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Thesis by

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Subject:—

"On the Pathogenesis

of Croupous Pneumonia."

April 1883.

On the Pathogenesis of Croupous Pneumonia.

Introductory. The brilliancy of the researches that have of late years been made into the lowest regions of plant-existence – regions previously little known, but now possessing universal interest as the field in which we study "germ" life – is apt to blind us in considering the causes of disease. A continuous stream of learned papers pours forth from the laboratories of physiological and pathological experts, and the great mass of the medical profession, not having the means to prove those papers right or wrong, are apt to be carried away by this stream, and come to believe as true that which is most often sounded in their ears. At present we are too prone to look upon the "germ theory" as the grand explanation of diseases, common and uncommon; already several maladies e.g. pyaemia, typhoid fever, malarial fever, anthrax, diphtheria ulcerative endocarditis, – have been, it would seem, indubitably proved

"Theory" at present put forward as grand explanation of disease.

to be due to the presence and influence of the least organised members of the vegetable kingdom, and from analogy others are suspected to be of similar origin. In regard, however, to Acute Pneumonia - the subject of our inquiry - the connection with a germ does not seem to be so clear; although Klebs, so long ago as 1875, described the presence of a micrococcus in the sputa, in the lungs, and in the ventricle of the brain, in cases of Pneumonia, which he named Monas Pneumoniae, and which he believed to be the causal agent of the disease; and again in his address in the Section of Pathology of the International Medical Congress of 1881, he asserts that croupous Pneumonia is the result of specific action. (Archiv für Experiment. Pathologie, vol. iv. p. 420; and Transact. Internat. Med. Congr. of '81. vol. i. p. 323)

Klebs asserts that acute pneumonia is due to a specific germ.

In order to determine whether a disease depends for its origin on a germ, it is necessary:- (1) to demonstrate in situ and to isolate any germs that may be present; (2) to show that the germ can be cultivated in appropriate cultivating fluids, apart

Post mortem necessary to full demonstration that any disease is caused by germs.

apart from the body. (3) & prove that the circulation of healthy bodies with the germ-containing fluid will result in the production of the same disease (or possibly, a modification of that disease if the cultivated germ be introduced to the system).

Have those conditions been fulfilled with this monad of Klebs? He has found a germ in animals suffering from Pneumonia, & he asserts that this is the cause of the disease; he has also been able to cultivate the germ but I have nowhere been able to find that by injecting specimens of the germ into the blood or lymphatic vessels, or into any of the cavities, organs or parts of the body, he has been able to produce an attack of acute lobar Pneumonia.

Has demonstrated germ in Pneumonia cultivated it, but must been able produce the disease by introducing germ into healthy

We may admit that Pneumonia might be produced by contact of this germ with the trachea, whence it might reach the alveoli of the lung, but the inhalation or injection of these matters will produce a similar effect — that effect not being from the influence of any particular germ, but from the general irritant properties of the substance used; thus,

if a kitten be allowed to inhale the vapour of Menthol - which is not likely to harbour germs in a living condition - acute Pneumonia will be produced. In like manner, the inhalation of Ammonia by rabbits and dogs, is found to cause Pneumonia (Drs. Griffin & Cambria - Med. Times & Gaz. 25/11/82). It can thus be readily proved that Pneumonia is at least sometimes not caused by the agency of any germ.

Inhalation of Menthol, Ammonia & other irritants cause Pneumonia - independent of germs.

The question then comes to be - Is it ever the case that germs cause Pneumonia? If we cannot actually demonstrate a germ, there are points which favour the conclusion that acute Pneumonia is not impossibly dependent for causation upon micro-organisms in some cases. Drs. Sturges and Copland (Memorandum of Collect. Investig. Committee on Acute Pneumonia, by Octavius Sturges, M.D. and Sydney Copland, M.D. - Brit. Med. Journal '82 - vol. I p. 439) seem to imply that there may be a specific germ which causes Pneumonia only, (as Klebs holds there is.). They say that - the fever not running parallel with the physical signs, the high temperature when the apex is affected, and the sometimes sudden

Germs ever cause Pneumonia?

