persons in mountain-districts generally. Dr. Hesse has described some cases of this disease, with details of the microscopical and other characters of the tumours. If, as I have assumed, malignant tumours depend on the presence and development of micro-organisms, the low, damp, close, and warm localities are those in which such organisms might fairly be expected to thrive, while the high, dry, and open situations are just as little favourable to their development. The cobalt-pits of Schneeberg, perhaps, contain a tumour-organism which enters the body with the air, but requires for its development and complete action frequent and long contact with the lung-tissue, with such favourable conditions as those afforded by advancing age, etc.

There are, of course, several important objections to the acceptance of the parasitic theory; and since the subject should be regarded in a thoroughly impartial manner, it is only fair to state the chief of those which have occurred to me. Some of them may be easily met, but others are exceedingly difficult to explain away.

In the first place, although scrapings and sections of tumours have been examined during half a century, no tumour-organism has yet been discovered, or at least recognised. To this the answer is, that all our knowledge of the relations of micro-organisms to disease is only a few years old, and that the micro-organisms of the infection-tumours have quite recently been discovered. Because tumour-organisms have not yet been discovered, it by no means follows that they do not exist.

Again, the growths produced by organisms at present known, exhibit for the most part a simple round celled or adenoid structure; and I am not aware of any micro-organism which produces new growths of epithelial structures, or new growths of so singular and complex a structure as that found in many specimens of malignant tumour. If these tumours be produced by the action of micro-organisms, the organisms must act not only upon tissues of many different kinds, but with an influence weakened by being shared with that exercised by the mother-tissue. To explain the resemblance of the secondary tumours to the primary growth, this same influence of the mother-tissue must be again invoked; the micro-organism excites the growth of a tumour, but becomes itself so far infected by the influence of the mother-tissue that, whatever tissues it afterwards affects, it is compelled to transform into a structure resembling that of the primary disease.

Malignant tumours are not, so far as we know, contagious or inoculable. But, in truth, all our experiments—and they are very few and incomplete, are far from conclusive on this point. The inoculability of tubercle has only lately and with difficulty been established; its power of infection or contagion has not yet been clearly proved. Nevertheless, we are gradually coming to believe that tubercle is due to the presence of a micro-organism. It is probable, if tumours be inoculable or contagious, they are so only under very peculiar and favourable circumstances.

The inheritance of malignant tumours can scarcely be explained on the assumption that they are due to parasites. The inheritance of malignant tumours is supported by evidence which, at first sight, seems incontrovertible, and by men of the first rank as thinkers in our profession. Certain doubts have, however, of late arisen regarding the influence of inheritance; and, if we exclude those cases in which cancer has attacked a large number of individuals of the same family, the general statistics of inheritance will not bear a minute scrutiny. On this subject, Mr. Haviland deserves attention.⁹ He suggests that, if whole families were to migrate from the low-lying grounds in the proximity of rivers to high dry sites, we should not hear so much of the hereditary character of cancer. "We never," he says, "hear of ague being hereditary. Father, son, and grandson have ague one generation after another whilst living in an ill-drained fever-district; but send them to the hills, and their plague disappears; so may it be with the mother, daughter, and granddaughter afflicted in their lives with cancer, whilst living from generation to generation under the same climatic conditions, on the same geological site, and on the banks of the same seasonally flooded river."

Again, it may be objected that malignant tumours occur primarily in organs and tissues which are distant from any surface directly connected with the exterior; that, for instance, they grow deep down in the substance of the muscles, in the intermuscular septa, and in or upon the bones. There need, however, be no difficulty in comprehending that organisms, minute and active as the bacilli and bacteria, may be conveyed by the blood to any vascular tissue, and even traverse the structures between the vessels.

Among the facts most difficult or impossible to explain on the

theory of parasitism, are the relations of malignant tumours to age. There are, of course, many reasons why certain organs and tissues should be more subject to disease during adult life than during childhood: the organs of generation, for example. But there is no conceivable reason why the epithelium of all parts should be almost exempt from cancerous disease in persons under twenty-seven or thirty years of age, and no reason why the connective tissue of the testis should be more subject to sarcoma in children under ten and in adults over thirty-five than at any other period of life. Neither parasitism, nor any other commonly accepted theory of malignant disease, offers an explanation of these and similar strange features in the life-history of malignant tumours.

ON THE PRINCIPLES OF THE CONSTRUCTION OF CHAMBERS FOR INHALATION IN DISEASES OF THE LUNGS.

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THE comparative inefficiency in diseases of the lungs of the methods of inhalation now in use, by means of oral and oro-nasal inhalers, by the vapour of hot water and by steam and air sprays, renders it very desirable that other and better means of inhalation should be devised and employed.

It appears to me that the most effective and natural method of inhalation which can be adopted is by a chamber, the air of which is charged with the antiseptic or other medicament which it is desired to employ. So far as I am aware, no such chambers have yet been devised and constructed; the reason, no doubt, being the apparently insuperable difficulties which have hitherto been presumed to stand in the way. Attached to some few of our hospitals there are, indeed, what are called "inhalation-chambers," but these can scarcely be said to deserve the name; they are, for the most part, simply chambers supplied with steam, in which a number of persons are enabled to inhale medicated steam-sprays at the same time and in the same apartment.

