistent, indicate that the secretion of pus is arrested, the softened tubercle got rid of, and contraction and cicatrization possible.

When in chronic cases of Phthisis dry blowing, combined with friction sounds, can be determined at the apex, it points out that adhesion and contractions of the tuberculated pulmonary tissues are taking place. If absence of respiratory murmur exist, it may depend on pleuritic effusion, when dulness on percussion and increased vocal resonance, or ægophony, will determine the nature of the lesion. But it may be accompanied by resonance on percussion, with a brazen, hollow, or metallic sound on coughing or a forced inspiration, in which case there is pneumo-thorax, and the tubercular cavity has formed a communication with the pleura.

In retrograde Phthisis, the auscultatory signs disappear in the inverse order to that in which they appear. The moist sounds become dry, and these last diminish in intensity and extent. Friction noises and dry bronchial murmurs are heard, with prolonged expiration, wheezing and sonorous rhonchi indicative of rigid bronchial tubes, conjoined with more or less emphysema. The area of dulness gradually diminishes, but a condensed mass in the lung generally remains for years at one or both apices, giving rise to harsh respiratory murmurs and increased vocal resonance, constituting strong evidence to the judicious observer of the diseased changes through which the lung has passed.

Microscopical Examination of the Sputum.—The sputum of phthisical patients, in the great majority of cases, may be found to contain, under the microscope, fragments of the areolar and elastic tissues, derived from disintegration of the lungs. They not unfrequently present circles and half circles, indicative of the form of the air vesicles, and when present, offer the most positive proof of pulmonary ulceration. Van der Kolk, of Utrecht, was the first to point out that such fragments might be seen with the microscope, at the commencement of the disease, long before percussion or auscultation gave any positive signs of its existence. Although such examples are rare, I am satisfied that they do occur, and that the microscopical examination of the sputa under such circumstances enables as to arrive at a clear diagnosis when otherwise there would be great doubt. Drs. Andrew Clark and Fenwick have confirmed this fact by their researches into the structure of Phthisical Sputum. The latter physician has pointed out that the examination is much facilitated by first liquefying the sputa with a solution of caustic soda, when the fragments of lung tissue are precipitated, and their amounts as well as character readily estimated.

Altered changes in the form and movements of the chest.—As Phthisis advances, a distinct flattening and sinking in of the thoracic walls below the clavicle may be observed, generally coincident with the

formation of cavities and loss of lung substance, of which it is diagnostic. An alteration in the movements of the affected sign may be seen even earlier, and may be roughly ascertained by spreading the fingers of both hands like a fan, over the two sides of the chest, and bringing the thumbs together at the middle of the sternum. On a forced inspiration, it may thus easily be seen that the thumb corresponding with the affected side moves less. The amount of this movement can be ascertained with great exactitude by means of the stethometer, and compared with that on the opposite side.

In addition to the symptoms and signs referable to the chest, there must not be overlooked a variety of circumstances which in conjunction with these will materially assist the diagnosis. Among these are the preceding premonitory symptoms: the continued impaired appetite and disordered digestion; the augmenting languor and debility; the hectic, night-sweats; lustrous eyes; the hopefulness and imaginative intellect, and even the alterations of the disease from better to worse, all of which are more or less characteristic.

Much has been written concerning what is called the differential diagnosis of Phthisis, and the means of distinguishing it from other diseases of the chest. But the truth is that a Phthisis necessarily implies the existence of almost every lesion of the lung, the tubercular exudation giving rise to or being accompanied by congestions and inflammations of the pleuræ, bronchi, and pulmonary parenchyma, with all their local signs and general symptoms. Pulmonary hæmorrhage and abscess are common. Emphysema, though seldom present in its advanced stage, so as to alter the form of the chest, is common in limited portions of the lung near chronic and retrograde tubercular deposits. Any lesion whatever, occurring at the apex of the lung in a young person labouring under the premonitory symptoms we have described, must be regarded with suspicion. In adults, an acute pneumonia at the apex may go through its natural progress, and leave no trace behind. But if it becomes chronic, a phthisis may be the result. Indeed there are many cases in which a chronic pneumonia of the apex and Phthisis Pulmonalis may be said to constitute the same disease. Cancer of the lung is a disease of advanced age, the dulness on percussion more marked, the tubercular respiration and bronchophony is much greater, and moist rattles are scarce or absent. Expectoration is trifling, and when present, unlike that of Phthisis; sometimes resembles currant jelly. The emaciation, night sweats, and general aspects afford little assistance. A dilated bronchus, independent of Phthisis, is rare, but when present is often associated with bronchitis and asthmatic symptoms, while the physical signs of the cavity are generally best marked at the posterior and middle regions of the chest, rather than at the apex. In advanced cases a pleurisy with effusion, or a pneumo-thorax may occur, when the physical signs distinctive of each will readily establish the diagnosis.

