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Thesis.

The Abortive Treatment of Specific ("idiopathic") Fevers.

by.

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The Abortive Treatment of specific ("idiopathic") Fevers.

Through the Kindness of Dr. Allan Jamieson and Dr. Wood, I have had, during the past session, abundant opportunities of seeing fever cases, of observing them for myself, and have had abundant food for thought in reference to fever; and I never visit the wards of the Fever-House without asking myself the question - "Is the treatment of specific fevers satisfactory?" - and wondering whether some means could not be devised to check the course of idiopathic fevers, about which, at least so far as cure is concerned, we at present seem to be so helpless. One is apt to think and say - "Oh! it's a fever and it must run its course, and all one can do is, by means of common sense treatment, simply to pilot the patient through it". But is this true? I do not think so: but apart altogether from its truth or otherwise, such an idea ties one's hands, and paralyses one's energies, and if we do not search for cures we cannot find them. It reminds me of the time when epidemics

were believed to be the special scourge of an offended Deity, and that to interfere by natural means, to stop the course of such epidemics – except by trying to appease His anger by peace-offerings – was to show an amount of impiety deserving of instant death. But the time has gone past when disease was viewed as specially sent by God as a punishment for sin committed, present or retrospective, or as a means of training for future usefulness, here or elsewhere. Disease, like Sin, could ~~form~~ find no part of a world, and the things therein, whether created or made, concerning which it is written – "God saw ... and, behold, it was very good" (Genesis I. 31). No! disease formed no part of the original programme: it is like its Father the Devil, an interloper – an usurper – a parasite – a troubler of the people, under the chaperonage of the Prince of the Power of the Air. But in everything that the Evil One has tried to do to spoil the harmony of God's original creation, he has been check-mated and conquered on every point, and what he has intended for the destruction and degradation of the human race, God has so arranged that

it has always been, is, and will be for their good; and for every disease that Satan has been allowed to hurl at our fallen humanity, God has, there and then, believe me, provided a cure. If this be not the case, then it must necessarily show that the Devil is the more powerful; but that cannot be, for unto God alone shall every Knee bow, and everything be held in subjection, whether in earth or hell or heaven. Hence we assume that for every disease in existence God must, ~~have~~, in the very nature of things, have provided a cure, and it is the Physicians duty to take his stand against the powers of evil and diseases and find them (the cures) out. He is to stand side by side with God and fight to the last and call nothing incurable. I must ask you to bear with me for apparently bringing in matter so foreign to our subject; but from my point of view at least, it really is not so, for to me Science and the teachings of the Bible are one book. It is true we cannot expect to get rid of disease altogether, or be entirely free from its scourge; but, at any rate, the Physician should be able to bruise

its head, even though it may bruise his heel: he should at least be able to rob it of its sting, and hasten the time when "the voice of weeping shall be no more heard in her, nor the voice of crying. There shall be no more thence an infant of days, nor an old man that hath not filled his days: for the child shall die an hundred years old." (Isaiah 65 - 19 & 20).

Having, therefore, given a short account of what I believe to be the pathology of disease in general, and the relation the Physician should bear towards it – having shown him, as it were, his marching orders, and that although his profession is the direct outcome of the work of the mischief-making devil, that nevertheless it is a sacred calling, I will now proceed to speak of the specific fevers in particular.

The Cause.

As regards the cause of specific ("idiopathic") fevers, I think it has now been sufficiently established that they are due to the introduction from without of minute microbes or germs, which after a certain period of quiescence, multiply within the system,

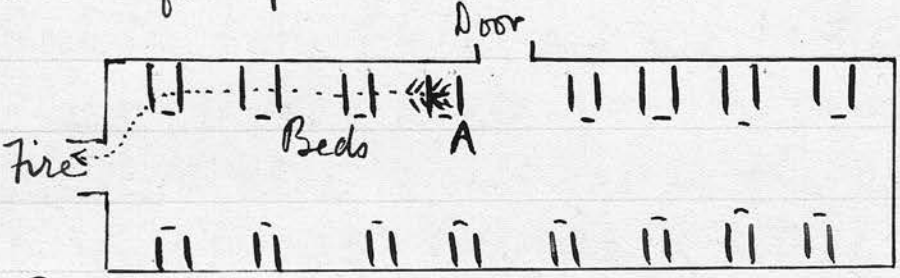
and that it is to this multiplication, their subsequent diffusion into the blood and through it to all parts of the body, and their peculiar vital reactions in respect to living tissues, that we must look for an explanation of the symptoms and effects of fever. We must now ask, and try to answer four questions -

1. Where do the germs come from?
2. How are they introduced?
3. Where do they incubate?
4. The abortive Treatment.

1. Where do they come from? Almost always, I believe, from the air; the micro-organisms themselves, or their seeds (spores) can readily float in the air, just as fishes can swim or float in water. [It is almost unnecessary to bring proof of this well recognised fact, but if any be necessary a reference to Tyndall's "Floating Matter" &c or to Pasteur's "Memoire sur les corpuscles organises qui existent en suspension dans l'atmosphere", or to the researches of Sir Joseph Lister, will settle the point.]

