ORIGINAL COMMUNICATIONS.

RESEARCHES ON THE PHYSIOLOGICAL AND MEDICINAL PROPERTIES OF SOME OF THE COMPOUNDS OF THE ORGANIC RADICALS: METHYLE, ETHYLE, AND AMYLE.

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[Read at the Meeting of the British Association for the Advancement of Science, held at Liverpool, Sept. 1854.]

WHEN we turn our attention to organic chemistry, and observe the vast number of new compounds which have been discovered of late years, it appears surprising that so few of real value should have been added by medical men to their stock of remedial agents. It is true that the properties of some useful remedy, such as kousso, is from time to time brought into notice; and, in like manner, we have new forms and slight improvements in the mode of administering some of our important remedies, such as iron. It must, however, be admitted, by any one who will reflect upon the small number of really new and valuable additions which have been made of late years, that the progress of therapeutics is not only slow, but disproportionately so, when compared with the advances made in other sciences, especially organic chemistry, from the discoveries in which we would naturally expect that the science of therapeutics would receive an impulse. While constrained to make this admission, we must not, however, omit to state that, though the progress of discovery has been slow, it has been marked by the addition, in our day, of a new and most valuable class of remedies—the anæsthetic; under the influence of which, operations are now daily performed without any pain; so that electro-telegraphic communication, the most surprising discovery of physical science, is not without a parallel in medical science.

Within the last few years, chemists have not only discovered many new organic compounds, but have also made great progress in determining the formulæ which indicate their composition and relation to other compounds; and there is reason to expect that, by examining the properties of the new organic compounds, medical men might not only add to the number of useful remedies, but also acquire some knowledge of a subject respecting which we have not at present much precise information: I mean the *modus operandi* of remedies and the chemical changes they undergo in the animal economy. By way of illustration, I may observe, that medical men are perfectly well acquainted with the properties and effects of the two alkaloids, morphia and quinine; they know that the former is a narcotic remedy which produces sleep, and allays pain; and that the latter is a tonic antiperiodic remedy of the greatest use in such diseases as ague; but they have no knowledge whatever of any relation that may exist between their chemical constitution and the different actions they exert on the animal economy. It is very probable, however, that an examination of the properties of the artificial alkaloids would throw light on this subject; for the progress of organic chemistry has shown that many of them have a definite composition and relation to each other, and they have accordingly been arranged in four series, viz., the amide, the imide, the nitrile and the ammonium bases. It would be interesting to know what are the properties of each of the artificial alkaloids (and I may remark that Dr. Simpson has found that one of them, furfurine, has antiperiodic properties like quinine); but it would be still more interesting to know if certain properties are common to all the members of a series, and in what respect the bases belonging to one series differ from those of another. In this way we might expect to trace a relation between the composition and the effects of remedial agents, as well as to acquire new and valuable remedies.

The difficulty of obtaining the artificial alkaloidal bodies

has hitherto prevented me from examining them; and on this occasion I have to bring before you some observations on the properties of a few organic compounds of more simple composition.

Methyle and ethyle are organic radicals composed of carbon and hydrogen only. They are the first and the second, and amyle is the fifth number of a series of similar radicals, from which, again, an extensive series of compounds of parallel composition take their origin. The relations of these homologous compounds may be at once seen by examining the table which Dr. Gregory has prefixed to his *Handbook of Organic Chemistry*.

Methyle, the first of these radicals, consists of two atoms of carbon and three of hydrogen. Ethyle, the second, differs from the first in containing two additional atoms of carbon and two of hydrogen, its composition being, therefore, four atoms of carbon and five of hydrogen. In the same way, each succeeding radical in the series differs from the preceding in containing two more atoms of carbon and of hydrogen; and, therefore, amyle, the fifth member of the series, contains ten atoms of carbon and eleven of hydrogen.

There is another series of radicals, differing slightly in composition from this, of which formyle and acetylene are the best examples. Formyle contains the same number of atoms of carbon as methyle; and acetylene the same number as ethyle; but they each contain two atoms less of hydrogen.