The following are the conditions and principles of the construction of a true inhalation-chamber. First, the dimensions of the chamber should be moderate, and in some cases even small; and this because of the difficulty there would be in charging with medicaments a very large space, and also on account of the great quantity of the drugs which would be required for the purpose. Secondly, the fireplace to the chamber should be closed, and the inlets and outlets to it should be only those of ordinary and moderately well-fitting doors and windows; and this because, if the air of the room were rapidly changed, of the difficulty in keeping the air charged to any given extent, and of the great waste of material which would take place. It will be well, however, that every chamber should be provided with one or two small outlets, to enable those inhaling to get rid of the used or foul air emitted during expiration; the air of the chamber itself being thereby maintained in a state of greater purity. For this purpose, nothing more would be necessary than a piece of elastic tubing furnished with a covering for the nose and mouth. Thirdly, the temperature of the room should be kept at about 19° Centigrade = 66° Fahrenheit; this regulation of the temperature is requisite, in order that the volatilisation of the substances used should proceed at one fairly uniform rate. Fourthly, the air of the room should be somewhat humid, the degree of humidity being ascertained by means of wet and dry bulb thermometers; a moderate but not too great an amount of moisture in the room is desirable, since it promotes evaporation.

I now come to consider the means whereby the air of the chamber is to be charged with suitable medicaments; this hitherto has been the one great difficulty, the solution of which, beyond the employment of large steam or air sprays, so far as I know, has not yet been rationally attempted; at all events, it has not been successfully carried out.

It occurred to me that, if any substance possessing even a feeble volatility at ordinary temperatures were dissolved and spread over a very large surface, the amount of the substance which would become volatilised would be in proportion to the quantity taken, the extent of the surface exposed, the temperature of the chamber, and the amount of the moisture therein contained.

To test this point, 50 grammes of carbolic acid (= 771 grains) were dissolved in water, two Turkish towels being saturated with the solution and exposed to the air of a room at a temperature of

⁹ Loc. cit.

22° C., equal to 72° F., the room also containing rather much aqueous vapour.

At the end of two hours, a portion of the air of the room was, by means of a large syringe, drawn through a solution of alcohol, a few drops of which, on evaporation, gave with bromine water decided evidences of the presence of carbolic acid; 13 cubic centimètres of the vapour or moisture which had settled on the windows (= 200 grains) were collected, and were found to contain 0.029 gramme of the acid, equal to 0.447, or nearly half a grain.

After the lapse of forty-eight hours, the towels had become quite dry, and I was not a little surprised, on examining them, to find that they did not possess the slightest smell or taste of the carbolic acid. One of the towels was then tested, and found to contain only 0.07 gramme of the acid, equal to 1.08 grain; that is to say, the whole of the carbolic acid employed, namely, 771 grains, had disappeared, with the exception of the small quantity above referred to.

This result appeared to me so surprising, although I was prepared for a considerable reduction in the amount of the acid taken, that I thought the towels must have been inadvertently washed. I, therefore, repeated the experiment in a more precise manner. I took one of the Turkish towels only. It measured 48 by 18 inches, thus presenting a surface of 1,728 square inches, and it was saturated with an aqueous solution, containing 25 grammes, or 385 grains, of carbolic acid. This experiment was commenced at 10 A.M., the towel being moistened, in the course of the day, once or twice with a little water. At 10 A.M. the next day the towel was still somewhat wet, but at 4 P.M. it was only just damp. It was then tested for the acid, 0.09 gramme only being obtained, equal to 1.39 grain. Thus, in the space of thirty hours, the whole of the acid used, 385 grains, had practically disappeared.

This result is of the highest importance, as it places in our hands the means of charging inhalation-chambers, to almost any desired extent, with all those medicinal substances which possess even a feeble volatility at the ordinary temperature of the air.

The following experiments were also made with carbolic acid. Turkish towels were cut into pieces, measuring eighteen and a half inches in one direction, and nine and a half inches in the other. Each of these was charged with 5 grammes (77 grains) of carbolic acid, dissolved in about 100 cubic centimètres of water, each piece being tested at intervals of four hours.

There were recovered out of the five grammes, or 77 grains, taken:

After 4 hours	2.77 grammes	=	42.66 grains
" 8 "	1.82 "	=	28.03 "
" 12 "	" "	=	" "
" 16 "	0.49 "	=	7.55 "
" 20 "	0.20 "	=	3.08 "

To show that the principle holds good in other cases, I will now state the results of a few further experiments.

