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# ANTISEPTIC INHALATION,

AND THE

# BEST METHOD OF CONDUCTING IT.

*A Paper read before the West London Medico-Chirurgical Society*

BY

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# ANTISEPTIC INHALATION AND THE BEST METHOD OF CONDUCTING IT.

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It was not difficult to foresee that if the antiseptic principle of treating certain surgical forms of disease were once established upon a sound clinical basis, it would be soon extended to the treatment of diseases of the lungs, and particularly of the most common disease, pulmonary phthisis. Before this could be done, however, we had to consider carefully the different conditions under which the treatment could be carried out. It was easy to use a fluid antiseptic where the parts were within reach, but in the case of the lungs it was clearly necessary to use the antiseptic in the form of vapour, so that it could be carried by inspiration into contact with diseased tissues.

The bacillus theory of phthisis rather favoured the use of antiseptic agents, and thus encouragement was given to this extension of a principle, at first applied only in surgery, but promising very reasonably to be of value, and great value, to the physician. It must be distinctly admitted, I think, that the merits of this method of treatment will be determined entirely by clinical experience. I mean to say that if it is to be a matter of faith with the

great number of us, it will depend on our own personal observations and our own experiments; and however reasonable it may be in theory, we should soon cease to adopt it if, after a few trials, we met with doubtful or negative results. It matters very little to the majority of our profession whether the bacillus theory of tubercle be decided one way or the other, and only those few can feel much interest in the question who are competent to examine it for themselves. But the majority of our profession cannot do this. The knowledge and skill required to test microscopically or otherwise the nature of a bacillus or bacterium are very considerable; and the most experienced microscopical examiners are the most aware of the difficulties of this kind of investigation.

But we can put to the test the value of the antiseptic principle in practice, and it is not only our duty to do so, each one for himself, but the promise held out of benefit to those that suffer is so great that our liveliest interest must be excited by it.

The question, therefore, that we must first decide is briefly this. The antiseptic agent which we propose to employ must be in the form of vapour, and not of fluid. This vapour must be tested in some way, and shown to be reliable. It must be tested just as we should test a fluid before using it. It will not do to be making experiments with an agent the qualities of which we are ignorant of, for self-evident reasons; but particularly because we could not bring into harmony with our own observations those of others who had obtained different results. We must at the very outset settle this question first, and when we are agreed on the plan we intend to follow, we shall soon be able to establish conclusions. You would imagine that this preliminary question must have been

decided already. This is not the case, however, and it still remains to be considered.

I will point out as briefly as possible the method that appears to me to be altogether the most convenient, the most reliable, and the most accurate.

I have here a solution of carbolic acid in water, such a solution as could be relied upon for surgical practice; the ratio of carbolic acid to water is 2 per cent.; that is, one in fifty. Now if we convert this solution into the form of spray some might suppose that it could be inhaled. This spray, however, is not vapour. The particles of fluid have not changed their condition except that they are separated or pulverised. They are still in the fluid state, and they act as the fluid itself would act on parts they come in contact with; but it would be easy to show that they cannot pass far into the respiratory passages, and cannot reach the remote parts of the lung.

The agent or force by which bodies are generally converted from the solid or fluid state to that of vapour is heat; and if we heat or boil this fluid and convert it into vapour we shall discover that the carbolic acid also evaporates, and we may naturally inquire, what are the properties of this carbolised vapour. Is it in the first place a vapour of definite strength, or does the carbolic acid only come off in small quantity? Is it antiseptic vapour? —that is, will it prevent septic action? and lastly, can it be inhaled? and can we reasonably expect it to act as an antiseptic in phthisis and other forms of disease of the lungs? On these points I have made experiments which would satisfy you, if I had time to enter into details, that there is no method so convenient and reliable as this very simple one of heating an aqueous solution of carbolic acid and breathing the vapour of it. There is one reason for

this to which I would ask particular attention, and after explaining it, if time allows, I will make a few remarks on the use of some agents, such as benzoic acid, thymol, and others, which might possibly be useful in therapeutics.

Our first object being to obtain an antiseptic vapour of definite strength; when it was observed, I believe by myself for the first time, that carbolic acid apparently evaporated at the same rate as the water with which it was mixed, it was clear that we had thus presented to our use the most simple and accurate means of testing this question. When I say that vapour of carbolic acid appeared to come off equally with the water, you will understand that I was using the only tests which I could apply personally, and that this observation arose, not by accident, but as the result of a series of experiments made with several substances, of which the volatile oils were the most important—the oils of turpentine, eucalyptus, cloves, cubebs, cinnamon, and many others, the experiments being made simply to determine this question of how they acted when boiled with water. There were no data to assist; as you can easily understand, this question would not offer much attraction to any one but a medical practitioner who had a special object in view. Having found that none of the substances had this peculiar property of carbolic acid, I felt impressed with the importance of submitting my own results to further experiment conducted by scientific chemists. It appeared to me most necessary that there should be no mistake upon this point, and I must take advantage of this opportunity to express my obligations to Dr. Piesse, and Mr. Johnston, for the care and trouble they took in deciding a question of some difficulty in chemical analysis.

The determination of the quantity of carbolic acid in a given solution is not a very easy matter. What was done was this : A certain measured quantity of water was taken, and to this a certain definite quantity of pure carbolic acid was added. This was boiled until a certain quantity of the solution had evaporated, and the remainder was then tested. Again, another quantity was evaporated and the remainder tested in the same way as before ; and this operation was repeated until the solution had been entirely used. It was thus easy to determine whether the carbolic acid kept a constant proportion to the water or not. It is known to chemists that hydrochloric acid mixed with water evaporates in constant ratio, a fact observed, I believe, by Professor Roscoe.