As the radicals of the methyle series act chemically, the same as the metals, in combining with iodine, chlorine, and bromine, and in forming oxides, which, with acids, produce a kind of volatile salts, it appeared to me that, if we could give such medicines as iodine and bromine in combination with one of these radicals, some advantages might probably be gained over the more ordinary mode of exhibiting them in the state of a salt formed by their union with a metal, such as potassium or iron. I resolved, therefore, to examine some of them.

Before mentioning the results of my own observations, let us inquire very briefly what is known of the physiological properties of pure hydrocarbons, and of the compounds of these two series of hydrocarbon radicals.

It is known that several pure hydrocarbon compounds act as local stimulants, and also excite the nervous system. It has also been ascertained that several of them, which are volatile, produce anæsthesia when inhaled. Dr. Snow and Mr. Nunneley both found that benzine has this property; and I have myself ascertained the same fact with respect to Persian naphtha and eupion. The more volatile compounds of the hydrocarbon radicals of both the series of which I have spoken appear to possess this power likewise. Chloroform, which is so perfect an anæsthetic that it has superseded all the others, is the trichloride of the radical formyle. Aldehyde, which is the hydrated oxide of acetylene, has been found to possess considerable anæsthetic power. Sulphuric ether, the first anæsthetic discovered, is the oxide of the radical ethyle; and I shall have occasion to show that several of its other compounds are very powerful anæsthetics. The compounds of methyle have likewise anæsthetic power, but only in a very slight degree.

It would seem, therefore, that the power of producing an anæsthetic effect upon the nervous system is a property which most, if not all, the volatile compounds of hydrogen and carbon possess in a greater or less degree, and that their union with a third body, such as chlorine, has the effect rather of increasing their power. That the hydrogen is not essential is proved by the fact that chloride of carbon and bisulphuret of carbon are likewise powerfully anæsthetics. On the other hand, as no anæsthetic agent has yet been discovered which does not contain carbon, we must conclude that the presence of carbon is essential in order to constitute an anæsthetic agent; and this, I may observe, was the conclusion which Mr. Nunneley drew from his very extensive series of experiments.

These facts would lead us to expect, in testing the effects of any of the compounds of ethyle, methyle, or amyle, in

the way of inhalation, that more or less anæsthetic action would be produced. The production of this has not, however, been my chief object, but rather to use them as a means for obtaining the local action in pulmonary diseases, and in others, the constitutional action of such powerful remedies as iodine and bromine.

The following are the compounds to which my attention has been directed.

Two of methyle,

1. Acetate of the oxide of methyle,
2. Iodide of methyle;

Four of ethyle,

1. Acetate of the oxide of ethyle,
2. Iodide of ethyle,
3. Bromide of ethyle,
4. Cyanide of ethyle;

Two of amyle,

1. Acetate of the oxide of amyle,
2. Iodide of amyle.

They are all volatile ethereal fluids, and my trials of them have been made by administering most of them in three ways; viz., internally, externally, and in the way of inhalation through the lungs.

Acetate of the Oxide of Methyle. Methyle is the base of wood spirit, which is hydrated oxide of methyle, being perfectly analogous in composition to alcohol, which is hydrated oxide of ethyle. Acetate of the oxide of methyle is a thin volatile ethereal fluid, with an odour like naphtha. It mixes with water; and, like most ethereal compounds, it acts as a diffusible stimulant. It is well known that pyroxylic or wood spirit has the power of checking sickness and vomiting; and this compound of methyle, which is usually present in pyroxylic spirit, has likewise this property. The most important property, however, which it possesses as an internal remedy, is the power of checking the secretion from the mucous membrane of the bronchial tubes. I have observed this effect produced by it in a very decided manner in many cases of phthisis and chronic bronchitis; and I may here remark that it is a property, not only of the compounds of methyle, but also of those of ethyle and amyle, especially the acetates of the oxides of these bases. I have found its anæsthetic power, like that of the other methyle compounds, only very slight.