Facts favouring theory of parasitic [illegible]

sometimes sudden subsidence (crisis), point to some influence, which, attacking the whole organism, has its local and manifest expression in pulmonary inflammation." To these points in favour of its parasitic origin they might have added (1) the occasional occurrence of Meningitis, as a complication or result of Pneumonia, since many cases of Meningitis are now, with some considerable appearance of probability, thought to belong to the class of Parasitic Diseases, in which cases it may reasonably be supposed that the germ infection of the Menin- - if such it be -, is secondary to the original germ focus in the lung. Dr. Leyden, a summary of whose address at a recent meeting of a German Medical Society, is given at p. 472, Brit. Med. Journ. 10/3/83, exhibited germs taken from a case of fatal inflammation of the membranes of the brain and cord. According to him, there is little doubt that meningitis is due to germs. Both Klebs and Eberth have observed Meningitis after Pneumonia where micrococci were present in the sputum, Eberth detected the same germs in the fluid

occasional occurrence of Meningitis as a complication of Pneumonia favours germ theory.

Leyden believes Meningitis due to

Klebs and Eberth support this view.

in the fluid exuded from the inflamed meninges as be found in the pneumonic exudation.

We may here observe that, assuming this Meningitis to be a complication of Pneumonia & caused by it, we might explain the presence of the micrococci described as being found in the inflammatory products, to be due to the transference of germs from the lung to the cranium, which have there set up inflammation of the meninges — these germs having occurred in the lung not as the originating cause of the Pneumonia, but. on having settled in the previously inflamed lung, the diseased tissues of which formed a suitable nidus — that is, that they occur, as is hereafter more fully stated, as an epiphenomenon, rather than a cause.

assuming the meningitis to be caused by transference of germs from the lung, this does not explain these to have caused the lung inflammation; they probably settled in the lung when it was already inflamed.

Remarks on Meningitis as a complication of Pneumonia:-

This complication, Meningitis, was pointed out by Guersant in 1842, and latterly, by Tirket of Liége (Annales de la Soc. Méd.-Chir. de Liége. Sept. & Oct. 80) — who calculates that it obtains on an average once in every 250 patients, although it is often latent; and I think we may further consider

considers that, short of inflammation, a temporary congestive condition of the meninges may be present in a very much greater proportion of cases of Pneumonia – cases in which "head symptoms" give anxiety for some time after the acuteness of the lung inflammation has passed, but which usually subside and permit recovery. A recent case has impressed me with the fact that Meningitis not only does occur as a complication of Pneumonia, but is a most serious addition to its risks:– On Mar. 31, Wm G.C. Hawke, act. 19, of exceptionally strong constitution, of steady habits, and with good family history, was seized with cold, aching in the limbs, shivering &c. Two days later I was called to see him, & found him with intense headache, temp. 103°, well marked pleurisy. The following day, pneumonia in the right lung was distinct – rusty sputum, temp. 104° – bounding pulse, dulness on percussion, fine crepitations. Next day, temp. was 105°; it then gradually fell till, eight days after the seizure, it was 101°6, the lung condition having meanwhile progressed favourably under poultice

of inflammation of meninges, cessation of these troubles often takes place suddenly.

