conveyed by some blood-sucking insect? Dr. Edwards tells me that one of his very rapidly fatal cases complained of having been bitten on the back of the neck by a body louse a short time before his illness, post or propter hoc.

I would like to acknowledge my indebtedness to Dr. Edwards for permission to examine this case, for the clinical notes he has kindly supplied, and for his interest in my results.

Bournemouth.

INJECTION OF OXYGEN AS A TREATMENT FOR TETANUS.

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As B. tetani is an obligate anaerobe and will not develop in the presence of the smallest amount of oxygen, it was thought that the injection of oxygen into a tetanus wound, and into the tissue immediately surrounding the wound, would be more or less efficacious as a treatment, or auxiliary treatment, in delaying the onset of the disease or rendering it less acute, if not in preventing the development of the disease altogether.

In the Canadian Medical Association Journal for November, 1914, one of us (H. O. H.) reported beneficial results from the subcutaneous injection of oxygen in cases of dyspnea of tuberculosis, gas poisoning, pneumonia, edema of lungs, bronchial asthma, and operative cases, and the success with this treatment led to the surmise that it might be valuable in cases of tetanus and other anaerobic infections, such as malignant edema, symptomatic anthrax, &c. The prevalence of tetanus infections, causing extreme mortality in the European war zone, made it appear probable that a few animal inoculation experiments with tetanus and the subcutaneous injection of oxygen might be of use in ascertaining whether the treatment was of any value in this connexion. Accordingly, Dr. G. C. Creelman, president of the Ontario Agricultural College, was asked if it would be possible to carry on the experiments with tetanus in the bacteriological laboratory of the College. Dr. Creelman readily gave his consent and referred the matter to one of us (D. H. J.) in charge of the laboratory.

As a result, the following experiments were planned, in which we were respectively responsible for the oxygen injections and the cultures, inoculations, and subsequent observations.

Cultures used.—A fresh culture of B. tetani was obtained from the Parke Davis Co., and subcultures under anaerobic conditions at 37° C. for three days, and kept later at room temperature.

Virulence tests.—To test the virulence of the cultures a guinea-pig, weighing 790 grammes, was inoculated subcutaneously on the inner side of the right thigh with two drops of a three-day old bouillon culture. After 24 hours tetanic symptoms were shown by the extension backwards and outwards in a rigid condition of the inoculated leg. Five hours later respiration was laboured, and the hinder half of the body was partially paralysed, being dragged around the cage with difficulty; 12 hours later—a total of 41 hours from the time of inoculation—the animal was found dead.

Oxygen injection experiments.—The oxygen injected was obtained from some oxone cartridges as prepared by the Roessler and Hasslacher Chem. Co., New York, from which oxygen was generated in the portable oxygen generator made by the Hartz Company, of Toronto, Canada, and Detroit. The oxygen escapes by means of a long rubber tube, at the distal end of which is an aspirating needle which is inserted into the subcutaneous tissue. The tube is then oiled, and by a pumping action of the hand the oxygen is forced through the needle.

Series I.

In this series four guinea-pigs were used. They were divided into two pairs. All four were inoculated with B. tetani, and one member of each pair was given an injection of oxygen near the point of inoculation, while the remaining member of each pair was kept as a control. Sufficient oxygen was given to raise an emphysema from 3 to 5 centimetres in diameter in the immediate region of the point of inoculation. (Note.—In all the cases where tetanus developed the symptoms were similar to those described above in the virulence test, the only difference being the varying time of onset and termination of the disease.)

Pair 1, Guinea-pig 1 (760 grammes—control).—Inoculated subcutaneously with half a drop of an eight-day bouillon culture on inner side of right thigh. Result: Tetanic symptoms first observed after 36 hours. Convulsions and death after 72 hours.

Guinea-pig 2 (760 grammes).—Inoculated same as No. 1, but oxygen injected immediately after. Result: After 18 days no tetanic symptoms had developed; guinea-pig well, having shown but little inconvenience at any time.

Pair 2, Guinea-pig 3 (840 grammes—control).—Inoculated with one drop of eight-day bouillon culture. Result: Tetanic symptoms first observed after 59 hours. Convulsions and death after 66 hours.

Guinea-pig 4 (840 grammes).—Inoculated as above and given injection of oxygen immediately. Result: Tetanic symptoms first observed after 44 hours. Convulsions and death after 84 hours.

