tory was probably external to the dura mater. But if the consciousness be only sufficient to enable the man to say a word or two after much rousing, or to produce a state which might be mistaken for drunkenness, then it must go for very little. Such a state, during the first hour or two, is quite compatible with severe lacerations of brain-substance.

ACTION AND USE OF OXYGEN GAS, WHEN ADMINISTERED AS A THERAPEUTIC AGENT.

By S. B. BIRCH, M.D., M.R.C.P. LOND.

3. The co-operation or otherwise of medicine must be regarded as of some moment in viewing the *modus operandi* of oxygen as a remedy in disease. Just as a close relationship exists between organic and inorganic polarity, so also must relative chemistry be kept in sight. Let us regard what is termed catalysis. Inorganic chemistry informs us that the presence of iodine, bromine, chlorine, and other of the more potent electro-negative series, will frequently cause or quicken oxidation by their presence, when the oxygen would otherwise be dormant or slow in action. Again, certain peroxides (already adverted to when speaking of the preparation of the gas for medicinal use), such as the peroxides of manganese, cobalt, cadmium, etc., by their simple contact in very small quantities with a salt containing oxygen, will cause that gas to be yielded with increased facility, and in much larger quantity, without themselves undergoing any permanent change. Now, far from these facts being adduced (which they have been) as evidence of the universal sufficiency of the oxygen in the atmosphere under any diseased condition whatever, and of the uselessness of artificially prepared oxygen as a remedy, it appears to me that they are capable of an inverse application. While admitting the frequent value of the foregoing electro-negative elements and their salts in promoting oxygenation within the organism, as well as in assisting oxygen gas therapeutically employed, I would suggest *pari passu* the probability of very small doses of more active oxygen, possessing a quasi-catalytic action in the lungs, or at least enabling ordinary atmospheric oxygen to be absorbed and combined, with increased energy as an immediate effect, and thus affording more or less continued benefit in lowered conditions of the animal economy, according to individual capability of sustaining the reaction induced.

With reference to co-operation or interference on the part of medicines, there is another interesting point to be named. It has been surmised that narcotics (opium especially) may act through suspending or lessening oxygenation within the organism. Now I have at present a lady under my care who has received great relief from small doses of oxygen gas. She had been taking thirty grains of opium daily for two months before I saw her, as the only relief for extreme neuralgia associated with cancer of the womb; and although the quantity was soon greatly reduced, yet from three to eight grains daily were still needful, notwithstanding the assistance rendered by the gas. Far from oxygen inhalation being rendered inert, it invariably, and in a marked degree, assisted the action of the opium, when the latter had partially soothed. It may be added that I have never found that the moderate use of opium interfered much with oxygen, when both were suitable for the patient's condition and disease; although, on the other hand, several lamentable instances have come under my notice where irreparable mischief resulted from a single dose of opium injudiciously administered by the practitioner, under fear that critical discharges suddenly produced by the gas, and really affording the only chance of cure, were too weakening. In fact, any sedatives or narcotics may be advantageously used with oxygen, provided that they be not abused by being given in unsuitable cases and in too large doses. Of alcohol (that much abused gift to man)—a stimulant or narcotic, according to dose—the same may be said. Supposing even that oxygenation may be rendered less active, or partially suspended, in the cerebro-spinal system, it still evidently remains influential over general nutrition and secretion in many cases, unless, indeed, injurious quantities of drugs or alcohol be administered.

In connection with this portion of the subject, I may here remark that a number of experiments upon rabbits with chloroform and oxygen, which I made eight years ago, led me to alter a mere idea which I had entertained and expressed two or three years previously; viz., that the use of oxygen would be advisable under accidental mischief from chloroform. In nearly every chloroform experiment, I found that the prior or simultaneous or subsequent employment of the gas tended rather to deepen the insensibility and further relax the tissues. In fine, it may be almost regarded as axiomatic, that *ceteris paribus* the artificial use of

oxygen will tend to promote a sedative effect where sedatives are judiciously exhibited, and will tend to assist suitably administered stimulants.