– of Meningitis complicating Pneumonia:–

poultices, depressant remedies at first, stimulants afterwards. Instead, however, of consciousness returning as the Pneumonia temperature fell, the patient was between the 8th and 11th days never fully conscious, and from the 10th to the 13th day of illness, when he died, he was unconscious. During this time he displayed a train of symptoms which to my mind as well as to that of a medical friend who saw the case with me, proved the gradual onset of Meningitis while the Pneumonia proper was pursuing an ordinary course. The temp. which had gradually fallen to 101·6, began again to rise; on the 11th day, in spite of ice constantly applied to the head and the bowels being kept freely open, it was 104·2; on the 12th, it ranged between 103·6 and 105·2; on the 13th day, it was 107·4 and an hour later, just before he expired, it reached the very high point of 108·6. During the last five days, instead of the "typhoid stage" of utter prostration seen in cases where the Pneumonia is itself the cause of death, the patient was very restless - rolling his head from side to side, & occasionally giving utterance to a peculiar whining cry. He seemed never to sleep

never to sleep, but his arms & legs moved incessantly in strong, rapid, to-and-fro motion, the finger and face muscles constantly twitching – this perpetual muscular excitation quite different from the aimless "fumbling with the bed-clothes" so often seen: there was delirium at times, of a low muttering type; the pupils were contracted; the respiration took on a "snoring" character; and he died without recovering consciousness all the later symptoms having pointed to his case being one of meningitis, as a complication of Pneumonia. It is subject of regret that a post-mortem examination was not obtained.

Fr. Examined 3 cases, post-mortem purulent meningitis in Pneumonia.

Fraenkel observed 3 cases at the necropsy of which purulent exudation was found under the pia mater of the brain and spinal cord; the thoracic serous membrane and the hepatic cells were also pathologically affected (see reference above). That this metastasis of diseased action occurs in Pneumonia, then, as it does in other diseases of presumably germ causation adds probability to the theory of the parasitic etiology of Pneumonia.

Pleuro-pneumonia of cattle is highly contagious:

II) Further, we know that the pleuro-pneumonia of cattle is a highly con-

contagious

-tagious disease; the fact of this contagiousness, which is a characteristic common to many "germ diseases", is an evidence in favour of acute pneumonia having a germ cause, as its corresponding form in the lower animals would seem to have.

times Pneumonia an is contagious

(iii) Another favouring point is that sometimes Pneumonia in the human subject is to all appearance contagious. This communicability, which is so noticeable in parasitic ailments generally, is discussed and exemplified in a paper on Contagious Pneumonia read before the Metrop. Counties Branch, East London District, Brit. Med. Association in October '81 (see B. M. Journ. '81; II. p. 796). In it Dr has given an account of six cases of typical Pneumonia, occurring in a house where sanitary arrangements were good, the disease spreading from patient to patient, as those who were much in the sickroom taking it.

points favour ory of Kleb.

All these points seem to show that Pneumonia may sometimes be due to a specific germ.

ested) explanation presence of s in Pneumonia

But it may be that more usually the already inflamed lung affords a sufficiently good ground for the growth of

growth of germs; and that those cases which appear to be of germ origin are simply cases of the germ (or some germ) finding suitable soil in that previously inflamed pulmonary tissue. The base of the lung in its normal condition does not afford a good position for germ growth; the constant influx & efflux of air, and the frequent movements, greatest at the base, tend to clear the lung of such growths, or prevent them from settling down; but let there arise a congested condition (say from cold) of a part of the lung & we may expect to find that germs will take root there. Burdon-Sanderson has shown that inflammation and inflammatory products are not in themselves contagious, but that the phlogogenic properties are derived from the micrococci &c which find the products a good soil in which to grow (Lumleian Lecture, 1882). Drs. Griffin and Cambria have been endeavouring to elucidate this matter (Med. Times & Gaz. 25/11/82). They have examined the blood and sputa of pneumonic patients, but have failed to discover the bacillus which Klebs described; they found however, another one with which they experimented. Their