The great difficulty is to detect Phthisis at its first appearance, and hence every circumstance that can throw light on its history at

this period is important. According to Dr. Ringer, the heightened temperature of the body, as determined by the thermometer, indicates the deposition of tubercle for several weeks before physical signs are developed. It is true that a similar increase of temperature occurs in a few other diseases, such as typhoid fever or rheumatism, but their symptoms are readily separable from those of Phthisis. This new method of recognising the disease at an early stage requires more extended observation before it can be generally recognised. The subsequent progress of Phthisis admits of being followed by the physician cognizant of its morbid anatomy, and well skilled in auscultation, not only with certainty, but in the majority of cases with a degree of exactitude that must be regarded as highly honourable to the progress of medicine in modern times.

IV. Prognosis of Phthisis Pulmonalis.

Phthisis Pulmonalis, up to a comparatively recent date, was not only regarded as a very dangerous disease, but as one which was uniformly fatal. This idea was supported by the circumstance that before the general introduction of physical diagnosis it was not clearly detectible until it was far advanced, while the merely palliative treatment then in vogue was anything but favourable to recovery. If, notwithstanding, a case here and there did ultimately get well, medical men were more disposed to accuse themselves of an error in diagnosis than doubt the correctness of so general a dogma as the incurability of consumption. Even when at length morbid anatomy unequivocally demonstrated the possibility of tubercular cavities cicatrizing, and of individuals afterwards attaining an advanced age, such an event was regarded as one of extreme rarity, and as occurring altogether independently of treatment. "No fact," says Andral, "demonstrates that Phthisis has ever been cured, for it is not art which operates in the cicatrization of caverns; it can only favour this at most, by not opposing the operations of nature. For ages remedies have been sought to combat the disposition to tubercles, or to destroy them when formed, and thus innumerable specifics have been employed and abandoned in turn, and chosen from every class of medicaments." Even Louis, in his admirable work, while admitting that a cure might rarely take place, points out that in such cases the disease must be limited and the result fortuitous. Hence the admitted occasional recoveries in no way interfered with the general view entertained of the unfavourable prognosis of this malady, or stimulated medical men to replace a palliative by a curative treatment.

At present, so far from Phthisis being considered to be uniformly or even generally fatal, it is admitted that treatment can in great majority of cases prolong life, whilst in many, the number of which are annually increasing, a complete and permanent cure may be effected. This revolution in our prognosis of the disease is owing—1st,

to the facts arrived at by morbid anatomy; 2d, to a more perfect theory or pathology of the disease; and 3d, to the discovery of cod-liver oil as a remedy.

1. The careful post-mortem examinations now made with such regularity in our large hospitals, have demonstrated the frequent occurrence of old condensations, cicatrices, and calcareous concretions at the apices of the lungs in persons of advanced age who have died of other diseases. In 1845, I pointed out that in the Royal Infirmary of Edinburgh, they occurred in the proportion of from one-fourth to one-third of all the individuals who die after the age of forty. Roger and Boudet had previously shown that at the Salpetrière and Bicêtre hospitals in Paris, amongst individuals above the age of seventy, they occurred in one-half and in four-fifths of the cases respectively. There can be no doubt that these cicatrices and concretions indicate the healing and drying up of cavities and softened tubercular matter at some previous period in the life of the individual, and the consequent spontaneous cure of the disease in a considerable number of persons.