A curious example of the transmission

of micro-organisms by the atmosphere has been noticed at the Fever House. For example if we have a room, such as the male erysipelas ward, with the door through the middle of one of the side walls, and a fire place at one end, thus -



There is a draught, of course, directly from the door towards the fire-place along one side of the ward more especially (as shown by the dotted arrow); now if (by mistake) a case of measles be placed in the bed next the door, of the side between the fire and the door (marked A) the measles will spread gradually up that side only, from the door towards the fire place. A case just like this actually occurred: it is not a mere picture of fancy. Now what is true about measles, is, I believe, equally true about other specific fevers, such as small pox, scarlet fever &c. In small pox, for example, it is absolutely unsafe

for one unprotected, by recent vaccination, to enter a room where there is a case of small-pox. This was shown very well this past winter in the case of an undertaker's assistant; he only entered the room where a small-pox case lay dead, but did not touch the body at all, and yet he had a slight attack of small-pox. The same thing also took place years ago in the case of Dr. Wood himself, who merely entered the room where there was a case of small-pox — a friend of his own, at Dundee — but was not allowed to stay long, and yet he also had a slight attack of small-pox. It is just possible that the medium might be solid or fluid food, but I believe it will only be so to the extent that the micro-organisms are given off with the watery vapour, that we know must constantly be flying off from fluid and moist bodies.

It has been proved by Naegeli and Buchner that porous soil will yield germs existing in it. A porous sandy soil was first sterilized by heat and then impregnated with well characterised forms of bacteria; on the top of

this were placed glasses filled with sterilised nutritive solutions, and the whole covered by an inverted bell jar, and after this the soil was heated. It was found that the nutritive solutions in the beakers were inoculated, and on being allowed to develope showed the same characteristic bacterial forms [Centralblatt f. d. med. Wissensch. aften. No 29, 1882]. We see the same thing often also in cases of typhoid fever infection, in this wise: the warm air in the houses being lighter, bulk for bulk, than the external air, is displaced and driven out by the greater pressure or weight of the fresh cold outside air, and if the fresh air inlets from proper sources are insufficient, then the air rises (or rather is forced) through the foundations and floors from all directions, and it is this air which, being forced up through the porous germ laden soil of the basement by the pressure of the outside air, carries up the micro-organisms with it into the breathing air of the rooms, the next step being that these micro-organisms are inhaled, and hence an attack of typhoid fever. So also

if a fluid containing micro-organisms be heated, we see at once little bubbles of gas rising through the fluid in all directions, as the warmed fluid is unable to hold so much gas in solution; when the little bells of gas reach the surface of the liquid, they each burst with a minute explosion, and throw up the micro-organisms into the air, like a bomb from a mortar. It is in this manner, in all probability, that the germs causing malarial fevers gain the atmosphere. [An article bearing on this matter will be found in "Vortraege gehatten in den Sitzungen des Aerztlichen Vereins zu Munchen — Zur Aetiologie der Infections-Krankheiten. 1880. p. 293.]

It is from considerations such as these that one is rather inclined to doubt the efficacy of boiling milk, water, &c in order to destroy ascertained or assumed infection, and makes one rather regard such treatment as a mere placebo, or harmless amusement; no doubt those who do not understand the "why" and the "wherefore" of these matters, think that they are doing something

great, like the fly on the axle of the carriage. In heating thus, a great many of the germs must necessarily be driven off into the atmosphere unharmed; probably those who are foolhardy enough to stay behind may be destroyed if the boiling be sufficiently prolonged, but even that is doubtful. Schroeder was unable to sterilise milk at 100°C, and Pasteur only succeeded in keeping it pure by prolonged boiling; but all spores can be killed by boiling at 110°C. under pressure. But in cases of infected milk for example, the proper germicide to use is one that will dissolve in the milk and gradually diffuse through it at the ordinary temperature, such as one of the many tasteless forms of boracic acid powder*. This substance is one of the most valuable antiseptics we possess, but it must be dusted on in quantity and in impalpable powder; it was thus applied and introduced by Dr. John Duncan during the past winter especially to keep the floor of the mouth sweet after excision of the tongue, and with the very best results, so much so that the risk of death from

*e.g. Boracic acid is the active agent of the well known powder "Glacialine", which is a most excellent antiseptic.

septic pneumonia (which is the great cause of death after such operations) has almost disappeared. The pneumonia was set up by inhaling germs, as the air passed to and fro over the septic surface, more especially in cases where blood had passed down the windpipe and coagulated in the minute bronchi; the clot in this case being very easily infected.] To return, then, to infection through fluids, especially milk. I hope to show that I have but little fear of the infective power of micro-organisms, introduced into the body by means of food and drink. I do not say that boiling the milk is entirely useless, but I do not believe it acts in the way it is supposed to do, nor half so efficacious as it is believed to be

We now pass on to the second question —

2. How are the micro-organisms introduced into the living body?

The answer to this question naturally follows from the last: almost always, I believe, by inhaling germ laden air, and especially when this air is inhaled

through the mouth, as it ought not to be, instead of through the nose, as it ought to be. That they should most readily be introduced by the lungs, is only what one would naturally expect from the minute anatomy of the parts, for there, as we know, the lymphatic system practically communicates with the open air, and then by the pumping movements of respiration, the micro-organisms can readily pass through the stomata into the underlying lymphatics. That is to say, during inspiration the stomata are widened out so that they can easily pass through, and then during expiration they are forced on into the lymphatic spaces. Witness, for example, a coal miners lung. It is impossible to have a more beautiful natural ~~preparation~~ injection of the lymphatic system of the lungs; the peri-vascular, the peri-bronchial and the inter-lobular lymphatics are simply filled with pigment. It is in the same manner, I believe, that the micro-organisms gain access in the case of the specific fevers.