The action of oxygen, when administered internally by the stomach, would seem to involve the two considerations, condition of gas and idiosyncrasy of each organism, equally with its exhibition by the lungs. In fact, extreme variation in effect are very frequently met with in the case of two at least of the three which we will take as examples of the classes, neutral, ozonide, and antozonide; viz., superoxygenated water, ozonified water or oil, and peroxide of hydrogen.

1. *Superoxygenated water*, being neutral, is less liable to disagree than either of the others, if carefully apportioned to the requirements of each constitution. The gas in this form appears to be rapidly absorbed by the mucous lining of the stomach; for rarely does any return by eructation, and seldom is flatus induced; the occasional symptom of flatulence being probably indirect, or flatus already existent excited into movement. In a few persons, I have known an invariable sensation of heat and determination to the brain within ten minutes after imbibing half a tumbler of the water. Very many experience a quiet exhilaration or feeling of general tone throughout the body. In cold weather (taking a subject rather below the average vital heat), it is apt to chill and depress; in hot weather, to cool and brace up; but, even in winter, its use is found very beneficial for persons confined many successive hours in over-heated, pure-air-excluding apartments, and especially as a remedy for the thirst and dry mouth following a stimulating late dinner. These facts need little comment, when taken in connection with foregoing observations on the *modus operandi* of artificial oxygen.

2. *Ozonified water or oil*, whose sphere of usefulness is very limited in comparison with the preceding, appears to have an action allied to perchloric acid and (in a more remote degree) to nitro-hydrochloric acid and iodides. They demand almost as careful prescription for the stomach as ozone does for inhalation; and, if not cautiously adapted to the state of the stomach and lungs, will affect injuriously the latter as well as the former. The oil especially (and I am happy in being able partially to confirm the belief of the late Dr. Theophilus Thompson) is very useful, when tolerated by the stomach, in the vomica and glandular suppuration of strumous subjects—useful after the failure of cod-liver oil and other approved remedies. The double action of this oil receives significance from (a) the irritating effect of ozone in large proportion *versus* its alterative, tonic, and absorbent effect when very small doses are used—when, in fact, the really valuable nature of the element does not undergo abuse by poisoning the system with it, as with the abuse of alcohol, etc.; (b) the well known usefulness of cod-liver oil and other oils in certain perverted conditions of nutrition.

3. *Peroxide of hydrogen*, representing the so-called antozonic compounds, appears to me, after repeated trials in a variety of cases, to be quite an exceptional remedy for administration by the stomach; and, notwithstanding the facility with which it gives up its second atom of oxygen (quickly becoming neutral) when subjected to moderate heat out of the body, its therapeutic effect evidences considerable dissimilarity from that of oxygenated water. It is very apt to disagree and to cause irritation and flatulence in the intestinal canal; sometimes it seems to have no action; seldom has it a decidedly beneficial action. The association of a second atom of oxygen with the oxide of an electro-positive element, apparently causing the assumption of a polar condition opposite to the polar state of the oxygen in unstable protoxides and chlorine peroxides, presents, as yet, a knotty scientific point even in inorganic chemistry; and, since a great difference exists between the action of peroxide of hydrogen and the opposite loosely combined compounds of oxygen, as well as oxygen in solution, the question arises (a) whether the loose atom in the peroxide of hydrogen becomes neutral, or undergoes some other special combination in contact with the contents of the stomach or after absorption through the mucous membrane; or (b) whether it be, on one hand, inert under many conditions of the stomach and internal economy, and, on the other hand, slowly active, and thus irritating in some instances, useful in a few diseased states. Dr. Richardson's suggestion regarding its usefulness in some cases of diabetes may be favourably viewed. A special catalytic agency in reference to the abnormal production of sugar and its oxygen component may be suggested; but, as to most other perversions of health, this peroxide affords little satisfaction compared with other well approved methods of oxygen exhibition, and is besides very unpleasant to the taste of most patients; *ergo*, the impression is arrived at, that we can do very well without it, except in bad cases of diabetes, where it should be fairly tried.