results

results are thus summarised:- "When the pneumonic sputum, free from saliva, was subcutaneously injected, or placed in contact with the trachea of rabbits and dogs, a fatal form of septicaemia was induced, and the blood of these dead animals, when inoculated into others, led to a lethal result." The authors maintain that this is not a specific effect of pneumonic sputa, for some old experiments by Senator have shown that the inoculation of fresh bronchial mucus under the skin of a dog was followed by a deadly result. "The saliva of pneumonic patients kills rabbits rapidly, but only gives rise to an abscess at the site of injection in dogs." But Sternberg, Pasteur and others have shown that the subcutaneous injection of human saliva induces a fatal form of septicaemia in rabbits, attributed to the presence in the saliva of some persons of a micrococcus, as it is only where this organism exists that the septicaemic results appear. (Brit. Med. Journal- Address on the Germ Theory of Disease by D. M. Crowfoot, M.D. President of the East Anglian Branch of the Brit. Med. Assoc.). Griffin and Cambria

Griffin and Cambria: subcutaneous injection of pneumonic sputum induced septicaemia; inflammation only; the bacteria found in the blood of the animal experimented on but it excited septicaemia, not pneumonia.

and Cambria go on to say: "Defibrinated blood, from cases of pneumonia, thrown into the cavity of the peritoneum or into the trachea of rabbit and dogs, resulted not in pneumonia, but in various degrees of fever. Inoculations of the bacillii in various stages of artificial cultivation never caused any changes in organs, but only alterations in temperature." "The bacillus of the pneumonic blood and sputa was always afterwards found in the blood of the vaccinated animals although it had excited no pneumonia." Hence those authors came to the same conclusion "that the bacillus found in the patients suffering from Pneumonia was an epiphenomenon, and not a necessary factor in the production of Pneumonia. Dr Crowfoot holds that if we take the observations of such men as Ogston (Brit. Med. Journ. 27/3/81, - report on micro-organisms in Surgical Diseases) and Sanderson, we may consider it to be fairly established that simple ordinary inflammation are not caused by micro-zymes, but that these, finding a favourable soil in the tissues already the seat of the diseased action, may lead to further changes in the inflammatory products,

Cousin alluded to Drs. Griffin & Cambria:-

Crowfoot thinks Zymes do not cause the disease but in the inflamed tissues lead to such further inflammatory products, as are capable of producing inflammation elsewhere, as in pyæmia or carrying infection both

products, rendering them capable of producing inflammations elsewhere in the body – as in the Meningitis occasionally consequent on Pneumonia, or, out of the body when they seem to carry infection to others, as in Dr Daly's six cases

assuming Pneumonia & Meningitis to be due to the same cause, the fact of the same parasite found in both of inflammation of the meninges, would prove its being a specific germ peculiar to Pneumonia

It may here be incidentally remarked that, assuming Pneumonia to be due to a germ, the fact that Meningitis accompanies it in a number of cases – which Meningitis is supposed due to a transference of germ action from the lung to the brain, – goes to disprove the idea that the Pneumonic germ is a specific one – as Klebs holds it to be – capable of producing Pneumonia only, for we find it in these Meningitis cases acting as an ordinary pathogenic irritant, producing an inflammation of the meninges, for instance; which a "Pneumonic germ" would be incapable of doing; it peculiar to pneumonia, it would be able, when introduced into the system to produce only an inflammation of the lungs.

Re non-communicability of Pneumonia as against theory of its parasitic origin

The Non-Communicability of Pneumonia in general certainly militates against the theory of its being of parasitic origin; many of the demonstrated germ diseases

germ diseases of diphtheria, are, and have always been, recognized as highly contagious. Phthisis, which it seems we must include in the above category (though Spica arrays a considerable number of facts and reasons against recent germ theories in that disease - Brit. Med. Journ. 10/3/83: p. 473.), is of comparatively slow action, and may therefore be expected to show less infectious character than other diseases, whose course is so much more rapid and virulent - (a consideration of some importance in the present divided state of opinion regarding the communicability of Phthisis) - but we should certainly anticipate that Pneumonia, if from germs, would be highly contagious; - the diseased part, the lung, being in direct contact with the atmosphere, the surrounding air &c. & the ground loaded with infection. The absence of contagiousness, then, in the great bulk of Pneumonia cases, is I think evidence in limine adverse to the Germ theory of Cause.