Another possible way is through solid food, milk or water — in other words by

the alimentary canal. Their introduction by this source, I believe, to be very unlikely, except in so far as they are given off with the watery vapour and gases into the atmosphere and inhaled by the respirations.

The stomach has apparently a wonderful power of rendering many of these organic poisons inert, especially if presented to it during digestion, I suppose by digesting them too; for cases are on record where cholera stools have been swallowed without any harm resulting. Again it is a well known fact that even the poison of deadly serpents is innocuous if introduced into the stomach; and still further, without going so far from home, it is the custom of many to eat game only when far advanced in decomposition. But even supposing the micro-organisms get safely past the stomach, what then? How are they to manage for oxygen in the intestine, or how defend themselves against the other micro-organisms who naturally reside there, and who, as naturally, will try to extinguish new-comers - I mean the organisms that bring about the butyric acid fermentation, and

other fermentations of the digestive process; the amount of acid produced would probably alone be enough to kill them. [I ought to mention, in passing, however, that it is believed by many that the internal forms of anthrax (bacillus anthracis) takes place almost entirely through the digestive tube; I merely mention this. It must be taken for what it is worth. Buchner has also shown that the mere inhalation of dried bacilli is fatal to mice. Koch, however, holds strongly to the view that the inoculation takes place through the intestines (mycosis intestinales of man) See Koch's work - Ueber die Milzbrandimpfung, 1882.]

Even those sad cases of death from sucking the tracheotomy tube in diphtheritic cases, is not, I am inclined to think due to the contact of the specific organism with the throat or stomach (besides any one in his sober senses would carefully wash his mouth and throat with some powerful antiseptic afterwards) but from their inhalation into the respiratory passages, where no wash can reach.

A third possible mode of introduction is through open wounds, and the puerperal uterus; this has been most frequently observed in the case of scarlet fever. Here, however, one must be very careful because in many cases of undoubted septic infection, a rash is produced very like that of scarlet fever. The micro-organisms of septic infection are usually introduced through open wounds, but curiously enough they are not readily introduced — at least so as to do harm — by the respiratory tract; for in cases where the lung has been lacerated subcutaneously into the pleural cavity with effusion of blood the wound thus formed does not become septic, or even suppurate, unless an opening be made through the chest wall, and unpurified atmospheric air introduced. Further Lister and Tyndall have shown that air in thus passing through the lungs is rendered optically pure and will not set up putrefactive changes in sterilised nutritive solutions. The question then arises, How is it purified? Do the lymphatics naturally swallow up the floating matter of the air,

and with it the disease producing germs? It seems likely but upon this point I cannot speak with certainty.*

We now pass on to the third question —

3. Where do they incubate? for all seeds must germinate before they can grow or reproduce their like.

(a) Is it in the blood stream?

It seems to be the prevailing opinion that it is and hence the blood is carefully examined with the hope of securing the incubating germs. I do not think it is at all likely that this is their incubating ground; we know, for example, that continuous motion of itself is almost sufficient to prevent the growth of bacteria of any form [See article by Howarth in "Pflueger's Archiv. f. Physiologie", Vol. 14 p. 125-] And further the white blood corpuscles are probably the natural enemies of micro-organisms of all kinds, for they seem to be able to feed on them, and destroy them, unless they are present in too great quantity.

* If this be so, it lends great support to the idea that microorganisms can and do most easily enter by the lungs. Put shortly: (1) Air, containing septic organisms, enters the lungs. (2) a corresponding quantity of air leaves the lung but minus septic organisms and all suspended matters. (3) Query - what has become of the septic organisms and other germs?

(b) Could it be in any part of the alimentary tract?

This, for reasons already pointed out, is extremely ~~unlikely~~ unlikely — except in the case of the intestinal form of Anthrax — (mycosis intestinales of man)

(c) We are left therefore with the lungs or respiratory tract as the most likely place, and I think it is very probable that the lungs are the incubators. Here the microbes can rest with comparative comfort in the peri-vascular, the peri-bronchial, and inter-lobular lymphatics. That minute particles of floating matter tend to be taken up by the lymphatics of the lungs is beyond a doubt, as we have already shown to be the case in coal miner's lung. The observations of Tyndall also, on the optical purity of air that has passed through the lungs tend to confirm it [Tyndall - "Floating matter of the air," 1882]

There is another well known fact that renders this explanation, at least probable — I mean the behaviour of the

"Filaria Sanguinis Hominis" which has been observed to pass into and out of the blood once in 24 hours. From sunset till midnight they pass into the blood (from whence?) and from 2 till 6 A.M. they gradually become scarcer and scarcer in the blood. It is believed that they retire into the lymphatics, and most likely I think those of the lung. There are three other points that seem to show that it is the lymphatics that are the incubators:

i. In hooping cough. The germs in this case probably reside in the lymphatics of the lungs and do not become diffused through the system generally; in this position they appear to exert their full force on the terminal twigs of the pneumogastric nerves there distributed.