2. The careful examination of tubercles by means of the microscope, demonstrates that it neither originates in or gives rise to cell formations, but that it consists of an exudation of the blood rendered feeble in vital power by impaired nutrition, and especially by deficiency of primary molecules of fat in the blood.[1] Hence the encouragement given to our efforts in stimulating the nutritive functions, and especially assisting in the increased assimilation of an easily digestible oil, whereby, while the tissues generally are supplied with formative material, the tubercular matter has time to degenerate and be absorbed; so that any cavities which have been produced may cicatrize. Attempts at cure in this direction have been so eminently successful as to influence our prognosis in a marked manner

3. It is very much to be doubted, however, whether this pathology would ever have been arrived at, or if it had, whether a successful treatment could ever have been established, unless the therapeutical properties of cod-liver oil had been recognised. This animal substance is easily assimilated, is not purgative, and meets all the indications required, while experience has demonstrated that it restores to the emaciated body the nutritive elements it so much requires, and enables it to triumph over the disease. It can no longer, therefore, with truth be considered that Phthisis Pulmonalis is that *opprobrium medicinæ* it was formerly considered. Nor should certain charitable institutions any longer refuse to admit such cases on the ground of their incurability.

In my work on Pulmonary Consumption,[2] will be found full details of the arrest of the disease in its most advanced stage, the individuals not only being still alive, but having enjoyed excellent health since

[1] In making this statement I am fully aware of the observations and arguments of Virchow and his followers, but which, for the reasons previously given, I regard as not only inconsistent with histological and pathological research, but as especially opposed to all we know of clinical facts in modern times.

[2] P. 152, et seq.

their recovery, for periods varying from ten to twenty-five years. To the list of cases therein given, I could now add many more. Twelve similar cases were recorded by Dr. Quain in 1852,[1] and many others may be found scattered in the works of different authors, and in the practice of individual medical men. There can be little doubt that could they be collected, it were easy to prove that such examples, instead of being few and far between, are much more numerous than is generally supposed. It is very difficult, however, to watch for many years in succession the progress and termination of chronic Phthisis, and in hospitals this difficulty is increased, as the patients on getting better go out long before the disease is even permanently arrested. All attempts to induce medical men to unite and record their experience on this or any other great question involving the prognosis or treatment of disease, has hitherto failed. We are, therefore, limited to the conscientious efforts of individuals in our attempt to elucidate this question, ~~and such~~ cannot be expected in a matter of ~~this~~ magnitude and importance to be, at present, of any great avail. Among these, however, I have great pleasure in referring to the accurate method in which Dr. Pollock has recorded his ten years' experience at the Brompton Consumption Hospital.[2] Were such method and care more uniformly practised by hospital physicians, and extended over more lengthened periods, many of the unsolved problems connected with this subject might be elucidated. I confidently look to the future, as affording means for demonstrating the ratio and conditions under which the prognosis of Phthisis may be determined. In the meantime, I can only express my conviction that its permanent arrestment and cure are, by judicious treatment and hygienic management, becoming every day more frequent and more widely extended.

In reference to the prognosis of individual forms or cases of Phthisis, we must regard acute Phthisis as generally fatal. The difficulty here lies in the diagnosis. Once recognised, however, the persistency of intense fever, with rapid emaciation and formation of cavities, give us little hope of a favourable termination.

In the earliest periods of Phthisis, the prognosis should be very guarded, but on the whole encouraging. As a general rule, the more slowly it advances, the less fever and emaciation, and the better the appetite, the more probability exists of an arrestment.

In the second stage, the favourable symptoms are limitation of the disease to one lung, dulness not extensive, and not increasing rapidly, nor persistency of moist rattle; expectoration moderate; fever trifling; emaciation not great; capability of taking nourishment, and a certain amount of exercise. The unfavourable symptoms are continuous fever, quick pulse, hæmoptysis repeated, profuse expectoration, rapid softening of the tubercle, and its deposition in both lungs; bad appetite and impaired digestion; increasing emaciation; profuse diaphoresis, and the existence of unfavourable complications.