Were Pneumonia always the result of a definite germ e.g. the Micrococcus Pneumoniae of Klebs, we should expect frequently to find the Pneumonia in the apex, the part of the lung which affords

rarity of Pneumonia of the apex of the lung adopted for germ contagion and th, is against the parasite theory.

affords the greatest protection to the growth of germs; but to have a primary affection of the apex is quite the exception- another fact which goes to contradict the theory of germ infection. Let us now ask, however, if in actual cases of Pneumonia of the apex, it can be shown to be ever due to a germ and not to be a "simple" inflammation. Dr. A. H. Wales says in regard to Pneumonia of the apex (Clinical Lect. on Pneumonia Brit. Med. Jour. '81: vol II p. 805) that "it is usually an indication of one of two conditions, either of the presence of some tubercular deposit, or else of a depraved and vitiated constitution." The apex being vitiated would to my mind be sufficient reason to determine simple inflammation to that special part, under the action of ordinary exciting causes, such as cold and damp —, independent of any germs. But the holders of the parasitic theory of the disease might assert that this depraved condition of the apex would be favorable to the growth of germs also & that they are more probably the exciting cause. If we allow the assumption to be feasible, we must point out.

Lew Pneumonia the apex does cur, does it tend support or contradict theory?

usually occurs a previously ated apex or in weak constitution.

former would dispose to ple inflammation, apart from ms.

point out that the rarity of the apex affection combats this hypothesis: for, since vitiation of the apex is exceedingly common, as post-mortems show, we should expect Pneumonia of that part to be much more frequent, were it due to a germ.

How can we explain symptoms of pneumonia of the apex – delirium &c – without adopting Klebs' theory?

Now, in referring the special symptoms of Pneumonia of the apex, do we find that they tend to prove or disprove Klebs' theory that the disease is due to a specific germ.

It is well known that when the apex is the part inflamed, the rigors and fever are accompanied by delirium always much marked some days before auscultatory signs can be detected. That might be construed to mean that a germ was the starting point of the disease, because in disease of parasitic origin, such as diphtheria, typhoid and other fevers, the constitutional disturbance is always marked before the local manifestation becomes obvious; if a germ is not the starting point, it may be considered that some sympathetic nervous influence is at work in apex Pneumonia, similar to that on account of which we find that

that in inflammations of some particular parts, such as the tonsils or the meninges of the brain, the temperature is very high in relation to the amount of surface inflamed, and the accompanying delirium may be accounted for by the over-stimulation of the brain which the high temperature causes.

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Which, then, of these two explanations of the specially marked nervous symptoms in apex Pneumonias is likely to be correct? In reply to this, let us examine the nearest parallel affection - acute tuberculosis of the apex - and having discovered the more probable explanation, let us ask if it helps us to connect Pneumonia more closely with a febrile cause, - or the reverse?

In tuberculosis, the apex is the usual part affected; are, then, nervous symptoms specially marked in Phthisis Pulmonalis, in which it is understood germs play a prominent part? Are the general symptoms in cases of acute tuberculosis - galloping consumption -, in which an apex is rapidly destroyed, similar to those of acute Pneumonia of the apex? The fever is certainly very marked, often

before

before any distinct lesion can be detected at the apex; but unless there is also tubercle of the meninges of the brain or spinal cord, it is rare to meet with cases of Phthisis in which head symptoms are marked, — a consideration which would induce us rather to assign different causes in the two diseases, and to think that if the Phthisis is due to a germ, the facts above mentioned by no means tend to prove that Pneumonia is of similar origin. In phthisis, then, we see that brain symptoms are specially marked only when the same tubercular germ is found in the cranium as exists in the lungs; in like manner we might expect that if the parallelism between acute Phthisis and apex Pneumonia holds good, in the latter (in which brain symptoms are so common) we should attribute both the Pneumonia itself and the accompanying meningitis to the same cause; but I have already stated what I believe to be the true relations between the two — viz. that when the apex Pneumonia and the meningitis are found together, they are not both from the same cause (whether that cause be

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germ or otherwise), but the former is antecedent to the latter, and the cause of it.