Iodide of Methyle. The next compound of methyle, the iodide, is a more important one. It is a transparent, oily-looking liquid, which dissolves very sparingly in water, and is exceedingly heavy, its specific gravity being 2257. It is very volatile, and the vapour is rather pungent. In odour and taste it is more pleasant than wood spirit, to which it bears some resemblance. Like other ethers, it acts as a diffusible stimulant, but is more powerful than most of them. The immediate heating and exciting effect it produces upon the system is undoubtedly due to the methyle base, but it also produces the physiological effects of iodine, and this we should naturally expect when we consider that iodine constitutes nine-tenths of the weight of the compound. It increases the secretions, especially the salivary and urinary, and it affects the mouth, the gums becoming red and swollen, with a tendency in some instances to bleed. In half an hour after a few drops have been swallowed, the presence of iodine may be detected in the saliva and in the urine by means of the starch and sulphuric acid test; and, as the iodide of methyle itself does not act with this test, it is evident that it must be rapidly decomposed in the animal economy, the methyle being separated from the iodine, which no doubt unites with sodium or potassium.

I have prescribed it as an internal remedy in some cases where it was desirable to give iodine as a medicine; but as its stimulating effects are sometimes objectionable, I have directed my attention more to its use as an external remedy, and I have also used it for inhalation.

Iodide of methyle unites readily with lard, and in the proportion of half a drachm or a drachm to the ounce it forms a stimulating ointment, which I have tried with advantage as an application to indolent ulcers, more especially those of scrofulous nature. I have also used it in two

cases of psoriasis, one of them of syphilitic origin, and in both it ~~was used~~, in conjunction with the internal means which were likewise employed, in removing the scaly eruption of the skin.

In directing my attention to these ethereal compounds, I was influenced in some measure by a desire to obtain remedies capable by their volatility of being made to act directly upon ulcers of the lungs. I formerly stated, in my report on the "Progress of Improvement in the Treatment of Consumption," that we often succeed in arresting this disease without being able to heal the ulcers which have formed in the lungs; that the disease is in consequence apt to regain new activity, and that I considered the discovery of means which would promote the cicatrization of cavities in these cases of arrested phthisis a desideratum, and a legitimate object of inquiry.

Having, therefore, found iodide of methyle useful as an application to external ulcers, I was naturally led to expect that it might prove serviceable when applied to those of the lungs in the way of inhalation. I have used it in cases such as I have alluded to, and in some I think it has been of service. It is, however, too pungent when there is any considerable bronchial irritation; and where this is the case, I have found another compound, which I shall presently describe, more applicable, viz., the iodide of ethyle.

Acetate of the Oxide of Ethyle. This is the first of the ethyle compounds to which I have to direct attention. It is commonly called acetic ether, and is the only compound among those I shall notice which has been already used for any medicinal purpose. Mr. Nunneley found that it has considerable anæsthetic power when inhaled. In this country, it has scarcely been used at all as a remedy; but, on the continent, it has been given as a diffusible stimulant; and its action has been considered similar to that of sweet spirits of nitre. Its most important action, however, is exerted upon the mucous membrane of the bronchial tubes; and this appears hitherto to have been altogether overlooked. I frequently prescribe it internally in cases of pulmonary disease, and have found it relieve difficulty of breathing, cough, and bronchial irritation, in many cases of consumption and bronchitis. Its most important property, however, is its astringent action upon the mucous surface; and, in cases of excessive secretion, I have found that it has a very decided power in checking the quantity of expectoration. In treating chronic inflammatory affections of the mucous membrane of the bowels or bladder, we use such astringent remedies as act specially on each of these surfaces freely and with the best effect; but, in treating similar affections of the mucous surface of the lungs, we generally give expectorant remedies, with the view rather of increasing the secretion; and dread the use of astringents, lest they should cause tightness and difficulty of breathing. I believe that the fear of such injurious effects is greater than there is any occasion; and that great benefit will often be derived from astringent remedies, which give tone to the bronchial mucous membrane. Of the various remedies that may be employed to effect this purpose, I do not know any which has a more prompt direct effect upon the part than the acetate or the oxide of ethyle, or any which may be more advantageously used to check the secretion.

A brief account of three cases will show the kind of pulmonary affections in which I have used this remedy, and the symptoms it may be employed to relieve.