In connection with whooping cough it is interesting to note the profound faith mothers have in the popular cure, viz:- to take the child to the Lyas-House; the mistake they make, however, is not to leave the child there - for some days I mean - a mere passing

visit is not enough. This point will be referred to again in the next part of this Thesis. Of course all popular medical cures must be received with great caution by the Profession"; still it is often possible to get valuable hints in this way, which may lead one to search for and find diamonds in the dung-hill of error. One should always remember the old proverb — "There's aye water where the stirkie drouns" [See Dean Ramsay's "Reminiscences", Peoples Edition, p. 153 if explanation be necessary]

ii. In the intestinal form of anthrax, Toussaint asserts that the lymphatic glands of the infected region swell and indicate the point of entrance of the virus [Recherches experiment. sur la maladie charbonneuse, 1879]

iii. In erysipelas also the lymphatic vessels are full of micro-organisms in advance of the red blush, and another fact well known to Surgeons is that the lymphatic glands corresponding to the infected area are

enlarged before there is any appearance of a blush at all [Pepper's, Surgical Pathology, first edition p. 70]

It is possible that the natural arrangement of the lymphatic vessels – mostly surrounding the air tubes and arteries – in a peculiar manner fit them for incubators.

We now pass on to consider the fourth point –

(4) The abortive treatment. I mean by this some method of treatment applied so as to kill the germs in their incubating ground, during their period of quiescence and multiplication. The same means might also possibly do good during the stage of invasion – i.e. the period during which there is distinct fever (rise of body heat) but as yet it has not taken on its specific character. At the present day, treatment does not begin, properly speaking till those two stages (incubation and invasion) are past – except perhaps a purge and some simple febrifuge mixture. On the treatment of fever after this point, I have nothing to say, as it is not

"abortive", and besides these is nothing left to say after hearing the excellent lectures of Professor Grainger Stewart on the subject.

But if I might just venture, in passing, to suggest any additional plan of treatment, it would be to give the means I am about to suggest a trial; it certainly could do no harm and might possibly do some good. But after the ~~germs~~ micro-organisms have left their incubating ground and entered the blood in their fully developed and active condition, probably the best antiseptic to use is alcohol, in repeated and small doses, as this substance enters the blood very easily, and permeates the tissues in all directions, as alcohol. It is probably the oldest of all antiseptics; it was certainly known as such to the Good Samaritan, and most likely also to Noah.

Let me now, at this stage, recapitulate the chief points we have already discussed-

(a) The cause of the various specific fevers is minute micro-organisms, or Bacteria

(b) That the habitat of these organisms

is the atmosphere, just as the sea is the habitat of fishes.

(c) That they are introduced chiefly, if not entirely through the respiratory tract by the medium in which they live

(d) That they come to rest and incubate in the peri-vascular & the peri-bronchial lymphatics, and there they obtain all that is necessary for active division - plenty of oxygen and a suitable nutritive fluid from which to obtain their other food.

(e) And now we wish to say a few words about the abortive treatment. That is to say, active treatment applied during the quiescent and incubating stage especially, with the intention of killing the germs when they are pathogenically weak - because all their energies are used up in reproducing their kind - in the lymphatics of the lungs.

Now since the micro-organisms float in the air and thus gain an entrance to the lungs, so, in like manner, must the toxic agent we employ for the "abortive" treatment. It's the old story of setting a

thief (a "reformed" one, we hope) to catch a thief; or take the later Mr. Syme's famous saying in regard to the treatment of stricture of the urethra - if urine can pass through so, with care can an instrument [Syme's "Supplement to Principles of Surgery", 1851, p.32.] Hence I would suggest that if the micro-organisms can get into the body, so can other toxic agents, to follow them up and kill them during their multiplying stage. What can be the reason, do you suppose, that Nature should have so arranged that these micro-organisms causing the specific fevers, should nearly all require such a comparatively long incubating period? Why of course, just to allow the Physician a chance of exterminating them before they had passed in their fully developed form into the blood stream.

(a) The first agent I thought of was Lister's carbolic spray. In wandering through the fever house I very often said to myself - Well, if I take any of these fevers, the first thing I would do would be to ask Professor Chiene to lend me one of his "sprays", so that it should play in my

room night and day.

(b) The next agent I thought of was nascent sulphurous acid (SO_2). It came about in this manner: I had been examining the throat of a patient, in the fever house, who was very ill indeed with diphtheria, and during the examination he ejected a blast of expired air right into my mouth as I was dodging about trying to see his throat all round. My mouth at the time was open — a rare circumstance — and at no great distance from the patient's mouth, and for the rest of the day I felt a peculiar, nasty smell and taste about my throat; at bed time I was wondering whatever I could do to get rid of this, when I saw my tooth powder (which contains finely divided sulphur) and I put some of it into the well of the candle and then inhaled the sulphurous acid as it came fresh from the flame. It was then that the thought occurred to me - "why not have ordinary candles impregnated with sulphur, ready for use, to be used in all such cases of possible or suspected infection