[1] Lancet, p. 487 et seq.
[2] The Elements of Prognosis in Consumption; London, 1865.

importance so frequently given to the special as distinguished from the general treatment of Phthisis that the former want of success may be attributed. The management of individual symptoms and the administration of drugs, so far from being the chief should invariably be the subordinate part of our object, and this for the obvious reason that if nutriment succeed in checking the disease, the symptoms will disappear of themselves. At the same time it must necessarily happen in the course of every case that various symptoms and complications will press themselves upon our notice, and their palliation or removal, while still continuing our general efforts at cure, is always a matter of great importance. It is only by studying individual examples of the disease, observing the numerous and varied combinations and indications that each presents, that the difficulties the practitioner has to combat in this way can possibly be understood. I have too frequently seen patients lying in bed, enervated, without appetite, sweating at night, and apparently sinking, with a mass of bottles and boxes at the bedside bewildering to contemplate. Each of these it is imagined had some special symptom or purpose to fulfil, such as lozenges, drops, and mixtures to relieve coughs; opiates and sedatives, to cause sleep and diminish irritability; catechu, gallic acid, tannin, and acetate of lead, to check diarrhœa or arrest hæmoptysis; sulphuric acid, to relieve sweating; chalk and antacids to combat acidity and dyspepsia; quinine, iron, or bitters, as tonics; wine, to support strength; cod-liver oil, &c. &c. All these I have seen administered at intervals about the same time, so that the stomach, drenched with drugs, is utterly prevented from performing its healthy functions. Under such circumstances, suspending all such supposed remedies, or preventing the patient from having recourse to them at will, is often the best introduction to an improvement, which the cold or tepid bath, insisting on their getting up and going into the open air, has, much to their suprise, tended to increase. It follows that in all our attempts to relieve symptoms, the utmost care should be taken not to interfere with the far more important object of arresting and ultimately curing the disease by general treatment. The various phenomena that present themselves, therefore, should be managed as follows.

Loss of Appetite and Dyspepsia.—These are the most constant and important symptoms of Phthisis, inasmuch as they interfere more than any other with the nutritive processes. If food, or its substitute cod-liver oil, cannot be taken and digested, it is in vain to hope for amelioration. Here we should avoid a mistake into which the inexperienced are very liable to fall. Nothing is more common than for phthisical patients to tell their medical attendants that their appetite is good, and that they eat plentifully, when more careful inquiry proves that the consumption of food is altogether inadequate, and that they loathe every kind of animal diet. We should never be satisfied with general statements, but determine the kind and amount of food taken, when sufficient proof will be discovered, in the vast majority of

cases, of the derangement, formerly alluded to, of the appetite and digestive powers. Very commonly also there will be acid and other unpleasant tastes in the mouth, loathing of food and other dyspeptic symptoms. In all such cases, especially if too much medicine has been already given, the stomach should be allowed to repose itself before anything be administered, even cod-liver oil. Sweet milk, with toasted bread, and small portions of meat nicely cooked, so as to tempt the capricious appetite, should be tried. Then ten drops of the sp. ammon. aromat., given every four hours in a wine-glassful of some bitter infusion, such as that of columba or gentian, with a little tr. aurantii, tr. cardamomi, or other carminative. In this way the stomach often regains its tone, food is taken better, and then cod-liver oil may be tried, first in tea-spoonful doses, cautiously increased; or other forms of fat, such as pork fat, bacon, suet, or butter, may be tried. Should this plan succeed, amelioration in the symptoms will be almost certainly observed.

Nausea and Vomiting.—Not unfrequently the stomach is still more deranged; there is a feeling of nausea and even vomiting on taking food. In the latter stage of Phthisis, vomiting is also sometimes occasioned by violence of the cough, and the propagation of reflex actions, by means of the par vagum, to the stomach. In the former case, the sickness is to be alleviated by carefully avoiding all those substances which are likely to occasion a nauseating effect, by not overloading the stomach, but allowing it to have repose. Here also in cases where too much medicine has been administered, a suspension of all medicaments for a few days will frequently enable the practitioner to introduce nourishment cautiously with the best effect. I have found the following mixture very effectual in checking the vomiting in phthisis: ℞ Napthæ medicinalis, ℥j; tr. cardamomi comp., ℥j; mist. camphoræ, ℥vj. M. ft. mist., of which a sixth part may be taken every four hours. When it depends on the cough, those remedies advised for that symptom should be given. I have tried emetics for the relief of nausea and vomiting, but with no good result.