But moreover, Pneumonia cases do occur in which Post-mortem Examination shows nothing within the cranium to account for the delirium &c, which were such prominent features during the progress of the case; so that we are forced to the conclusion that the brain symptoms in ape Pneumonia, when there is no actual Meningitis present, are due either to a temporary congestion of the Meninges or to the influence on the nervous system of a simple inflammation occurring in an already shaky constitution; in other words, the symptoms are quite susceptible of explanation without the assumption that germs have acted as the cause of the original lung lesion.

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We now proceed to state one or two geographical considerations in reference to Pneumonia causation.

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We know that in warm countries diseases depending upon germs are more severe and more contagious than in temperate climates; thus some maladies, as yellow fever, soon

die out when imported to the temperate zone; febricula, or simple continued fever, is much more severe in the tropics than in this country; and phthisis has long been regarded as contagious in the warmer climate of Italy; so that even after allowance is made for the absence of cold (which would be a predisposing cause even if the disease were due to a germ), we should expect Pneumonia in the tropics to occur in a more virulent & more contagious form than in this country, were it of parasitic origin. We find, however, that such is not the case, and that, though idiopathic Pneumonia is by no means unknown, in most cases the disease occurs in connection with some other ailment. Oftentimes it is concurrent with, or consequent upon, some infectious disease (its relation with which group of maladies will be discussed later); but there are also other diseases, with which germs have certainly nothing to do, in which the lungs are affected, severe congestion and oedema taking place, if not actual Pneumonia; thus in Sunstroke, though the digestive and nervous

idiopathic Pneumonia does occur in a more frequent, more severe or more contagious form in the tropics, we should in analogy expect, were it of parasitic origin.

though it occurs as a complication of other diseases, it occurs also in connection with ailments unconnected with germs as sunstroke, in which congestion of the lungs, if not inflammation, is common.

nervous systems suffer most, yet according to Sir Joseph Fayrer, the lungs are often deeply congested. This is presumably accounted for by the general depression of vitality entailed by the nervous shock, this causing loss of tone in the lung vessels which therefore become congested more readily during the enfeebled action of the heart. Indeed, in warm climates the respiratory system seems to fare better than the other systems of the body, and inflammation of the lungs differs from the recognized germ diseases in being less common (unless as a complication of other maladies) and less severe in warm climates than in temperate; this I think must to a great extent be due to the absence of the combination of cold and wet, the great exciting causes of acute Pneumonia.

Another point is suggested by climate considerations – & that is, – Were pneumonia due to germs, it should be extremely rare when the atmosphere is specially pure, as at sea and in the various mountain health resorts. Such places are comparatively free from disease of all kinds

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all kinds but in the cold European resorts Pneumonia is not unknown, and the presence of melting snow is well recognized as being conducive to inflammations of the respiratory organs; this latter point is exemplified by the state of affairs at such places as Davos Platz in Spring when the thaw sets in. Thus we see that the Germ Theory of the disease does not receive support when we consider the conditions obtaining either in a tropical or cold climate.

Relation of Pneumonia to Zymotic diseases.

There is, however, another point worthy of consideration, viz. the relation which Pneumonia bears to certain diseases which are believed to be due either to a germ, or to some septic influence.