(c) The third agent -

Thinking about the chemical action of this substance (sulphurous acid) in bleaching straw, woollen goods &c I was naturally led to the chlorine group of elements (chlorine, bromine, Iodine, and fluorine) which act in an opposite manner, and more properly deserve the name of "bleachers", because they destroy the colours by a true oxidising action. But the only accessible member of this group that could be used for our purpose is Iodine. Chlorine is a gas and could not be put into candles: bromine has a very bad smell and is liquid at the ordinary temperature, and could not therefore be applicable for the purposes of candle making. Fluorine is too expensive, too difficult to separate, and there is too little known about it to make it of any practical value, although it has been asserted, now that I recall it, that hydro-fluoric acid as used in etching on glass, and the gases that are given off during this process, are powerfully antiseptic [I have been unable to find more than one reference to this matter, although I know there are others. See article by Dr. Hayward in the

British Medical Journal, Dec. 24th 1887, on Sodium Fluosilicate as an antiseptic]. Still it is not a workable substance, hence, therefore, I was left with Iodine.

(d) The fourth substance.

Quite recently I see, it has been asserted that the oil of peppermint is a powerful antiseptic – as are all the volatile or essential oils [See article by Dr. Braddon in the Lancet, March 14th of the present year.] If this be so it would seem to be well fitted for our purpose, as it is volatile, cheap, easily procured and pleasant to inhale.

To discuss these substances more in detail –

1. Oil of Peppermint – I would merely state concerning this substance that it is worthy of a trial. I might also mention, since we are speaking about volatile oils, that Koch has stated that the volatile oil of mustard, (among other substances) though not very destructive to bacteria its presence in small quantity (1 in 33,000) prevents their growth [Mittheil. aus dem Gesundheitsamt, p. 234]

* See also the same Journal for April 28th at p. 933.

2. The carbolic acid spray.

I believe this would be an excellent agent for our purpose. In fact I am inclined to think that the spray does good in the surgical wards, not so much because it protects the wound from living, floating, micro-organisms, but because of its action on the atmosphere of the ward, and from the fact that patients must, to a certain extent, inhale its vapour. In fact Sir Joseph Lister himself, says that it (the spray) is the least important part of all his method of treating open wounds. For my own part, I always derive great comfort, if I have been in any suspicious place, (as regards infection) from standing in the line of the spray (steam) and inhaling the vapour, till my lungs are filled with it. The steam spray in a room in cases of fever, or suspected infection, I believe, would be a great boon, not of course to play just on the patients mouth, but at no great distance from him; and I would fain hope that the spray will yet do more in this direction, than ever

it has done in the treatment of open wounds. Of carbolic acid is not a very powerful agent for the destruction of spores, yet a solution of 1 in 850 will check the development of the bacillus anthracis (See Koch's work already quoted on p. 26 of Thesis) and the usual strength of the spray as it leaves the engine is 1 in 30.

3. Sulphurous acid and Iodine in the presence of water.

For the purpose of using sulphurous acid and Iodine, I have made two kinds of candles impregnated with iodine (the dark coloured one) and ~~an~~ precipitated sulphur (the light coloured one) respectively, specimens of which I forward with this Thesis. There are various technical difficulties in making these candles which I need not describe in detail; for instance, the sulphur is about double the specific gravity of the melted paraffin, and hence, unless special care be taken, it very rapidly sinks to the lowest part of the mould. This, however, I believe, could be easily overcome so as to insure

of equal distribution through the whole candle. Not only do these candles produce fresh sulphurous acid and iodine, respectively, in an amount that can easily be tolerated in a sick room but the watery vapour is produced at the same time, which is necessary for the chemical action of these gases. The essential parts of the reactions are shown in the following equations -

$$SO_2 + H_2O = SO_3 + H_2.$$

and

$$I_2 + 2H_2O = 4HI + O_2.$$

Of course the sulphurous acid could also be produced by burning carbon disulphide in a lamp; but those who have once smelt this substance are not at all likely to follow the example of Oliver Twist and "ask for more" - the smell will form a lasting remembrance.

The elements set free in the above reactions are in the nascent condition, i.e. they are probably liberated in the form of atoms, so that if they have the chance they will ~~rather~~ combine with some sub-

stance different from themselves, rather than with like elements, as we know that atoms can't exist for any appreciable length of time alone, and rather than exist alone they will combine with each other: thus if nothing else be present we would have O+O becoming O_2, and H+H becoming H_2. [In case this should by any chance ever meet the eye of the Professor of Chemistry, I may add that it is hardly proper to say that the gases in the above reactions are "set free": it is rather a transference from one substance to another without ever actually assuming the free state.]

Now in the nascent condition a gas is much more powerful, for good or evil, than the same gas in the form of fully developed molecules, and in the free state. But if sulphurous acid in great volume be able to disinfect rooms saturated with infective micro-organisms, it occurred to me that instead of waiting till the end of the case, we should begin at the very beginning, and even before the beginning and wedge systematic warfare

against the organisms, the cause of the fever. To attack them in short in their incubating ground as already explained, and thus, if possible, prevent them giving rise to their specific effects at all.

I ought to mention that both sulphurous acid gas and iodine vapor are much heavier than atmospheric air; hence the candles should, when burning, be placed well above the level of the patients bed. Still in any case, the gases, from the law of diffusion, will gradually diffuse equally through all parts of the room.