CASE I. P. A., a man about 50, was admitted into the Infirmary with cough of three years' standing, but aggravated by a recent attack of cold. He had dulness below the right clavicle, and other signs indicating tubercular deposit. He had also sibilant and mucous râles over both lungs, before and behind, in every part indicating recent bronchitis. He was emaciated; his breath was very short; and the expectoration very copious; the upper stratum consisting of froth and thin clear fluid; the lower of thick muco-purulent matter. On admission, cod-liver oil was prescribed; and two days afterwards, with the view of checking the copious expectoration, twenty minims of acetate of the oxide of ethyle were given three times a day. Three days

after, it was found that he did not expectorate one quarter of the quantity he had previously done; the secretion consisted only of the lower thick stratum; and the expectoration of thin frothy fluid was entirely stopped. He had some tightness in the chest, but felt better, and had more appetite. He subsequently used inhalation of iodide of ethyle, and gained flesh and strength by continuing cod-liver oil and other suitable means, and went out much benefited. The effect of the remedy in this and similar cases has convinced me that it has no marked effect upon the purulent secretion proceeding from tubercular cavities, but that it has a decided and most beneficial effect upon the bronchial congestion and relaxation which so often coexist with tubercular disease, and are a chief cause of the copious secretion from the lungs in consumption, as well as chronic bronchitis.

CASE II. R. S., a man 30 years of age, was admitted with cough of a year's standing, shortness of breath, and very copious frothy secretion. Mucous and sibilant râles, more especially at the lower part of both lungs posteriorly, showed that he had chronic bronchitis; but he had also signs indicating slight effusion into the right pleura. He was blistered on account of the effusion, and inhaled iodide of ethyle, which relieved the breathing, but did not materially diminish the expectoration. At the end of a week, the acetate of the oxide of ethyle was prescribed, and produced a prompt and decided effect. The quantity of frothy mucous secretion was very much reduced, and the cough and difficulty of breathing were at the same time very decidedly relieved.

CASE III. R. B., a little high-shouldered man, 56 years of age, who had been subject to winter cough for five years, was admitted with asthma and bronchitis, and having all the physical signs of emphysema of the lungs well marked. Having used for a fortnight some of the ordinary antispasmodic and expectorant remedies without any decided benefit, and the patient still having much cough and asthmatic paroxysms in the night, and viscid mucous expectoration, but not copious, I prescribed acetate of oxide of ethyle, which at once relieved the cough and difficulty of breathing most decidedly, and also checked the expectoration. This was not, however, of the same frothy character as in the two previous cases.

In these cases, the remedy was given in acacia mixture and water only, in order to test its effects alone; but, in many cases, it may be advantageously prescribed in combination with a sedative, such as acetate of morphia, or an expectorant, such as oxymel of squill.

Iodide of Ethyle. Iodide of ethyle is a transparent colourless fluid, the specific gravity of which is 1920. It dissolves very sparingly in water, and resembles chloroform very closely, not only in smell and taste, but also in possessing powerful anæsthetic properties. Mr. Nunneley made a series of experiments in order to determine the anæsthetic power of a variety of volatile compounds, which were published in 1849, in the *Transactions of the Provincial Medical and Surgical Association*. In his experiments, all the animals which were rendered insensible by inhaling iodide of ethyle died, not immediately, but some hours after they had recovered from the state of insensibility. From this he concluded that it poisoned the blood, and was a very deleterious compound. I thought it probable, as neither iodine nor ethyle are separately deleterious, that this might have arisen from the article he had used not being perfectly pure, and containing some of the phosphorus used in its preparation.* I thought it necessary, however, in consequence of what he had stated, to proceed with caution. I therefore caused a full-grown cat to inhale it, by placing it in a large jar, into which one drachm and a half of the iodide of ethyle was introduced in three equal quantities. At the end of seven minutes, the cat was quite insensible; but it speedily recovered when taken out, and, in ten minutes after, it appeared quite

well, and ate some food. As no injurious effect followed, I concluded that the animals to which Mr. Nunneley had given it had died from the effects of the phosphorus with which the iodide of ethyle had been contaminated; this being sufficiently evident from the fact that some of the animals were luminous after death.

