Notes on the treatment of phthisis by pure oxygen and ozonised oxygen / by Arthur Ransome.

With kind regards
A. R.

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NOTES ON

THE TREATMENT OF PHTHISIS

BY

PURE OXYGEN AND OZONISED OXYGEN.

BY

ARTHUR RANSOME, M.D., F.R.S., &c.

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NOTES ON THE TREATMENT OF PHTHISIS BY PURE OXYGEN AND OZONISED OXYGEN.*

MONSIEUR PASTEUR has shown the power of the oxygen and ozone of the atmosphere in attenuating the infective power of various micro-organisms. The good effects also of fresh air, both in the treatment of consumption and in its prevention, have now been placed beyond a doubt.

It was on these grounds thought desirable that a thorough trial should be given to oxygen and ozone at the Manchester Hospital for Consumption and Diseases of the Throat.

It may be said that something had already been done towards this end in the construction and aeration of the wards of the hospital at Bowdon. In the older portion of the building, 6,000 cubic feet of fresh warmed air is admitted per head per hour, and in addition to this large supply the windows of both wards and living rooms are kept open winter and summer, night and day. There are also several Tobin's ventilators in each room.

In the two new pavilion wards, erected by Mr. W. F. Crossley, still larger amounts of fresh-warmed air are constantly passed through the ventilator, and, if required, 18,000 cubic feet of air can be admitted per head per hour. It has been ascertained also that the entering air contains a fair amount of ozone.

The results of this large admission of pure air from the gardens of the institution upon the health of the patients have, on the whole, been very satisfactory. In most of the cases admitted, there has been at least a temporary arrest of the activity of the disease, attested by the diminution of fever, by a gain in weight, and by the absence of night sweats. Owing to the kindness of Messrs. Dewhurst, an opportunity has, however, been afforded of trying the effects of Brin's pure oxygen in the treatment of certain selected cases. Since Feb., 1887, no less than twenty-four cylinders, each containing twenty cubic feet of pure oxygen, have been supplied to the institution without charge.

Moreover, two dozen syphons of oxygenated water and some bottles of milk were provided for the use of patients.

The inhalations were not given directly from the cylinders, but a Clover's nitrous oxide inhaler was used. After the bag had been filled with oxygen, the current was shut off, and the patient allowed to exhaust

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the contained quantity, expiration being performed into the external air through an aperture with a valve opening outwards.

The following notes as to the action of pure oxygen were made by Mr. Cottam, Resident Medical Officer at the Institution :—

Inhalation.—Three patients inhaled pure oxygen for periods of time beginning with five minutes, and gradually increasing up to fifteen.

(1) K. W., a case of phthisis, third stage, left chest, early second on the right; bacilli had been found in the sputum. She inhaled oxygen almost every day for four weeks in the manner stated above. The pulse and respiration were both diminished in number at the end of the experiment. These effects were very temporary, and were very possibly exaggerated by nervousness. The patient said she felt clearer and lighter after an inhalation; and on two occasions a headache was cleared away. If given just before a meal, the appetite was improved. No effect, as far as could be ascertained, upon the bacilli.

(2) S. H. In this case the left apex was breaking down; the right showed slight consolidation in the same region. There was a marked family history of phthisis.

The result of a week's inhalations was almost inappreciable. Pulse and respiration unaffected. Appetite slightly improved, and there was the same feeling of clearness as in the case of K. W. Patient was usually sleepy after an inhalation.

(3) M. H. This patient's lungs were both in the third stage of phthisis, the left being the more advanced. Bacilli were found in the sputum.

On inhalation, pulse and respiration were both increased at first, afterwards diminished. The patient was liable to headaches, and these always disappeared after respiring oxygen, and she felt lighter and brighter. The respiratory power distinctly increased after a short period of inhalation. No effect could be observed upon the number of bacilli.

In these three well-marked cases of phthisis the inhalations were never found to excite coughing unless the patient took a very deep inspiration; but a deep inspiration in ordinary air produced just as much coughing.

Oxygenated Water.—This was given alone or with milk. In cases where there was gastric irritability with pain or discomfort after food, or where there was vomiting independently of coughing, milk and oxygenated water were easily retained, and almost invariably without discomfort, and there was no objection on the part of the patients to taking oxygenated water. Depressant after-effects were never noticed.

Oxygenated Milk.—This did not get a fair trial, for it was found impossible to keep it for more than a few days after arrival.

Ozone.—Whilst these observations upon the action of pure oxygen were being carried out, it was also thought desirable to ascertain the effect of ozonising the pure gas as it issued from the cylinders. It was thought possible that the deleterious effects of ozone, that had been at various times observed by others, might have been due partly to some impurity. Ozone was accordingly obtained by connecting the wires from an induction coil, with the inner and outer tubes of an ozone-generator (Tinsley's), and allowing a gentle stream of oxygen from a Brin's cylinder to pass through the tubes. The apparatus was at first placed in the ventilating chamber, underneath one of the pavilion wards. By means of test papers ozone could be found passing into the ward in increased quantity, but as no appreciable results followed, and as moreover atmospheric ozone was found in considerable quantities in the air entering the ventilating chamber by its louvres, this method was soon discontinued. It was then tried in the sunbath with nine, ten, or a dozen patients, with the windows closed, for half an hour. Irregular results were obtained from pulses and respirations, and there was marked increase in coughing and headaches (? probably due in part to confinement of excess of patients in a limited area).