Koch found that sulphurous acid if present in the air, in the proportion of 1 per cent. by volume, can kill developed forms of bacteria in 20 minutes or less; its action on spores he states, is less reliable. As regards iodine the same authority places the group of which it is a member, next to corrosive sublimate – which he says is the most powerful of all antiseptics. In this way therefore iodine is a much more powerful antiseptic than carbolic acid (See Koch's work already quoted

On p. 26 of [Thesis]

In specific fevers the "invasion" stage, I believe corresponds to the emigration of the micro-organisms from their incubating beds into the blood, but before they have seized upon the special tissue or part which is to be the chief seat of their operations; for we know that each micro-organism has its "seat of election". It is this emigration and entrance into the blood in the fully developed form, that is the probable cause of the rise of temperature before the special characteristics of the fever are manifest. In support of this view I will mention an interesting thing that happened in Mr. Duncan's wards in connection with a case of transfusion of blood, during the winter Session '87-'88. It was an operation necessitated by extensive tubercular disease of the limb, with sinuses communicating with the air, and during the performance of the amputation Mr. Duncan, ~~E~~ according to his custom in cases where loss of blood is a serious matter, directed that the blood be caught in a solution of phosphate of soda, so that it might be

re-injected, towards the conclusion of the operation, into an open vein on the face of the stump. But the assistant who had charge of the vessel into which the blood was dripping, very stupidly allowed pus to dribble in also, of course carrying the micro-organisms present in that fluid with it [Since there was an open wound, there could no doubt be at least two kinds of microorganisms present, the tubercle bacillus, and the organisms that give rise to septic conditions, suppuration&c. How, many organisms are mutually antagonistic e.g. the micro-organisms of Tubercle and those of erysipelas are mutually antagonistic and destroy each other; but the micro-organisms of Tubercle and those that cause septic conditions are not antagonistic, or even passive, but actively assist each other in their work of destruction and death. This is well illustrated in phthisis, for whenever the tubercular nodules have ulcerated through into the air vesicles, or minute bronchi, then instead of having to fight against one kind of micro-organisms, we have two to fight against, and the chances of the patient

recovering are immensely diminished, as compared with cases where there are no open ulcers. I believe that the cases of cured phthisis often seen in the post-mortem room belong to this latter class. When, in the Surgical wards, tubercular cases have reached the stage of open septic sores, the treatment is amputation, or in cases where this could not be done, scraping with a sharp spoon, free scrubbing with a powerful antiseptic (usually corrosive sublimate) and free drainage: but how is this to be done in the case of the lung, that is the question? In "broncho-pneumonic phthisis" however, the case is a little different: here the caseious masses are originally exposed to the air, and very soon therefore become infected with septic organisms, but not necessarily the tubercle bacillus. Infection with the tubercle bacillus may or may not follow, but I do not think that is necessary to carry off the patient: look at the great cause of death after excision of the tongue: it is called septic pneumonia but might just be

as well called "acute broncho-pneumonic phthisis", or "galloping consumption". In this case the blood is inhaled, passes into the minute bronchi and air vesicles, there coagulates, and becomes infected with septic organisms from the wound in the floor of the mouth.* (I have already explained that this condition is much less commonly met with now-a-days on pp. 10 & 11 of this Thesis). In different specific fevers again, the different micro-organisms are mutually passive towards each other, each lets the other go its own way. I have seen this illustrated several times at the fever-house e.g. when a child with measles had, by mistake, been sent in as a case of scarlet fever and placed by the nurse in the scarlet fever wards during the absence of Dr. Wood. The child then recovers from the attack of measles, but after a period corresponding to the incubation of scarlet fever, a well marked attack of this latter fever develops. These facts seem to suggest the following clinical class-

* This condition is also very apt to follow tracheotomy and it is from this, I believe, that the German Emperor at present suffers. The conditions necessary for its production are (1) blood inhaled into the bronchi and (2) inhalation of septic organisms. Could it have been avoided?

ification of micro-organisms-

(a) Those that are mutually ~~actu~~ antagonistic.

(b) Those that mutually assist each other. And

(c) Those that are mutually passive.

You must kindly excuse this digression, but the whole question is so interesting that I could not resist the temptation to enlarge slightly upon it]

But to return (p. 33). When Mr. Duncan noticed that pus was being caught as well as blood, he stopped the operation for a little and had that blood all emptied out, and the vessel cleansed as carefully as possible, and then during the rest of the operation nothing but pure blood was caught. But after the injection, in this case, there was a smart attack of fever (high temperature) which should not, and does not usually follow this, now-a-days, simple operation. I can only account for the great rise of body heat, in this particular case, by the supposition that some

of the micro-organisms had been injected directly into the blood, notwithstanding the careful cleansing of the vessel containing, in the first instance, mixed blood and pus.

During the stage of "invasion" the micro-organisms leave their incubating grounds, and enter the blood in their fully developed condition, preparatory to taking up and finishing their special life work. And searching for the special tissue or part, each micro-organism is specially fitted to attack. At this stage, I do not know if antiseptics acting specially on the lungs, would be so valuable as during the incubating stage; still they might possibly prevent further emigration by destroying those already formed and ~~prev~~ arresting the development of others.