When taken internally, iodide of ethyle acts as a warm stimulating remedy; but it is milder and less heating than the iodide of methyle. Like the latter compound, it affects the gums, and increases the saliva and the urine, in both of which secretions the iodine may be readily detected by the starch and acid test. The odour of iodide of ethyle may almost always be perceived in the breath of those who have taken it for a few days; and the same is the case with those taking oxide of ethyle or sulphuric ether; whilst no such effect is perceived from the use of the iodide of methyle. It would therefore seem not improbable that there is a special tendency to the elimination of the ethyle compounds through the lungs.

I have given iodide of ethyle, in the dose of from five to twelve minims, in many cases where iodine would have been an appropriate medicine. It acts as a stimulating tonic, and often improves the appetite and general health. I have prescribed it with decided benefit in chronic rheumatism, scrofula, and secondary syphilis. Several patients have gained flesh and strength under its use; and I believe that it will in many cases be found applicable where iodine or the iodide of potassium are indicated. The very decided effect which iodide of ethyle produces upon the mouth and gums led me to expect that it might prove more efficacious in the treatment of secondary syphilitic affections than the iodide of potassium. I therefore gave it in several cases until the gums were decidedly affected by it, but without perceiving that this power of acting upon the mouth gave it any well-marked superiority over the latter more commonly used and valuable remedy.

I shall very briefly detail a few cases illustrating its remedial power in these diseases.

CASE I. T. A., a healthy-looking plumber, 34 years of age, was admitted into the Infirmary with chronic rheumatism affecting the left arm and the muscles of both thighs. The pains were of two months' standing, and brought on by getting wet while working on the roof of a house. I prescribed five minim doses of the iodide of ethyle. In three days, the pains were relieved; a warm bath was then given, to assist the medicinal treatment; and, in twelve days from the time of admission, he was discharged perfectly cured.

CASE II. S. F., a porter, 35 years of age, was admitted with pain in both clavicles, from periostitis. The right clavicle was swollen, and very tender on percussion. He had suffered more or less from pains for five years, which he attributed to exposure to cold and wet; but he had also had syphilis fourteen years previously. For four months he had suffered from the pain in the clavicles; but for five weeks he had in consequence been unfit for any work, and had been under treatment at a dispensary. Five minim doses of the iodide of ethyle were prescribed for him thrice a day. At the end of four days, he was better, but had still considerable pain in the right clavicle. Iodide of ethyle ointment, in the proportion of a drachm to an ounce of lard, was ordered to be rubbed upon the part. This relieved the pain, and the swelling rapidly subsided under the combined use of iodide of ethyle externally and internally. At the end of sixteen days, he wished his discharge, being free from pain and swelling in either bone.

In many cases of chronic rheumatism, the patient complains much of a feeling of coldness. The iodide of ethyle is a remedy peculiarly suited for the treatment of such cases, as its stimulating properties promote more active circulation in the extremities and in the parts affected.

A woman, thirty-two years of age, who had the capsular or gouty form of rheumatism, and stiffness and swelling of the wrists and small joints of the hands more particularly, and in whom this feeling of coldness was a prominent symptom, has experienced great benefit from taking iodide of ethyle. The feeling of coldness has been entirely removed by it;

* I may state that I am indebted to J. B. Edwards, Ph.D., Berry Street, Liverpool, for the preparation of these compounds, most of which I should not have been able to procure without his assistance.

and the swelling and pain have also subsided very greatly under the external as well as the internal use of this remedy.

As an external application in the form of ointment, iodide of ethyle produces an anodyne effect; and, when applied to an ulcerated surface, it does not cause so much smarting as the more stimulating ointment made with iodide of methyle.* It is therefore a more suitable application for painful or irritable ulcers. It had a most beneficial effect in the case of a girl who was treated in the Infirmary, under the care of my colleague, Mr. Cooper. She had extensive ulceration over the left elbow, the diameter of which was nearly four inches. It was of scrofulous nature, connected with an affection of the bone; and there was some reason to believe that there might be a syphilitic taint also. Under the use of iodide of ethyle ointment, which was applied at my request, the ulceration healed rapidly. Internally, however, she also took iodide of potassium; but the beneficial effect of the ointment was most apparent.