Cough and Expectoration.—At first the cough in Phthisis is dry and hacking. When tubercle softens or bronchitis is present, it becomes moist and more prolonged. When excavations exist, it is hollow and reverberating. In every case cough is a spasmodic action, occasioned by exciting the branches of the pneumogastric nerves, and causing simultaneous reflex movements in the bronchial tubes and muscles of the chest. The expectoration following dry cough is at first scanty and muco-purulent, and afterwards copious and purulent. When it assumes the nummular form,—that is, occurs in viscid rounded masses, swimming in a fluid clear mucus, it is generally brought up from pulmonary excavations. The accumulation of the sputum in the bronchial tubes is an exciter of cough; and hence the latter symptom is often best combated by those means which diminish the amount of sputum. When, on the other hand, the cough is dry, those remedies should be used which diminish the sensibility of the nerves. In the first case,

the amount of mucus and pus formed will materially depend on the weakness of the body and the onward progress of the tubercle. Hence good nourishment and attention to the digestive functions are the best means of checking both the cough and the expectoration; whereas giving nauseating mixtures of ipecacuanha and squills is perhaps the worst treatment that can be employed. There is no point which experience has rendered me more certain of than that, however these symptoms may be palliated by cough and anodyne remedies, the stomach is thereby rendered intolerant of food, and the curative tendency of the disease is impeded. On the other hand, nothing is more remarkable than the spontaneous cessation of the cough and expectoration on the restoration of the digestive functions and improvement in nutrition. When the cough is dry, as may occur in the first stage, with crude tubercle, and in the last stage, with dry cavities, slight counter-irritation is the best remedy, employed in various forms. Opium may relieve, but it never cures. The occasional use of the sponge saturated in a solution of nitrate of silver, is frequently of the greatest service, especially when from irritation of the fauces or larynx vomiting is occasioned.

There is a period in the history of chronic Phthisis when the cavities become dry and the sputum inspissated, tough, and difficult to expectorate. The practitioner is then frequently asked for some medicine to loosen the phlegm, relieve the feeling of tightness or compression in the chest, and dyspnœa. Under these circumstances, in no case should he resort to expectoration and opiates. The patient should be instructed that these are favourable symptoms, and indicate healing and cicatrization going on in his chest. Instead of relaxing, now is the time to persevere in avoiding palliatives which nauseate and depress the system. A few drops of sulphuric ether in camphor julep, diminishing alarm, and a little quietude, constitute all the treatment required.

Pain.—It is very surprising to what an extent tubercular disease of the lung may occasionally proceed, without causing inconvenience in the chest. Frequently there are sensations of constriction or oppression, which, however, scarcely excite attention; or from their purgative character are attributed to any cause but the right one. Occasionally there is a fixed pain in the affected side, which is increased on coughing. This more especially occurs when there is chronic pneumonia or pleurisy. The best method of relief is to keep the parts at rest as much as possible, and apply warm fomentations or a hot poultice. Slight counter-irritation with tincture of iodine may also be tried.

On the other hand, leeches and cupping, though they may relieve, are opposed to the general principle of supporting the strength, and should be avoided. The same may be said of blisters, croton oil, tartar emetic ointment, and the moxa. I have long satisfied myself that severe counter-irritation is of no real benefit, whilst it produces an amount of suffering that irritates, and frequently does harm. Opiates are also injurious, by destroying the appetite and increasing the perspirations. At the same time, if pain be very distressing and long

continued, and especially if it destroy sleep, some anodyne must sooner or later be had recourse to. Under these circumstances I have found chlorodyne derange the appetite, tongue, and stomach less than any other remedy of this class. Recently, chloral in fifteen or twenty grain doses has seemed to me to act as a purer hypnotic and cause less disturbance to the economy than other remedy. Again, when all curative efforts are obviously useless, and death is approaching, palliatives need no longer be withheld. Then, all hope of cure being abandoned, relief of pain, if it exist, becomes our chief duty. But even then it should be effected with caution and discretion, otherwise the discomfort and increase of other symptoms in the patient will more than counterbalance the temporary benefit obtained.

