really necessary? With the exception of Morison's recurrent case and Waugh's case, they were performed in only one of the other eight cases mentioned—another reason for the performance being given. They were not performed in any of Dr. Still's cases, and though "the earliest was nearly eight years ago and the latest a year ago"² none had recurred.

My best thanks are due to Dr. G. F. Still for kindly supplying me with one of the references.

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TREATMENT OF TUBERCULOUS AFFECTIONS BY INFLATION WITH OXYGEN.*

BY

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THE subject of this communication was first brought to our notice in a paper published by Lieut.-Colonel Rost, I.M.S., in the *BRITISH MEDICAL JOURNAL* of December 10th, 1921.¹ He stated that he was led to try oxygen gas in the treatment of various affections by the desire to reach the inaccessible parts of a psoas abscess. He reports altogether 32 cases, including psoas abscess, tuberculous peritonitis, tuberculous joints (with effusion), chronic synovitis, pyaemic abscess, and fibrous ankylosis of the knee-joint. The results he obtained were extremely good, improvement or cure having been obtained in almost every case.

During the past two years we have employed this method in a number of tuberculous cases and epitomize here notes of 21 of these which we have been able to trace and recently verify.

The method consists in evacuation of the abscess (by aspiration, trocar and cannula, or incision) followed by inflation by oxygen gas. Evacuation by the aspirator is usually inadequate owing to the frequent presence of large flakes of lymph, and it has been found better to use a large hydrocele trocar and cannula, after making a preliminary nick in the skin. In deeply situated abscesses evacuation by free incision commends itself. Evacuation is frequently facilitated by changing the position of the patient.

The apparatus required consists of oxygen in the usual cylinder, connected by tube to a wash-bottle containing hydrogen peroxide solution; this is connected in turn by a tube to a hydrocele cannula, or to a Potain's aspirator needle fitted with a two-way tap, which tap connects with the aspirator bottle and the suction syringe. Midway in the tube connecting the wash-bottle and the two-way tap is interposed a length of glass tubing containing a filter of sterile cotton-wool. This union and a coil of the rubber tube on either side lies in a basin of hot water to warm the gas.

The Procedure.

Rigid asepsis is essential; the aspirator or trocar should be introduced through sound skin, and if possible in such a manner as to produce a valvular closure on its withdrawal. If the abscess is evacuated by incision the needle or trocar for introduction of the gas may well be inserted at a distance from the incision, after the cavity is evacuated, and so arranged as to be in a convenient position. The incision is then closed, in layers if possible, before the gas is introduced. A similar procedure is applicable to the abdomen. Rost used flushing with saline or other fluids to aid in evacuation of large masses of lymph.

The abscess having been evacuated, or the abdomen

prepared for the introduction of gas by separation of adhesions, the oxygen is introduced through the cannula until a distension equal to that produced by the pus is obtained. In plastic tuberculous peritonitis the degree of distension is less easy to gauge, but it may be carried to the point of a tight distension, with a high tympanitic note on percussion; care must be taken to permit the patient to emerge from deep anaesthesia as the gas is being introduced, and, in order to avoid respiratory embarrassment, to regulate the flow of gas so that it is slow. Frequently only a small pocket, which may be in any part of the abdomen, may be attainable amongst the adhesions. Having once entered the abdomen, the line of least resistance is the line to follow; resistance to any but the gentlest pressure by the gloved finger should divert the efforts to another quadrant. A sponge on a holder, to reach a more distant point than the finger can reach, is dangerous, as at any point the easy yielding adhesion may be replaced by a dense one and the relatively non-sensitive pressure of the swab on a forceps, compared with the finger itself, may lead to a tear and a subsequent faecal fistula. The closure of the puncture is effected best of all by one or two Michel's clips. The purse-string suture used at first was found to be liable to produce necrosis of the edges of the puncture.

Selection of Cases.

Cases with sinuses or redness of the skin are not suitable. The presence of a mixed infection appears to lead to failure. So far tuberculous peritonitis with effusion has not yielded any good result. (See table, p. 907.)

Part Played by Oxygen.

A point of speculative interest is the part played by the oxygen. Rost suggests:

1. *Mechanical*, in separating the adherent surfaces by the pressure of the gas, and by preventing readhesion. We have observed that on the second or third inflation of a tuberculous abdomen the space amongst the adhesions had markedly increased (notably in case No. 2); we have noted also the cessation of vomiting after each inflation.
2. *Pressure* prevents exudation of fluid. (Limited observations do not confirm this, at any rate in regard to the abdomen.)
3. *Reduces blood supply.*
4. Pressure reduces pain by separation of joint surfaces. (To this we agree.)
5. Probably may exert some inhibitory action on the pathogenic process.

The chief interest lies in the possible inhibitory action of the oxygen on the tuberculous process. The tubercle bacillus is a fairly strict aerobe and does not, in the laboratory, grow under anaerobic conditions. Rost states that "The gas in passing through the wash-bottle is freed from any particles, and is rendered nascent." We have been unable to obtain any confirmation of this change taking place. Mr. C. R. Houseman, chief chemist to the British Oxygen Co., Ltd., has informed us "That cylinder oxygen after passage through hydrogen peroxide solution contains no trace of ozone, and is no more chemically active than before entering the solution; that no reaction occurs."

We may therefore seek for another explanation, and the work of MacLeod and Gordon,² of the pathological department of the University of Leeds, suggests another method of action. They find (1) that an inhibitory substance is developed in pneumococcal cultures to which there is abundant access of oxygen; (2) that this inhibitory substance is hydrogen peroxide; (3) that the early death of the pneumococcus in culture is usually due to accumulation of excess of hydrogen peroxide; (4) that in addition to pneumococci the only bacteria which have yet been shown to produce hydrogen peroxide are many streptococci, both haemolytic and non-haemolytic, and a few other coccal forms.