Portions of Turkish towels were taken, 9½ by 4½ inches, and were each charged with 1.25 gramme of creasote, equal to 19 grains; in one case, the creasote was placed on the cloth without any addition; in another, water was used; and in a third case, the creasote was dissolved in alcohol. After four hours, the cloths were examined. From that with creasote only, 0.91 gramme was recovered; from that with creasote and water, 0.41; and from that with the alcohol, 0.39 gramme: amounts which correspond with 14.01, 6.31, and 6.01 grains respectively. It will thus be seen, taking equal areas of the Turkish towels, that the loss of creasote at the end of the four hours was even greater than that of carbolic acid, both having been treated with water; the proportion recovered, in the one case, being 2.77 grammes, and in the other, 1.65 gramme, equal to 42.7 and 25.4 grains. The experiments also showed that the loss, as might have been anticipated, is much less when the creasote is simply sprinkled on the cloth, because in this case it is less diffused and covers a smaller surface. When alcohol is employed, the loss appears to be about the same as when water is used; although, of course, the towels, when moistened with alcohol, become dry in a much shorter time than with water.

In other corresponding experiments, in which the time allowed was twenty-four hours in place of four, the amounts of creasote recovered approximated to the quantities obtained after four hours; and this would appear to show that the loss is proportionately greater during the first few hours of its exposure; and that this should be so, will be readily understood when it is stated that creasote, unlike carbolic acid, is not a definite substance, but is made up of different compounds having different degrees of volatility.

The last experiments made were with thymol. Thymol possesses only very slight volatility at ordinary temperatures, and is nearly insoluble in water; so that, in the case of this antiseptic, it is necessary to use a solvent. This, in the experiments about to be described, was alcohol: 5 grammes of thymol, equal to 77 grains, dissolved in 80 cubic centimètres of spirits of wine, were spread over a piece of Turkish towel, 18½ by 9½ inches; and, after four hours, 3.44 grammes, equal to 52 grains of the thymol, were recovered. From another portion of Turkish towel of the same size, and containing the same amount of thymol, 1.70 gramme, equal to 26.27 grains, was obtained at the end of fifty hours.

These experiments show that the loss of thymol, so little volatile at ordinary temperatures, is very considerable; although the proportionate loss is much less than in the case of carbolic acid and creasote, still it is sufficiently great for practical purposes.

It is thus seen that the idea or principle upon which the foregoing experiments were founded was correctly conceived; but there is another principle which may be brought to bear on the subject of inhalation, and which, combined with the principle of evaporation over a large surface, is capable of furnishing results equally striking with those already narrated; and that is the principle of increasing the volatility of but little volatile substances by means of heat; that is to say, by a regulated temperature varying according to the volatility and properties of the substances employed.

The best and most practical method of applying this increased temperature is by means of hot water spread over a comparatively large surface. Owing, however, to the increase of volatility obtained by the augmentation of temperature, the extent of surface required will be very many times less than that which is necessary when Turkish towels or other suitable fabrics are used, while the time occupied will be proportionately reduced—two great advantages.

The effect of the combination of a somewhat large surface with increase of temperature is well illustrated by what takes place in the case of thymol. Forty grammes of thymol, equal to 616 grains, were melted in hot water in a dish having a superficies of 64 inches, the temperature being maintained at 72° C., equal to 161.6° Fahr. At the end of twelve hours, it was found that the whole of the thymol had disappeared—a substance which, as already remarked, possesses but little volatility at ordinary temperatures, and which, even when spread over the large surface of a Turkish towel, is far less volatile than carbolic acid, creasote, and a variety of other substances.

I have thus shown that, by the methods pointed out, the air of a chamber may be quickly charged with the most powerful antiseptic substances, and, indeed, with a great variety of other medicinal substances which possess even a very low degree of volatility at ordinary temperatures, and this to any extent required.

Such, then, are the general principles on which inhalation-chambers may be constructed. The practical details require to be further studied and worked out, and with this part of the subject I am still occupied. Very shortly I shall have completed, at San Remo, an inhalation-chamber on the principles here set forth.

I would point out, in conclusion, that the results recorded in the present communication are important, not only in their application to inhalation, but also to disinfection.

A DUTCH POISONER.—A married woman, called Van der Linden aged 45, mother of three children, is in custody at Leyden on a charge of having murdered sixteen persons within the past few years. Nearly all the victims were members of her family, whose lives she had insured in burial and life insurance companies, without their consent, with the intention of poisoning them, and receiving the money at their deaths. The crimes became known under the following circumstances. A family named Frankhuyzen, at Leyden, lost on one day the mother and a child of eight months. The father was also taken ill, and removed to a hospital. In each case there were symptoms of poisoning, and the examination of the bodies proved this to be the fact. It was ascertained that Mrs. Van der Linden came into the house of her relatives, and put poison in milk which was being made hot on the fire. After the death of the woman and her child, it was remembered that, during the last two or three years, a number of the members of the family had died under the same circumstances, and the bodies of two other children which had been exhumed showed traces of poison. A cousin of Mrs. Van der Linden, a soldier, whom she tried to poison fifteen months ago, is very ill, and Frankhuyzen is in great danger. The accused has confessed her guilt. Her husband is innocent. The prisoner has herself lost five children, and it is presumed that they have also been poisoned.