I prescribed it in the form of ointment, as well as internally, with considerable benefit, in the case of a young man who had enlarged glands and scrofulous sores in the neck, complicated with syphilitic affection of the throat and skin. In this case, however, it did not prove of any service till the syphilitic disease had been removed by the use of bichloride of mercury; and after that, its beneficial operation was aided by the administration of cod-liver oil.

In the way of inhalation, I have used the iodide of ethyle in many cases of consumption and chronic bronchitis; and I do not know any remedy which may be more easily and safely employed for this purpose. It is well known that inhalation of small quantities of chloroform not unfrequently affords very decided relief from the cough and other urgent symptoms in cases of phthisis. In a very distressing case of laryngeal disease, I found it of great service. Iodide of ethyle may be inhaled just as readily, and unites with sedative properties, like those of chloroform, the local and constitutional action of iodine. In first using it, I give it by dropping it upon a handkerchief; but I have found that there is an advantage gained by giving it with a proper apparatus, as it is then sufficiently diluted with the atmospheric air, which prevents it from causing any cough or irritation.

Medical men have hitherto been disappointed in almost all the means they have tried for the treatment of pulmonary diseases by inhalation. This proves that it is either an inappropriate mode of treatment, or that we have not yet applied the right kind of remedies. The latter I believe to be the true cause of past disappointment, agents having been not unfrequently used for inhalation which were incapable of being volatilised; and I am satisfied that compounds of the organic bases, to which I have now directed attention, will afford us the means of turning this mode of treatment to better account. Iodine is both a volatile body and an efficient remedy in scrofulous diseases, and it has therefore been much used for inhalation in phthisis; but its irritating properties in the uncombined state render it unfit to act directly on so sensitive an organ as the lungs, and for this reason it is now for this purpose almost entirely laid aside. It does not, however, appear to have previously occurred to any one that, in order to give this medicine in the way of inhalation, it would first be requisite to find a suitable compound possessing the necessary degree of volatility as well as freedom from irritating properties. In the iodide of ethyle, I believe we have such a compound. Its action must be twofold, inasmuch as it combines the sedative and antispasmodic properties of ethyle with those of iodine; and, when inhaled, it must necessarily exert, first, a direct local action on the diseased part; and, secondly, from being absorbed, a general or constitutional action. I have shown that when applied to ex-

ternal ulcers, similar to those which occur in the lungs in consumption, it produces a beneficial effect; and, as it can be very easily and safely inhaled, there is reason to believe that its local action when so administered must be perfectly analogous. When inhaled, it produces the same constitutional action as when taken internally: it acts upon the gums and kidneys, and iodine may be detected in the urine and saliva. In some cases, I have also observed that it produced a tonic effect and improved the appetite.

Such being the theory of its action, we have next to inquire what practical benefit is derivable from inhalation of the remedy in bronchitis and phthisis. In chronic bronchitis, I have found the inhalation of from fifteen to thirty minims of decided service. It has relieved difficulty of breathing and cough, and rendered expectoration easier and less copious. I have observed a diminution of the quantity of expectoration both when the iodide of ethyle has been taken internally and when inhaled; but this effect has not been produced uniformly in all the cases in which I have given it.