Diarrhœa.—This is a very common symptom throughout the whole progress of Phthisis, at first depending on the excess of acidity in the alimentary canal, to which we have alluded, but in advanced cases connected with tubercular deposit and ulceration in the intestinal canal. The best method of checking this troublesome symptom is by improving the quality and amount of the food. The moment the digestive processes are renovated, this, with the other functional derangements of the alimentary canal, will disappear. Hence at an early period we should avoid large doses of opium, gallic acid, tannin, and other powerful astringents, and depend upon the mildest remedies of this class, such as chalk with aromatic confection, or an antacid, such as a few grains of carbonate of potash. When, on the other hand, in advanced phthisis, continued diarrhœa appears, and is obstinate under such treatment, then it may be presumed that tubercular disease of the intestine is present, and the stronger astringents with opium may be given as palliatives.

Hæmoptysis.—This symptom sometimes appears suddenly, as we have seen, in individuals in whom there has been no previous suspicion of Phthisis, and in whom, on careful examination, no physical signs of the disease can be detected. On other occasions, the sputum may be more or less streaked with blood; and lastly, it may occur in the advanced stage of the disease, apparently from ulceration of a tolerably large vessel which may be dilated or aneurismal. In all these cases the best remedy is perfect quietude, and avoidance of every kind of excitement, bodily and mental. Astringents have been recommended, especially tannin, gallic acid, acetate of lead and opium; but how these remedies can operate, I am at a loss to understand; and I have never seen a case in which their administration was unequivocally useful. Can it be supposed that either of these substances can be absorbed into the blood in such quantity as to render that fluid more capable of coagulating in the lung where the vessel is ruptured? I have now met with several cases where supposed pulmonary hæmorrhage really originated in follicular disease of the pharynx or larynx, and, with the supposed phthisical symptoms, was removed by the use of the probang and nitrate of silver solution.

Sweating I regard as a symptom of weakness, and therefore as a com-

mon, though by no means a special one in Phthisis. Here, again, the truly curative treatment will consist in renovating the nutritive processes, and adding strength to the economy. It will always be observed that, if cod-liver oil and good diet produce their beneficial effect, the sweating, together with the cough and expectoration, ceases. On the other hand, giving acid drops to relieve these symptoms, as is the common practice, by adding to the already acid state of the alimentary canal, is directly opposed to the digestion of the fatty principles, which require assimilation.

It should not be forgotten that consumptive patients, and all those suffering from pulmonary diseases, are especially sensitive to cold. The impeded transpiration from the lungs in such cases, is counterbalanced by increased action of the skin, which becomes unusually liable to the influence of diminished temperature. Again, cold applied to the surface immediately produces, by reflex action, spasmodic cough and excitation of the lungs. Every observant person must have noticed how cough is induced by crossing a lobby, going out into the open air, a draught of wind entering the room, getting into a cold bed, &c. &c. The mere exposure of the face to the air on a cold day, takes away the breath, induces cough, and obliges the patient instinctively to muffle up the mouth. The numerous precautions, therefore, that ought to be taken by the phthisical individual, should be pointed out, especially the necessity of warm clothing, to which large additions should be made on going out into the air. Thus, covering the lower part of the face is important as a means of extra clothing, and not as a means of breathing warm air, as the favourers of respirators imagine. The patient should always sit with his back to the horses or to a steam-engine, aud if by accident his shoes or clothes become wet, they should be changed as soon as possible. In the house, ladies should have a shawl near them, to put on in going from one room to another, in descending a stair to dinner, &c. By attention to these minutiæ, much suffering and cough may be avoided.