During the stage of "advance" of the fever i.e. the stage during which the special characteristics are seen, the special symptoms objective and subjective, are, in all likelihood due to the micro-organisms having now fixed upon the special tissue or part they are specially fitted to destroy.

and that in their search for oxygen or other food materials they break up this tissue in part; if this be so, then we have a ready explanation of the leading symptoms, such as the large amount of urea in the urine, the high temperature, the nervous effects, the rapid emaciation, and the general poisoning of the system. For there is no doubt that even the aerobic micro organisms can live without free oxygen provided they are allowed to attack and break up substances containing that element; in fact Pasteur defines fermentation thus - "fermentation is life without free oxygen". [See his "Studies on Fermentation", English translation, 1879]

How would the means we suggested for the destruction of the micro-organisms during the incubative stage, be of any service during the advance period? I am unable to say; at any rate the adoption of such means could do no harm to the patient, and would certainly do good to those about him as well as killing the infective micro-organisms settling in the

room. What is rather indicated, however, it seems to me, is a liquid and rapidly diffusible antiseptic which will enter the blood and permeate the tissues as such, without the risk of combining with, breaking up, or being broken up by, other substances on the way; for this purpose the oldest of all antiseptics will probably be something at least like what is wanted, not merely because of its supporting and stimulating powers, but also of its directly toxic action on micro-organisms – I mean ethylic alcohol, already mentioned on p. 21 of Thesis. It has further been ascertained by Koch, that allyl alcohol, while not very destructive to bacteria yet its presence in the proportion of 1 part in 16⅔,000 can prevent their growth. [See his work, already quoted, "Mittheilungen aus dem Gesundheitsamt, about p. 234].

There is another circumstance that makes one think of alcohol, viz:- the very great amount of evil it is capable of doing when abused; this would seem to suggest that it really must be one of the most valuable therapeutic agents yet discovered,

and that in all probability we have not as yet found out its true value. For any substance capable of doing great harm when abused, must, I think, according to a well known law of Nature, be capable of doing an equal amount of good when properly used. Look at opium, for example, "God's gift" to a suffering humanity.

In support of my views on the value of gaseous antiseptics in preventing infection, or in all probability, killing it during the incubative period, if already introduced, I would ask you to look at those clouds of incense that filled the camps of the Israelites by day and by night, in their journey from Egypt to the Promised Land, through the Sinai Peninsula, under the leadership of Moses — the greatest authority on matters of ~~Politics~~ Public Health and public morals yet known. What mean these clouds? No doubt, in the first instance, the chief meaning was as an act of worship, but in worshipping God, we - best serve ourselves. What else could have prevented typhus (camp fever)

typhoid, &c? Think of the number of people, 2½ millions, [including women and children, at a moderate calculation: the number given is 600,000 men above 20 yrs. of age. To each man I have allowed one wife and three children] think also of the thousands of oxen, sheep, and other animals killed as sacrifices, the amount of blood spilt, the entrails, offal, and refuse which would quickly putrify in the warm sun and spread disease and death through the camp, unless some special means were taken to prevent it.

I would also instance, in support of this theory, for what it is worth, the popular remedy for whooping cough already referred to on p. 18 of this Thesis. I take it that the gases which flood in and fill the atmosphere of the Gas-House are inhaled and kill the micro-organisms, the probable cause of this disease.

How is it that specific fevers come to an end? There seems to be various ways. In the first place, there is the

struggle for supremacy between the two hostile armies - vegetable and animal cells (probably white blood corpuscles) The battle won by the animal cells means recovery from the disease, while the supremacy of the invading parasites means death of the patient. There is another way, however: these peccant micro-organisms, like everything evil, contain in themselves the elements of their own destruction, and produce by their own growth, poisons that ultimately prove fatal to themselves.

Many have tried by ordinary antiseptic substances to arrest the course of specific fevers, after the fever has fairly got a hold (i.e. during the "advance" stage) but without success. For instance Dr. Dukes has suggested the use of mercuric iodide (biniodide) in scarlet fever (see Dr. Jamieson's paper in the Edinburgh Medical Journal, Nov. 1887) and Dr. Illingworth I think, states that it will cut short the course of a well established cases of scarlet

fever, but that is all nonsense, and besides this substance is surely not the best one might choose considering the risk of kidney inflammation (glomerulo-nephritis) in this disease. It was tried at the fever-horse, but was found useless: in two cases exactly alike in every respect one got the bin-iodide the other did not, but the course of the fever was the same in both cases, and if anything, the patient who was taking the bin-iodide manifested a higher temperature than the other one. As I have already said what we need is a substance that will enter the blood and tissues unchanged and work as effectively and surely in the body as in an ordinary culture flask. I do not think that mercuric iodide fulfils these conditions.