Pneumonia occurs as one of the symptoms or complications in a number of such diseases, as typhus and typhoid fevers, measles and smallpox, which indicates that the presence in the system of the germs peculiar to these diseases may tend to induce an attack of Pneumonia as well as the conditions of cold and damp. This result is probably due to the state into which the various organs are brought by the action of the deteriorated germ-containing

germ-containing blood. This blood cannot afford the nourishment the parts require, nor can it so well clear away the débris from the tissues, which accordingly lose tone, and loss of tone in a part is (generally) a preliminary to inflammation. But besides existing in the blood, a specific germ has in measles been discovered in the breath, a fact indicating of course its presence also in the lung. (Braidwood & Vacher, Brit. Med. Journal '82: vol I. p. 77); if in other fevers the germ were similarly to enter the system by the lungs, we should not only not be surprised to find Pneumonia occurring, but it would in all probability be one of the earliest symptoms. It may be that the bacteria, before penetrating into the general circulation, may settle in the lung, and may thus produce a special form of Pneumonia — that form which Drs Grimshaw and Moore, of Dublin called Pythogenic Pneumonia. (Dublin Journal of Med. Science: May '75. p. 404). The existence of this peculiar germ-pneumonia would explain the experiences of many who have seen cases in which there seem to be

Pneumonia as a complication in the diseases (perhaps due to deteriorated blood causing loss of tone in the lung + predisposition to inflammation.

germs, which have been detected in the breath in measles, may settle in the lung, so disposed, and excite a form caused pneumonia.

Rounds

grounds for attributing the disease to a parasitic causal agent. Germs finding themselves in a position to grow will, as Herbert Spencer would say, "adjust themselves to their environment" and produce a disease which would be a departure from the typical pneumonia – one which would probably be described as not "running a normal course" – but these cases which are not typical appear to be just those which deserve the most consideration in reference to the germ theory of cause. Changes may take place in the fever germ, which in "new environments" may adjust itself to these and become modified in character, just as beings higher in the scale deviate so much from the normal type, when placed under new conditions, as to be considered new species. Such changes for instance in fish have been shown in regard to the famous Gillaroo trout, in Ireland, the characteristics of which were lost when they were hatched and grown in rivers devoid of the shellfish on which the Gillaroo trout has been accustomed to feed; they became ordinary brown trout, having

fever germ may circumstances modified, when they take root the lungs

Gillaroo trout Ireland became similarly modified circumstances altering; such changes have been noticed in regard other fish – and are common in the vegetable kingdom.

owed

owed to their food their deviation from the normal type. Similarly, Prof. Day, late Inspector of Fisheries for India has ascertained that what seemed to be different species of char were really one, and that by change of circumstances and cultivation, endless varieties could be produced. The vegetable kingdom also shows innumerable instances of change of character produced by change of circumstances, and we may thus easily explain the change in character of the bacteria found in the lung, when these organisms of the simplest structure are found to be different from the germs producing the particular disease of which the Pneumonia is a complication.

Further, these special Pneumonias may, with great appearance of truth, be looked upon as merely additional local manifestations of the disease-in-chief. Recently, Dr [reference misplaced]), described a series of cases of "Pneumonia" which, when other drugs had failed, were treated successfully only by doses of Perchloride of Iron, in a manner which suggested to his mind very strongly that the cases

cases he was treating were really identical with erysipelas, except that the local manifestation of the disease was in the lungs instead of being in the skin. Since then Fehleisen (Die Aetiologie des Erysipelas. Berlin: 1883) has conclusively proved the existence of a micro-organism as the cause of Erysipelas; and as it does not enter the blood but is found chiefly in the corium and subcutaneous adipose tissue, filling the lymphatics and lymph spaces, it is surely not an impossibility that the numerous lymph channels of the lung may become an occasional nidus for the disease, giving rise to a kind of "Pneumonia," and yet not in any way affecting more external parts. If the erysipelas germ can effect this, why not the germs of other diseases? We are accordingly found to admit that certain so-called "Pneumonias" — found in connection with other (germ) diseases — may be, and probably are, due to germs as causal agents; but so far from these organisms being specific Pneumonia germs, capable of originating Pneumonia and nothing else, they would

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seem to be germs of the diseases, modified perhaps by their implantation and growth in a new soil - the lung - and exciting an "erysipelas of the lung" or a "typhoid inflammation (if not ulceration) of the lung", or a "measles of the lung" - complications called at present, for want of a better term, by the general name "Pneumonia". But that these germs, when introduced to the system, cause a true idiopathic inflammation of the lung, i.e. a true croupous Pneumonia, is far from being proved by a consideration of the complication as it occurs in these diseases.