Febrile Symptoms.—The quick pulse, general excitement, loss of appetite, and thirst, which are so common in the progress of phthisical cases, are dependent on the same causes as those which induce symptomatic fever in general. Vascular distension, resulting in exudation and its absorption, is proceeding with greater or less intensity in the lungs, and frequently in other organs. This leads to nervous irritation and increase of fibrin in the blood, accompanied by febrile phenomena. The intensity of these is always in proportion to the activity of local disease, or to the amount of secondary absorption going on from the tissues, or from morbid deposits. Nothing is more common than attacks of so-called local inflammations in Phthisis, and the careful physician may often determine by physical signs the supervention of pleurisy, pneumonia, or bronchitis on the previously observed lesion, and not unfrequently laryngitis, enteritis, or other disorders. In such cases, nature herself dictates that the analeptic treatment, otherwise appropriate, is no longer applicable—food disgusts, and fluids are

eagerly demanded. Under these circumstances, it has been common to apply leeches to the inflamed part, and extract blood by cupping, measures which undoubtedly cause temporary relief, but which are wholly opposed to the plan of general treatment formerly recommended, and to what we know of the pathology of the disease. Every attack of febrile excitement is followed by a corresponding collapse, and it should never be forgotten that, in a disease which is essentially one of weakness, the patient's strength should be husbanded as much as possible. Hence the treatment I depend on in such circumstances consists of at first the internal administration of the neutral salts, combined with diuretics, in order to favour crisis by the urine. Subsequently quinine is undoubtedly advantageous. I have satisfied myself that such attacks are not to be cut short by leeches or cupping, and although in many cases, as previously stated, temporary relief is produced, the exposure of the person, and unpleasant character of the applications, the trickling of blood, and wet sponges, as often irritate, and give rise to unnecessary risk. Still there are cases where topical blood-letting, if it cannot be shown to have advanced the cure, cannot be proved to have done harm; but these cases, as far as my observation goes, are very few in number. In the rapidly febrile cases, or the so-called instances of acute Phthisis, mercury has been recommended: but has never produce, the slightest benefit.

Debility.—This is a very common symptom of Phthisis from the first, and frequently leads the patient into indolence both of mind and body, a condition very unfavourable for the nutritive functions, upon the successful accomplishment of which its removal depends. It is to remove the weakness that tonics have been administered, but I have never seen quinine, bitter infusions, or even chalybeates, of much service alone, while the continual use of nauseous medicine disgusts the patient, and interferes with the functions of the stomach. Neither have I ever been able to satisfy myself that the hypophosphites of soda or of lime, or the syrup of those phosphates and iron, have ever been of service. In all cases, the removal of debility is to be accomplished by counteracting the dyspeptic symptoms, giving cod-liver oil, an animal diet, and improving the appetite by gentle exercise and change of scene. Should the practitioner succeed in renovating the nutritive functions, it is often surprising how the strength increases, in itself a sufficient proof as to what ought to be the method of removing the debility. I have frequently seen patients who have been so weak that they could not sit up in bed without assistance, so strengthened by the analeptic treatment, that they have subsequently walked about and taken horse exercise without fatigue, and this after all the vegetable, mineral, and acid tonics have been tried in vain.

Despondency and Anxiety.—It is impossible for the careful practitioner to avoid noticing the injurious influence of depressing mental emotions on the progress of Phthisis. Indeed the worst cases are those of individuals with mild, placid, and unimpassioned characters, who give way to the feelings of languor and debility which oppress them.

Such persons are most amiable patients—they give no trouble—anything will do for them—they resign themselves to circumstances, and state that they are eating well and getting better up to the last. These are cases of bad augury, for it is exceedingly difficult to inspire them with sufficient energy to take exercise, or to carry out those regulations which are absolutely essential to renovate the appetite and the nutritive functions. Such persons are benefited by slow travelling, cheerful society, and everything that can elevate the spirits, and, insensibly to themselves, communicate a stimulant to the mental and bodily powers. Anxiety, on the other hand, though it may sometimes depress and interfere with the digestive functions, is often a most useful adjunct to the physician. Those who experience it are most careful of their health, sometimes indeed too much so, but, if once satisfied of the benefit of any particular line of treatment, they pursue it with energy. These are cases of good augury, and most of the permanent cures I have witnessed have been in such persons—medical men, and others acquainted with the nature of their disease, who have exhibited resolution and a noble fortitude, who have bravely struggled against local pain, general debility, and nervous fear, and literally fought the battle of life with the greatest success.