In several cases of consumption I have found it useful; but, in judging of its effects in this disease, I would remark that we have to consider how far they may be due to the direct action of the remedy on the tubercular disease itself, and how far to its power of relieving irritation and removing the bronchial inflammation and congestion which so often complicate the primary disease. I am convinced from what I have seen of its effects, both in simple cases of chronic bronchitis and in those cases of phthisis where bronchial congestion has been superadded, that inhalation of iodide of ethyle produces a beneficial effect upon the mucous membrane in both of these diseases. Indirectly, therefore, by removing this complication, it must, in many cases of consumption, have the power of doing no inconsiderable amount of good. As respects any direct influence it may exert over the tubercular disease itself, either in causing absorption in the earlier stages, or in promoting in the more advanced the healing of tubercular cavities, I would at present only state that the acknowledged power which iodine possesses of controlling scrofulous affections when used externally as well as internally, and the beneficial action which iodide of ethyle has been shown to produce when applied to scrofulous ulcers, are sufficiently powerful analogical reasons to lead us to expect some degree of benefit also from its direct action on the primary disease. In determining a question like this, however, practical observation in a sufficiently large number of cases can form the only sure basis for correct conclusions; and, as I still wish to examine the subject more fully, I refrain from expressing my opinion more decidedly on this point; but as inhalation of iodide of ethyle produces no inconsiderable amount of good by its sedative action, whilst it also affords the best means hitherto tried of producing the direct action of iodine upon the lungs, I consider it an addition to our means of treating some pulmonary affections well worthy of the notice of the profession.

As it combines the sedative effects of ethyle with the absorbent and diuretic action of iodine, there is some reason to expect that it may be found applicable in some instances to the treatment in the way of inhalation of other diseases besides those of the lungs. I used it with very good effect in a case of dropsy from enlargement and valvular disease of the heart, where there was also congestion of the lungs and violent palpitation. It relieved the cough, checked expectoration, and assisted the other means used to excite increased action of the kidneys. The dropsy was ultimately removed entirely, and the patient went out of the infirmary greatly relieved, and having derived all the benefit of which the nature of the case admitted.

Bromide of Ethyle. The bromide of ethyle has an agreeable aromatic odour and taste, and it is more pleasant for inhalation and as an internal remedy than the iodide of ethyle. It is, however, prepared with much greater difficulty, and will therefore be an expensive remedy. I have given it in several cases both internally and in the way of inhalation; and, so far as I have examined its properties, I

* Both of these ointments lose their strength by evaporation when kept exposed to the air.

have found them similar to those of iodide of ethyle. Its anæsthetic power does not, however, seem to be so great.

Cyanide of Ethyle. The cyanide of ethyle is the only other of the ethyle compounds I have to notice. It is well known that many of the compounds of cyanogen are highly poisonous; but, notwithstanding this, one of them, hydrocyanic acid is a most valuable medicine in minute doses. It appears, too, that cyanogen itself has anæsthetic properties, and Dr. Snow asserts that the anæsthetic power of the smoke of the puff-ball, which was used to stupify bees in order to take the honey without killing them, long before the discovery of chloroform, is produced by the presence of cyanogen in the smoke. The cyanide of ethyle I have, however, found to be so potent a poison that it will probably never be available as a medicinal agent. A large kitten was placed in a glass jar, with four minims of the cyanide of ethyle; it made every effort to escape, but in less than a minute it sunk to the bottom of the jar. It was immediately taken out in a state of profound insensibility, but breathing rapidly. Cold water was thrown upon it, and ammonia held to the nostrils, and it slowly recovered, and continued well afterwards.

Three drops were put upon the tongue of a large cat. It attempted to vomit; but almost immediately afterwards, it rolled upon its side and struggled. Respiration then ceased, though the heart continued to beat for about three minutes. It was then quite dead. On examination, the heart was found full of dark coloured fluid blood, which afterwards coagulated imperfectly. The lungs were congested, and several spots were observed where blood was extravasated as in pulmonary apoplexy. The brain presented no alteration from the natural condition.

These two experiments prove that the cyanide of ethyle has all the poisonous properties of cyanogen in a high degree, and is, probably, not less potent than prussic acid.

Acetate of the Oxide of Amyle, and Iodide of Amyle. I have made but few trials of the compounds of amylo, as I have found that the only compounds of this radical which I have used, viz., the acetate of the oxide, and the iodide, have harsh irritating properties. They both cause a sensation like heartburn when swallowed, their vapour irritates the bronchial mucous membrane, and the iodide of amylo produces heat and smarting when applied externally as an ointment. When it is taken internally, iodine appears in the urine and saliva, and may be detected by the starch and acid test.