In prescribing oxygen-gas in disease, there ought to be much more care than usually obtains, or is commonly deemed necessary. It would be obviously superfluous here to extend my remarks beyond inhalation, and the administration of oxygenated water; since the therapeutic employ-

* Concluded from page 329 of last number.

ment of substances containing oxygen is a part of our ordinary materia medica, and there is no fear (*e.g.*) that any hunter will lead the profession, like inexperienced hounds, "off the scent," by assertions regarding the fumes of perchloric acid and nitric acid conveying pure oxygen to the lungs by inhalation. As to inhalation, undiluted oxygen may be, and is, exceptionally useful; but, as a rule, it affords but little satisfaction, even if it does no harm. In desperate cases, as a last resource, I have tried the undiluted, after the gradually less-and-less diluted gas had failed. For one or two minutes it has seemed to revive the patient; but the transient reaction has generally been followed by an immediate return and even increase of depression. It is necessary that the atoms of oxygen should be distributed through some medium; and atmospheric air is naturally selected as the best and most convenient, though nitrogen would almost equally subserve; and in some cases a medium of hydrogen (very carefully managed) affords a special advantage. For doses I would direct the reader to remarks, interspersed among the illustrative cases afterwards, to my paper of 1859, and to my monograph, *The Use of Oxygen in Disease*, published in 1857, a new edition of which will shortly appear. The precise method of inhalation is highly important. In bad cases the inhalations (for a time, at least, at the outset of treatment) ought to be carefully watched by the practitioner. According to the special condition of the lungs, heart, brain, etc., or the patient's physical weakness or possible nervousness, so ought the depth and vigour of the inspirations, and duration of each sitting, to be regulated. The diluted oxygen should be retained in the lungs for at least two seconds. A medium period is five to six seconds after an ordinary inspiration of (say) from 70 to 150 cubic inches, according to pulmonary capacity. One minute's interval of ordinary respiration, at least, should elapse between each artificial inspiration; and in some cases—either sensitive to its effects, or soon fatigued through debility—from two to four minutes' interval, ought to take place. As a rule, one well-managed half to three-quarters of an hour's sitting in the twenty-four hours is much more beneficial than short and repeated sittings; but of course there are exceptions. It is not desirable, as a rule, to take it either after long fasting, or soon after a good meal. During the sitting all excitement should be prohibited; but after its completion active movement for a few minutes in the room, or a little exercise in the open air, is advantageous. From foregoing observations, it will be obvious that chilliness and cold feet must be guarded against, as far as possible, during the inhalations.

To conclude this portion of our subject with a slight summary. As atmospheric air is provided for us by Infinite Wisdom as the perfect respiratory medium physiologically considered; so physiological experiments point to its physiological relations, and materially assist towards a comprehensive view of artificially-prepared oxygen as a curative agent. But, on the other hand, artificially-prepared oxygen can only be thoroughly-tested in its own plane; being a remedy demanded by perverted physiology, its true value can only be understood through pathology. Thus it can be clinically tested by its action through the lungs, stomach, and skin; but, in testing it, we must recognise practically—1, heat, polarisation, motive power, associated with the oxygen atom; 2, the same forces in the living organism; 3, the mutual relations of these forces, inorganic and organic, in connection with individual constitution and various perversions from the healthy standard, as well as under medicinal modification.

THE LATE DR. LESLIE.—The Buenos Ayres papers report the death of Dr. Leslie, a gentleman well known there for the benevolent zeal with which he made his scientific knowledge contribute to the well-being of those about him. In April last his wife returned to England, after an absence of eighteen years, her main object being to place their children at school, and a subsidiary one being to have some intercourse with friends from whom she had been separated so long. The sudden intelligence of her husband's death made her almost mad. She learns that the district in which she left him has been visited by cholera; that great numbers of men, women, and children have been stricken with the hateful disease, and that the doctor, caring only for those who were suffering, gave himself, night and day, to the services required of him as a medical man. On the 13th of January last he was himself attacked. The news spread rapidly through the entire district, and crowds of people, rich and poor, jostling together at the door, made eager inquiries as to the chance of so valuable a life being spared. He died the same day, and was buried on the following morning. The Buenos Ayres papers report that he not only attended the poor zealously without fee, but that very frequently he supplemented his proper work of a doctor by giving money, food, and clothing wherever he found a family in want. Mrs. Leslie has already left England to visit the grave of her husband.