Similar treatment in a small ward with three or four patients at the most, and continuing for about six weeks, gave the following results: The room used was 2,790 cubic feet in size. The patients were left in the room for an hour, with the exception of J. S., who remained usually half an hour. The general effects observed were these: Sleepiness (only one patient out of five unaffected); increased appetite for the next meal; no marked effect on either pulse or respiration; no irritable effects, such as increased coughing; no headache; no definite alteration in the amount of bacilli in sputa. One patient (G. H.) was brought in for one inhalation, but coughed so much that it was not thought advisable to continue in his case. L. C. felt very little difference during several weeks trial, though she could readily detect by the smell the presence of ozone. On two occasions the stream of pure oxygen was shut off, and the ozone obtained from ordinary air. On both occasions *all* the patients complained of coughing and a sense of irritation.

Pure Ozone under slight pressure.—Mr. Cottam and I then tried the effect of inhaling pure ozonized oxygen that had been passed into a Waldenberg's apparatus—a kind of gasometer upon which more or less pressure could be made by means of weights and counter weights. As we experienced no ill effects from our inhalation, I selected the following case as one upon whom cautiously graduated experiments with this gas could be tried. The notes have been furnished to me by Mr. Cottam.

A. J. E., aged 49, of good family history, was admitted Oct. 10th, 1887. His previous history was as follows: Winter cough since 1882, usually quite well in the summer. Last spring the cough, instead of leaving him, increased. His breathing became shorter, and he lost flesh. The expectoration became freer, and changed from a frothy black and white to a yellowish green. No hæmoptysis and no night sweats. On admission it was found that the apex of the left lung was beginning to break down, but no definite signs of a cavity could be detected. Moist râles could be heard down to the base of the fifth dorsal spine behind. Bacilli in moderate numbers were found in the sputum, which was thick and muco-purulent. After he had been in hospital seven weeks, during which time he gained some 7 lbs. in weight, he was given inhalations of oxygen and ozone under pressure. A stream of oxygen, driven through an ozonizer, had about 8 per cent of its volume converted into ozone by means of a current from an induction coil and battery. The mixture of oxygen and ozone was passed into the pneumatic apparatus, holding (during this series of experiments) 560 cubic inches.

December 5th.—The patient was given two inhalations under a pressure of 3 kilos (6½ lbs.) at first, and the amount was gradually increased to four inhalations at 4 kilos (9 lbs.) pressure, daily, during a period of five weeks. The following observations were made. There was no difference between the pulse taken before inhalation and that taken after, and none in the number of respirations. The patient felt brighter and more buoyant, and after a few days could walk further and with more comfort, slept better, appetite markedly improved, especially for breakfast and tea. Increase in weight between 5 and 6 lbs. (he was taking cod liver oil during the whole period). Increased respiratory power, gauged by lessening the number of respirations in which he was able to empty the ozone chamber. No catarrh, and at no time could any irritating effects be noticed. He never coughed, either at the beginning or at the end of inhalation. The ordinary morning cough and expectoration diminished. At the end of the first week bacilli could not be found in the sputum, and when again examined at intervals four times subsequently, bacilli were absent. Two other patients (males) were also submitted to daily ozonised inhalations, but it will be unnecessary to give the details of their cases. One: B. H., æt. 29, had been admitted as an in-patient three months before this special treatment was commenced. He had a small cavity in the left apex, and infiltration to four inches below the clavicle, and on the right side, under the upper three ribs, and under the supra-spinous fossa behind, the lung was undergoing softening. He had already improved very much in health during his stay in the Hospital, having gained nearly 13 lb. in weight, and he had no fever or night sweats, but the bacilli in the sputum were numerous. He has now had daily inhalations for three weeks, emptying Waldenberg's gasometer at first twice, and then three times at each sitting, the contents being 633 cubic inches each time. He continued to gain in weight, and expresses himself as feeling much better since the treatment was commenced. Sleeps, eats, and breathes much better; the temperature is normal, and the pulse has diminished in rate from 80 to 70. The sputum has been twice examined, on January 29th and February 12th, and on each occasion many bacilli still appeared.

J. T. J., æt. 19, had phthisis in the second stage on the right, and probably slight consolidation on the left side. He commenced the inhalations on January 20th, having been in hospital ten days. His weight on January 20th was 110½ lb., and on February 15th, it was 115 lb. He emptied the cylinder under a pressure of four kilos, from two to five times, and seems to have benefited from the treatment. His pulse also has slowed somewhat; he eats and sleeps better, and his temperature is normal. His sputum, examined on January 30th, showed no bacilli, but on February 14th, a few were found.

I have ventured to publish these few imperfect notes, not because I think they afford any conclusive proof of the action of oxygen or of ozone upon tubercle, for this proof can only be obtained by a much longer study of the subject, but because I think that certain of the facts already ascertained are worthy of notice, and because by their statement, other observers may be induced to repeat and to carry further these observations, as I certainly mean to do so myself. It has thus been ascertained (1) that pure oxygen, without any admixture of air, may be inhaled continuously for at least 15 minutes, and probably for a longer period, without the slightest harm resulting, without producing inflammation, or even irritation of the air passages, without increase of fever, or even elevation of the pulse-rate. (2) It has been proved that from 2,000 to 4,000 cubic inches of pure ozonised oxygen may be breathed, not only without harm, but even with apparent benefit in the cases in which it was tried. (3) If we may trust our repeated microscopic examinations, the ozone diminished the number of bacilli in the expectoration in two cases, and in the third, the expectoration was diminished, and the disease was quiescent. The general condition of the patients was much improved.

March 19th.—The patient, A. J. E., went out of hospital on January 30th. He came for several weeks to the Dispensary, and seemed still to be improving, and he was gaining weight; but on March 5th I was informed that he had died suddenly of hæmoptysis.

Patients B. H. and J. T. J. are still under treatment, and are gaining weight steadily. In each case the disease seems to be stationary, but microscopical examination still shows bacilli in the sputum.

John Heywood, Excelsior Printing and Bookbinding Works, Manchester.