Summary of the arguments pro. & con. :-

To summarise, then, the arguments pro. and con., we find that — in favour of the zymotic theory of cause are these points:- the sudden onset of Pneumonia, its high fever, the rapid fall of temperature when the inflammation is still at its height, its common association with contagious diseases, its occasional epidemic character, the presence of the micrococcus in the lung, inflammatory products, the sputum, the ventricles of the brain (as described by Klebs (Archiv. für Experiment. Pathologie: vol. iv. p. 420), Eberth

Points in favour of the parasitic theory of cause:-

(Deutsch Arch. für Klinische Medecin. vol. XXVIII.); Koch (Arbeiten aus dem Gesundheitsamt: p. 46); Friedländer (Virchow's Archiv. vol. LXXXVII: p. 319); Leyden; Günther (see Brit. Med. Journ. 3/3/83: p. 422)}; the occasional occurrence of Meningitis (which is thought to be often of ferm origin) as a complication of Pneumonia; the contagiousness of Pleuro-pneumonia, the corresponding disease in cattle; and the occasional apparent contagiousness of acute Pneumonia in the human subject.

Points against the theory:- On the other hand, Leyden states that in certain other cases of Pneumonia, the fluid withdrawn by puncture showed no Micrococcus, and in two epidemics of Pneumonia, one described by Kühn (Berl. Klin. Wochenschrift, 1881) where some of the tissues were examined by Koch, and the other described by Kerschensteiner, search for micro-organisms gave negative results. (This is specially noteworthy, because we should expect epidemic pneumonia more than any other to show the evidences of its zymotic origin, were its cause a parasite.). Another point of the greatest importance is that Pneumonia has never been excited by the inoculation of these organisms

nor by their introduction into the system experimentally; till this has been accomplished, one of the most essential proofs of a germ cause will be wanting.

Against the hypothesis are also the considerations:- that Pneumonia can be produced by the inhalation of Menthol, Ammonia &c, in which are no germs; the fact of the non-communicability of the disease as a rule; the rarity of Pneumonia of the Apex, the part of the lung most susceptible to the implantation and influence of micro-organisms; the fact that in warm climates idiopathic Pneumonia is not more common or more severe than in temperate climates, and that in pure atmospheres (where germs should be rare) it occurs as elsewhere under the combined influences of cold and damp; that the high fever and delirium, common in Pneumonia, can be accounted for otherwise than by the presence of parasites; and that the lung inflammation occurring in zymotic diseases in no wise favours the idea of that inflammation having arisen from a specific pneumonia germ, but rather that it is a local manifestation of the disease-in-chief, caused by the modified

modified germs of that disease, and ought not therefore to be included in the subject we are considering.

Conclusions:- We conclude, then, that true idiopathic Pneumonia has not been proved to be of germ origin, - that the nature, situation, and functions of the part affected, its intense vascularity, its openness to the germ-laden atmosphere, and the liability to which it is exposed, when diseased, of germs taking root and flourishing in the congested tissues - account for the symptoms and signs which suggest its pathogenesis from germs, and for the presence of bacteria in the sputa, the lungs themselves, and the products of inflammation elsewhere; but we may admit that when inflammation occurs as a complication of recognized germ diseases, we may, and probably do, have a germ-caused Pneumonia (so-called) - the parasite of the causal disease being possibly modified by the new conditions surrounding it; but that there is a specific germ which acts as a causal agent for Pneumonia only, as Klebs and his followers maintain, is, I believe, far from being probable, and as yet has certainly not been proved.

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