When the disease has been arrested, all the symptoms have disappeared, and even some degree of *embonpoint* returned, the patient must still be careful, still consider himself an invalid, and continue to pursue the hygeinic regulations which have proved so beneficial. These, however, will not materially interfere with his enjoyment of life, or even the pursuit of active business or professional life. Amongst the poorer classes, it will be more difficult to obtain such handiwork or occupation as may not be injurious. In order to live, however, they must exchange their unhealthy for more healthy modes of life. As a general rule, the dwellers in towns should seek the country, and the inhabitants of rural districts change the scene of their labours—always remembering that it is not mere place that can benefit, but the opportunities it may offer for carrying out that improvement in the nutritive functions we have endeavoured to show is so necessary.

Local Treatment.—It has not failed to suggest itself to medical practitioners that remedies might be useful if applied directly to the lungs. To this end condensed air, an oxygenated atmosphere, carbonic acid, sulphurous and tar fumes, and all kinds of substances in a gaseous form have been inhaled. Solutions in a state of vapour, or divided into spray, have also been tried. Astringent and other fluids have been injected down the larynx and bronchi. Pulmonary cavities have even been opened from without, and variously treated with a view of causing cicatrization. The result of all these efforts has been —what an intelligent consideration of the pathology of the disease might have anticipated—a uniform failure.

STATISTICS.—It is a matter of extreme difficulty to determine with exactitude how the change in the treatment of Phthisis which commenced in 1841, and became pretty general in 1850, has influenced

the mortality of Phthisis Pulmonalis. In 1852, Dr. Wood, of Philadelphia, remarks of it, that in that city, during the ten years from 1840 to 1849 inclusive, the average proportion of mortality from Phthisis was 1 in about 6·76 from all causes, or 14·8 per cent., and the same average existed in previous years. Cod-liver oil was then generally used in its treatment, and the mortality sank in this disease during 1850-51 to 1 in 8·33, or about 12 per cent., and in 1851 it was only 11·86 per cent.

In 1862, Dr. C. J. B. Williams, in one of the Lumleian lectures delivered to the London College of Physicians, observes that the experience of Louis and Laennec gave an average duration of two years' life in Phthisis after it was decidedly developed, but that since cod-liver oil was introduced, he infers from 7,000 cases, that the average duration of life has been four years.

The registration of deaths in Scotland only commenced in 1855, and offers therefore no means of comparison, as regards Phthisis Pulmonalis, between the mortality occurring before and after that period. But the English registration of deaths commenced in 1837, and, with the exception of a few years, has continued up to the present time. The following is the result :—

Years.	Average annual population.	Average of total number of deaths.	Average of deaths from Phthisis.	Percentage of deaths from Phthisis to total deaths.
37-41	15,720,385	347,070	55,718	16·0
50-54	18,174,011	359,681	50,515	14·0
55-59	19,257,184	425,703	50,187	11·3
60-64	20,196,787	495,531	51,595	10·4

It would appear from the above table that, taking a five years' average previous to 1841, before cod-liver oil and an analeptic treatment were introduced, the proportion of deaths from Phthisis was 16 per cent.; whereas, in the years 1850 to 1854 inclusive, the deaths were 14; in 1855 to 1859, 11·3; and in 1860 to 1864, only 10·4 per cent. of the deaths from all causes. It must be observed, however, that a certain number of cases annually are vaguely returned as "lung diseases," and that whilst deaths from Phthisis have diminished, those from pneumonia and bronchitis have greatly increased. Doubtless exactitude in diagnosis has very much extended among medical practitioners during the last twenty years, whilst it is a matter of common observation that the winter and spring seasons have increased in severity and duration, circumstances which to a certain extent might account for the numerous returns of pneumonia and bronchitis. Without attaching, therefore, too much importance to the exactitude of the results obtained by the Registrar-General, all that can be said is, that as far as they can be relied on, they exhibit during the last twenty-five years a marked diminution in the mortality of Phthisis Pulmonalis, as compared with the period before cod-liver oil and a restorative treatment was employed.