ON THE NITROUS OXIDE GAS AS AN ANÆSTHETIC.

By J. MARION SIMS, M.D.,

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[With a Note by Dr. J. THIERRY-MIEG.]

I AM glad to see that the subject of nitrous oxide anæsthesia is now prominently before the profession in England; and I wish to lay my brief experience with it before my brethren.

In December 1867, Mrs. P. came to Paris from St. Louis, Missouri, to have her breast amputated. She was fifty years old. The tumour, occupying the left mamma, had been growing for two years, and was about the size of a man's head. Two large deep sloughs on its surface gave issue to a profuse ichorous sanies, and she was failing rapidly. Drs. Evans and Colton administered the nitrous oxide gas on December 22nd; and I amputated the breast, and then united the edges of the incisions by sixteen interrupted silver sutures. The operation and dressing occupied sixteen minutes; and during all this time the patient was kept under the influence of the anæsthetic. She recovered readily from its effects, without nausea, headache, or any other unpleasant symptom. I had the assistance of Sir Joseph Olliffe, Baron Larrey, Professor Pope of St. Louis, Dr. Johnston, and many others, all of whom expressed themselves perfectly satisfied with its action.

On the 28th of December last, Drs. Evans and Colton gave the gas to Miss X., of Dublin, aged 38, who has been living in France for eleven years. While residing in Dublin, she had some disease of the lungs, for which Professor Stokes ordered her to the continent. She supposed herself cured of her lung-disease, and I was consulted for an abdominal tumour, which had been growing for the last three or four years. Dr. Maisonneuve had seen her, and there was some doubt about the real nature of the disease. To determine whether it was fibroid or cystic, I suggested the propriety of giving her chloroform, as she was too nervous to bear the necessary manipulation without an anæsthetic; but she objected, on account of some heart-disease, saying that she had taken chloroform once, and Dr. Stokes had warned her never to take it again. Dr. Pratt examined her heart, and found that she really had organic valvular disease. With these facts before us, and with the warning of Dr. Stokes, we did not dare to give her chloroform. I mentioned this case to Dr. Colton; and he said he was not afraid to give the gas where there was only disease of the heart, but that he thought there was some risk in confirmed cases of consumption with a tendency to hæmorrhage. On the 28th of December last, Drs. Evans and Colton administered the gas to Miss X.; and she was kept fully under its influence for eight minutes. She promptly recovered from its effects; but on the following day she had a slight exudation of blood from the ears, the nose, and the throat. She had a little bloody expectoration for more than twenty-four hours. She says that the immediate effects of the gas were very disagreeable; for she felt as if the blood would burst forth from her ears as soon as she commenced to inhale it.

A stout healthy-looking woman (a native of Italy), the mother of two children, had an indurated fissured knobby tumour of the umbilicus about the size of an English walnut. It was seen by Mr. Nélaton in September 1866, and he pronounced the disease cancerous. He advised her against any surgical operation, saying that the wound of the peritoneum necessary for the removal of the tumour might produce fatal peritonitis.

I saw this case soon after Mr. Nélaton, and concluded to try Dr. Broadbent's treatment by acetic acid injection. This was practised from time to time for six months, and the tumour gradually diminished to about one-fourth of its original size. It lost its deep purple appearance and seemed to shrink down to a small mass of fibrous structure, but it retained its fissured knobby appearance and its lancinating pains. Six months ago I abandoned all hope of curing it by this means, and the operation was determined upon.

On the 2nd of this month, Dr. Crane, a young American dentist of Paris, gave the gas, and I extirpated the tumour. I expected to finish the operation in five or six minutes; but twenty minutes elapsed before the dressing was complete, and during all this time Dr. Crane kept the patient constantly under the influence of the gas. I presume this is the longest time that any one has as yet been kept under its influence. The operation was done in the presence of Sir Joseph Olliffe, Dr. Dyce Duckworth of London, Dr. Schost (late of the U.S. Army), Dr. Thierry-Mieg, and Dr. Pratt. They were all satisfied with the effects of the gas. Dr. Duckworth examined the tumour microscopically, and pronounced it cancerous.