Another observation bearing on the question is that Pasteur made use of oxygenation to attenuate cultures of anthrax and of the virus of fowl cholera.³ Apparently, oxygen may have a deleterious effect on bacteria other than those capable of producing hydrogen peroxide.

* This article is based upon a paper read before the Nottingham Medico-Chirurgical Society.

Notes of Cases.

No.	Age.	Condition.	Other Evidence of Tuberculosis.	No. of Applications.	Time since Discharge.	No. of Relapses.	Result.
1	25	Abscess of right iliac fossa	None	Evacuation and eusol 1; oxygen 2	2 years	None	Well.
2	15	Plastic peritonitis and obstruction	Both lungs slightly	Oxygen 5	1 year	Two	Much improved.
3	22	Abscess from seventh right rib	None	Oxygen 4	1½ years	None	Well.
4	17	Abscess in neck from gland	None	Aspiration 2; oxygen 4	1½ years	None	Well.
5	4	Abscess of left iliac fossa	None	Oxygen 2	2 years	None	Well.
6	18	Tuberculous elbow with abscess	None	Aspiration 1; oxygen 1	2 years		Broke down at once.
7	25	Isoas abscess in thigh	None	Oxygen 6	1½ years		Broke down after sixth application.
8	30	Peritonitis with effusion	Advanced pulmonary	Oxygen 1			Died within few days from generalized tuberculosis.
9	9	Abscess from fifth and sixth ribs	None	Oxygen 2	1½ years	None	Well.
10	51	Tuberculous hip with abscess	None	Oxygen 7	1½ years		Broke down after seventh application.
11	11	Abscess in neck from gland	None	Oxygen 1	1½ years		Not traced.
12	18	Abscess over scapula	Marked pulmonary	Oxygen 1	1½ years		Broke down at once.
13	15	Abscess right lumbar region	None	Aspiration 1; oxygen 4	3 months	One	Well.
		Abscess left lumbar region	None	Oxygen 1	8 months	None	Well.
14	?	Plastic peritonitis	None	Oxygen 2			Died from faecal fistula.
15	27	Abscess left lumbar region	Right lumbar sinus	Oxygen 2	10 months		Broke down, but patient much better.
16	27	Psoas abscess in left thigh	None	Oxygen 1	1 year		Broke down soon after.
17	11	Tuberculous hip with abscess	None	Oxygen 1	1 year	None	Well.
18	20	Abscess from sacro-iliac joint	Lupus of face	Oxygen 2	1 year	None	Well.
19	27	Abscess right buttock	None	Aspiration and iodiform 1; oxygen 1	6 months	None	Well.
20	25	Abscess from sacro-iliac joint	None	Aspiration 1; oxygen 1	4 months		Broke down two months later.

Note.—No. 13 represents two separate conditions treated at different times.

Summary of Results.—Well, 10; improved, 2; failures, 6; died, 2; not traced, 1.

Conclusions.

Although our results have not equalled those related by Rost, the method appears to us distinctly helpful, and worthy of further trial.

It should be noted that the cases recorded were in no way selected except that no case with a sinus was treated, and all the patients returned to their homes, often to convalesce under very adverse conditions. The procedure is as simple as any other method and can be used in out-patients. There are no unpleasant sequelae.

As there are many disappointments in the treatment of tuberculous abscesses, an extended trial of this oxygen method is worth pursuing.

MacLeod and Gordon have shown that some organisms do produce inhibitory substances in the presence of excess of oxygen. May it not be possible that the tubercle bacillus, whether in an abscess or in the lung, can produce under the same conditions an inhibitory substance? This leads one further to ask the question, Is it herein that lies the efficacy of sanatorium treatment of tuberculosis?

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TREATMENT OF BILHARZIASIS BY ANTIMONY TARTRATE.

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IN the *JOURNAL* of February 26th, 1921, we gave notes on 1,000 cases of bilharziasis treated by antimony tartrate in the C.M.S. Hospital, Old Cairo, which was the first report in the medical press of this mode of treatment on a large scale. By the end of 1923, 4,600 individuals had been thus treated, and with this amount of material on which to base our conclusions we feel that a few additional notes may be of value to those interested in this subject.

Patients suffering from bilharzial disease have been attending the Old Cairo Hospital since its earliest days, and various methods of treatment, mostly palliative, were used till June, 1919, when the injection of antimony tartrate was first started. Since that time we have been treating over 1,000 cases a year, the numbers being as follows:

1919 (June to December)	...	...	...	...	370
1920	...	...	...	...	1,143
1921	...	...	...	...	1,087
1922	...	...	...	...	1,051
1923	...	...	...	...	1,004

The year 1920 was the first settled year after the war and local riots, and general conditions were good and cotton at a high price. The slight decrease in numbers in subsequent years is due to the fact that the Government has been doing a considerable amount of work in the treatment of bilharziasis. In reality, the fact that the record of bilharzia admissions has kept almost constant shows the favour with which the treatment is received, for during these years our other departments, particularly that of ankylostomiasis, show a much bigger proportional drop in numbers.

Sodium antimony tartrate is now used for injection as it is thought to be less toxic than the potassium salt. For adult males, 1 grain is the initial dose, increased by 1/2 grain each injection up to 2½ grains, which is the maximum dose. The injections are given daily for six days, and then on alternate days. Weak patients and women and children take proportionately smaller doses. The regular number of injections is twelve, which at full doses makes a total of 27 grains, but this depends on the results of microscopical examinations. Unless there is some contraindication we continue the course until only "dead" eggs are reported.

Statistics.

Cases dealt with at Old Cairo in which the urinary tract is infected with bilharziasis have always greatly