The experiments of Dr. Piesse and Mr. Johnston were entirely confirmatory of those I had made in a different manner, so that now I am in a position to assert that for the purposes of testing the antiseptic method in the treatment of pulmonary disorder we have a reliable, accurate, and convenient plan at our disposal.

I will read to you the letter in which Dr. Piesse states the results of his experiments :—

"January 1, 1884.

"The experiments consisted of three sets, each of six experiments.

"The strength of the solution of carbolic acid in Set 1 was 5 per cent. ; in Set 2, 2½ per cent. ; in Set 3, 0·5 (½) per cent.

"The *modus operandi* was as follows :—

"Six flasks were taken, numbered 1 to 6, and into each a solution containing 10 grammes (150 grains) of pure crystallised carbolic acid (absolute phenol) was poured, and the bulk of fluid made up to 200 centimetres by the

addition of distilled water. They were then set to boil, and were boiled vigorously—

"No. 1 for 10 minutes
„ 2 „ 20 „
„ 3 „ 30 „
„ 4 „ 40 „
„ 5 „ 50 „
„ 6 „ 60 „ respectively.

In each, after cooling and restoring to its original bulk with distilled water, the amount of phenol remaining was estimated by pouring in a standardised solution of hypobromate of soda, containing a trace of free bromine."

Then follow the actual figures in a tabular form, from which it will be clear when we consider the nature of this analysis that for practical purposes the vapour is constant in its quality. I will not trouble you with these figures as they would more suitably be submitted in a printed form.

The next question which arises is this, What proportion of carbolic acid and water should be used to afford a vapour of certain value as an antiseptic, in which the carbolic acid is reduced to a minimum ? for there is clearly a disadvantage in using a vapour stronger than necessary ; or, worse than that, injurious effects might follow from it.

If the solution contains carbolic acid in the proportion of 1 to 80 as the strongest, and from that to 1 in 150, we can be certain of obtaining a vapour of high antiseptic properties. A vapour stronger than 1 in 80 acts as a solution would upon the skin and produces the usual irritating effects which follow the application of carbolic acid. A drachm of carbolic acid, that which is known as Calvert's No. 2, added to from fourteen to sixteen ounces

of water, will be found to supply a vapour of proper qualities for the purposes required.

I would suggest now a simple plan by which the vapour can be exhaled. Instead of boiling the solution in a small vessel or in a kettle from which the steam would pass off at a high temperature, and thus considerable danger might arise of accidental scalding of the mouth or throat, the steam may be made to issue in a jet at a certain tension. As the steam in this state escapes it carries with it a current of air which quickly reduces its temperature, and reduces very considerably the possibility of the danger arising from the use of vapour at low tension.

Some years ago I explained the use of this principle for the supply of warm vapour, as distinguished from steam at high temperature. By the addition to our knowledge of the property of carbolic acid which I have been pointing out, we obtain a current of antiseptic vapour, and we obtain it in such a form that we can use it very conveniently for the purposes of testing clinically the value of the antiseptic theory in the treatment of pulmonary disorders.

It has been thought by some that the best plan would be to place the patient in a room the air of which was charged with the vapour of carbolic acid, and theoretically this plan has much to be said in its favour; but I need hardly point out that such a plan must be so greatly limited in its application as to make its general adoption quite impossible. It has no advantage practically over the plan I have suggested, and as the chief object of my remarks is to provide a very simple and ready means of applying the antiseptic principle in daily practice, I shall make no further observations upon the advantages or disadvantages of the carbolic room.

Now, if you ask the question, What proof is there that the vapour or steam given off by water and carbolic acid when boiled together in the proportions I have stated is surely antiseptic? the answer is simply this, that by experimentally exposing to its action solutions which under ordinary circumstances are found to putrefy, such putrefaction does not occur. The general plan adopted in such experiments is the same in principle as that we employ when testing a solution: it is only modified to suit the altered conditions.

It is easy to vaporise many substances by heating them in their pure state, and I promised to make a remark upon some of these. For example, benzoic acid, as we all know, is very volatile. If a piece of dry gum benzoin be heated it parts with the benzoic acid. The same thing happens when a piece of gum-benzoin is boiled in water. The benzoic acid evaporates very quickly with the steam. Eucalyptus oil does the same. Here we have two substances which are converted into vapour at very different temperatures. Benzoic acid vaporises below the temperature of boiling water, while oil of eucalyptus must be raised to a much higher temperature; and yet they both vaporise in much the same way when boiled with water. They differ entirely, however, from carbolic acid. The reason is not apparent, but the fact must be clearly recognised if we use any particular substance in clinical practice.

You can easily understand that one person may say that he has obtained such and such results, while another has obtained very different ones, and useless discussion may arise; that is to say, if the methods of vaporising the substance in question are not stated the real explanation of the disagreements is overlooked. It is therefore

necessary if we desire to use any volatile substance for clinical purposes to ascertain the proper conditions for its use. I would advise that we should work for some time with carbolic acid alone and test the question of the antiseptic principle as generally as possible. There may, after all, be no value in it. I am inclined to think from personal experience that there is a great deal in it if it is carried out on accurate and scientific principles.

We are too apt at the present day to sacrifice our independence to assumed authority in matters of therapeutics, and I think there is a degree of credulity in our profession which we ought to be on our guard against. We do not trust enough to our own experience, and we are rather too apt to adopt new remedies on insufficient evidence of their merits, and then we are disappointed and discard them. I have been anxious this evening to place before you the question of the antiseptic treatment of a certain class of diseases in such a way as to prepare you to judge independently of the question and to criticise any statements which are submitted to you.

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