As these researches do not extend to compounds of more than three of the organic radicals of the numerous class to which they belong, we can scarcely draw any conclusion as to the effects of different quantities of hydrocarbon in modifying the physiological properties of the bases and their compounds; but it would seem that the corresponding compounds of methyle and ethyle, which are the lowest in the series, and next to each other, bear such a resemblance in their physiological properties as exists between the salts of sodium and potassium, whilst it would appear that the compounds of amylo, which is a higher member of the series, and contains a much larger number of atoms of hydrocarbon, differ in a greater degree from the compounds of methyle and ethyle.

It would seem that compounds of each of these bases exert an influence upon the bronchial mucous membrane, and that the power which one of them, acetate of the oxide of ethyle, possesses of lessening the quantity of this secretion, may be made practically useful in the treatment of some pulmonary diseases. It would likewise appear that these bases produce certain effects upon the nervous system; and that such effects, whether stimulant or anæsthetic, of one of them, viz., ethyle, may be obtained at the same time that the action of another remedy combined with it is also produced.

The preceding researches tend further to show, that for therapeutic purposes organic radicals may be made to take the place of some of the inorganic radicals, such as sodium or potassium; that in such combination iodine may be

given in larger than ordinary doses; that this, and some other medicinal agents are thus equally capable of producing their beneficial effects externally as well as constitutionally, and that so combined, their volatile properties afford facility for their introduction into the system through a new channel hitherto but little used for such a purpose, viz., the lungs, upon which internal organs their local action may likewise be obtained in an advantageous manner.

I trust that the observations of others will confirm what I have advanced as to the properties of these compounds, and the practical uses to which some of them may be applied. My chief object, however, has been to direct the attention of medical men and scientific chemists to the properties and uses of the numerous compounds which the progress of organic chemistry is almost daily bringing to light; and I feel that these researches will not have been fruitless, if they should induce others to enter this wide and unexplored field for therapeutic inquiry.

Liverpool, January 1855.

NOTES AND OBSERVATIONS ON SOME OF THE MORE REMEDIABLE CASES OF DEAFNESS.

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NO. II.

INFLAMMATION of the membrana tympani, as a primary affection, is not of very frequent occurrence; but occurring secondarily from extension of inflammation to it, either from the meatus or from the cavity of the tympanum, is by no means uncommon. Indeed, it would seem impossible that disease could exist for any length of time in either of these cavities, without implicating the thin membranous septum which divides them from each other; hence the rarity of meeting with a healthy condition of the membrana tympani in the great bulk of patients affected with deafness, and the frequency with which destruction of this membrane more or less complete is met with. In the case of Bradford, it was the outer or dermoid layer of the membrana tympani which principally suffered. In the following case, the middle and internal layers would appear to be the structures most involved, in which the lining membrane of the tympanic cavity probably participated; so that these two cases would stand somewhat in the same relation to each other, as purulent conjunctivitis or purulent ophthalmia, as it is sometimes called, and scleritis or rheumatic ophthalmia.

CASE II. *Inflammation of the Membrana Tympani, affecting chiefly its middle and internal Coats, and involving the Tympanic Cavity; Great Deafness; Severe Pain; Loud Tinnitus; without Discharge; the Membrane thickened and Flesh coloured; Treatment by Leeches and Aperiens, with Relief.* Ann Turner, aged 29 years, stout, somewhat plethoric, and having a sullen appearance, applied to me on the 3rd of April for deafness and earache of both ears, accompanied with tinnitus, but without discharge. These symptoms first came on in the right ear, and shortly after in the left (and the pain in the right ear especially was exceedingly violent), a fortnight previous to her application.

Hirudines iv pone aurem sing. statim applic.

April 9th. The leech bites bled freely and afforded decided relief to the pain, but the deafness and tinnitus still continued. The *hearing distance* of the right ear was nothing; that of the left was six inches. Both auditory passages were healthy: neither membrane could be satisfactorily seen, owing to the want of light, but they appeared less glistening and more opaque than natural. The friend who accompanied this patient declared that her dull and sullen appearance had only come on since the present attack; and that she was very low spirited, and feared that she would never recover her hearing again.