In Diphtheria, too, many local (for the throat) antiseptics have been used from time to time, and stated to be all that could be desired in curing the disease, but all have failed as yet to be of any certain or practical value. This arises

I believe, from the mistaken notion that the primary lesion is in the throat, whereas the throat symptoms are secondary, being but a consequence and proof of systemic infection! – just as in the sore throat of syphilis. It is of little good therefore, except for local comfort, to apply local remedies, which can never cure the disease; if a patient recovers in cases where local remedies have been used, it is because he would have recovered at any rate, and is not due to the local treatment. This plan is like cutting off the leaves of a dock, but leaving the root in the ground; it is not pulling it up by the roots: you simply cut off one head but a thousand spring up in its stead. The only local applications that seem to do any good at all, are inhalation of steam*, and painting the throat with boro-glycerine; for my own part I would prefer to use boracic acid powder dissolved in glycerine, or the powder in excess mixed with oil of eucalyptus. It is possible however, that the application of local

1. The lesion begins around the blood vessels in the submucous tissue (Aitken's Pract. of Med. p. 751)

* It is better to medicate the steam with some volatile antiseptic as ol. eucalypti, carbolic acid, &c for the sake of the room and the nurses and also to save the patient from fresh and repeated auto-infection.

volatile and solid antiseptics may prevent repeated auto-infection through the pulmonary lymphatics. Dr. Wood has often told me that patients who recover have, as a rule, had little or nothing done for them except to inhale steam, (probably because the case was simple and did not require anything) whereas those who die, have been treated by every possible known method. Further, we know that the throat-symptoms are of small moment as compared with the profound systemic poisoning, and that when patients die it is rarely if ever from choking, but from paralysis of the heart* due to the effects of the micro-organisms on the cardiac muscle and its ganglia directly but also no doubt on its centres in the medulla, coupled with the action of the poisons produced by their growth. (That the organisms affects the nerve centres directly, receives support from the paralytic symptoms often found in cases of recovery).

There is another point to which I must shortly refer. It may be said

* at all ages above puberty at any rate.

that if the inhalation of antiseptics into the lungs be capable, as asserted, of killing the incubating organisms of the specific fevers, why is not this plan more successful than it appears to be, with regard to the tubercle bacillus, in cases of phthisis pulmonalis? But here the circumstances are essentially different. The "seat of election" is the lungs, and the first thing the bacillus is to surround itself by an impermeable wall and at the same time block up the lymphatics: it is like an invading army that burns the bridges and destroys the roads behind it, so that pursuit or retreat are alike well-nigh impossible. Further the tubercle nodules, or follicles, are, in their very nature, destitute of vessels, whether for the conveyance of blood or lymph. For these reasons — and others might be added — it is so specially difficult to reach the tubercle bacilli, while all the time auto-infection goes on, the destructive changes being assisted, secondarily, by the presence of septic organisms as well.

There is no doubt the inhalation of volatile antiseptics, with or without steam, does good in phthisis, just as in diphtheria, by protecting those about the patient from infection by the escape of living micro-organisms, and by keeping the walls, furniture, air &c of the room free from infection, as far as may be, and may also protect the patient himself from re-~~inoculation~~ infection by the germs given off from the diseased area, and driven backwards and forwards by the respiratory movements. Just to day (April 20th) at the fever house I was talking to the nurse who has charge of the diphtheritic cases, and asking her, as she was pouring oil of eucalyptus into the bronchitis ~~Kettle~~ Kettle, whether she thought it did much good? She said, she thought it did good to themselves, meaning the nurses, and the other patients in the ward, in the way of preventing the spread of the infection, by killing, on the spot, the micro-organisms escaping into the atmosphere of the ward.

There is yet one other point: Even supposing the micro-organisms are sometimes introduced through the medium of the alimentary canal, antiseptics in the form of gases inhaled into the lungs, will reach the alimentary canal more quickly than by any other path: I found this on a circumstance I have noticed for many years, viz.- If one is dressing, or otherwise working with a very putrid sore (happily seldom seen now-a-days) or making a post-mortem or, or dissecting, a much decomposed subject, the putrid gases are inhaled and make their way with great rapidity to the alimentary canal, and the next time one breaks wind, or goes to the water closet these very gases are again evolved and can be recognised at once. This fact has very often struck me as being very remarkable, to say the least of it, and I believe, is another circumstance supporting the view that specific infective micro-organisms are almost always (if not always) introduced into the living body through the respiratory passages.

For the proper carrying out of the abortive treatment it would be necessary to educate the people, mothers especially, to the necessity of taking the disease in its very beginnings, and either to send for a medical man, or else (better) themselves to adopt at once some of the simple means I have ventured to suggest, the moment suspicious symptoms appeared, or whenever the child had been in places where it was likely to catch infection. Under these circumstances it would be the mothers duty, not only to bath the child in the usual sense but also to give it an internal aerial bath, as it were, of sulphurous acid, or iodine, or carbolic acid, or oil of peppermint, or some of the other volatile oils. The first two and the last could be procured by the poor, and it would be an easy matter for the rich to have a "spray room" and an engine for the production of the carbolic spray always ready.

In Conclusion:

There may be many fallacies in this Thesis, which older and more experienced heads than mine will discover. When I began it I felt as if I could make something of the subject; as I finish, I feel as if I had done nothing. My sole wish was to write something which would benefit my fellow-men - to do something however small, to lessen disease and suffering. If at times it seems dis-connected, I must ask your forbearance, for side illustrations would crowd in upon me. It may be that I am only like a finger-post, pointing in the right direction, but am permitted to enter the promised land. But if anything I have written be the means of suggesting ideas to others, which may ultimately lead to the solution of the great problem herein discussed, even though no credit be due directly to myself, I will be more than content.

John M. Lachlan

April 1888.