We see from the above that with the first pair of guinea-pigs where half a drop of culture was used for inoculation tetanus developed and terminated fatally in the case of the control, but had not developed where oxygen was injected 18 days later. With the second pair, where the amount of inoculum was double that used with the first pair, tetanus developed with fatal termination in both cases, but the appearance of tetanic symptoms and subsequent death were considerably deferred by the one injection of oxygen.

Series II.

For this series the agar-plate cultures were used. To inoculate, a puncture was made through the skin with a sterile sharp instrument, then a platinum needle was drawn through the surface growth of the culture and inserted into the wound. As with Series I., four guinea-pigs were used. They were divided into pairs, and one of each pair was inoculated and immediately given a subcutaneous injection of oxygen, and the other member of each pair was inoculated and not given oxygen.

Pair 1, Guinea-pig 5 (650 grammes—control).—Result: Tetanic symptoms first observed after 38 hours. Death followed tetanic convulsions after 66 hours.

Guinea-pig 6 (700 grammes).—Oxygen injected after inoculation. (Note.—Some of the oxygen injected bubbled outward through a drop of blood at the point of inoculation, indicating that the wound was being well bathed with the oxygen, which would thus be brought into direct contact with the bacteria and prevent their development.) Result: Tetanic symptoms first observed after 90 hours. Eight days after inoculation the pig was alive and active on three legs, and able to eat hay. The inoculated leg had been more or less extended and rigid for the last three days. It looked
very promising for an ultimate recovery as though an active immunity was being established.

Pair 2, Guinea-pig 7 (700 grammes—control).—Inoculated. Result: Tetanic symptoms first observed after 36 hours. Death following tetanic convulsions after 50 hours.

Guinea-pig 8 (850 grammes).—Inoculated and given oxygen injection. Result: Tetanic symptoms first observed after 51 hours. Death following tetanic convulsions after 72 hours.

With this pair of guinea-pigs, as with the second pair in Series I., we noticed that while tetanus with fatal termination developed in both cases the time of onset of the disease and of death was much delayed by the oxygen injection.

We take it for granted that the reader is acquainted with the modern treatment of tetanus—e.g., use of antitetanic serum, hypodermic injections of dilute carbolic acid solution, anaesthesia for spasms, the darkened room, chloroette, &c.—but draw attention to the fact that the only treatment used in these experimental cases was the direct deep injection of oxygen into the wounds, and we assume that if the beneficial effects in these cited cases were due to the injection of the oxygen other anaerobic infections might be at least equally well benefited.

We do not say that these limited experiments prove conclusively that subcutaneously injected oxygen is a sure cure for tetanus, but we think the results obtained warrant their publication, and we feel justified, in view of the fatalities that are occurring in the war zone from tetanus, to call the attention of the medical men in attendance, and others, to the beneficial effects obtained from this treatment as in the above cases, with the hope that it may in some measure aid in the prevention of, or recovery from, the disease with the wounded.

A fuller account of the experiments will be published later, and further experiments are planned which it is intended shall be carried out in the immediate future.

Clinical Notes:

MEDICAL, SURGICAL, OBSTETRICAL, AND THERAPEUTICAL.

A CASE OF ANTHRAX.

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On account of anthrax being comparatively uncommon the following notes may be of interest to readers of THE LANCET.

History.—A driver in the R.F.A., age 30, was admitted to Connaught Hospital, Aldershot, with three pustules on his forearm. For about six months the patient had been working amongst horses and in stables, but had no recollection of having had any abrasions or the like. On March 3rd he noticed three spots on his forearm, two close together 2 inches below the end of the elbow, and the other 2 inches nearer the wrist. He felt "out of sorts," ascribing his condition to a cold, and it was on account of the latter which may have been present; incubation was continued for three days. A flask of normal saline inoculated with some of the dense growth by means of a glass rod, and the saline emulsion was then heated at 85°C. for 30 minutes and stroke cultures made on agar plates from the latter. 24 hours' incubation of the agar plates showed numerous colonies of B. anthracis. To the naked eye and low-power examination the colonies were quite characteristic. Examination under 1/12th inch oil immersion revealed the characteristic B. anthracis.

Convalescence has been progressive and the man has been discharged from hospital feeling very fit.

I am indebted to Temporary Lieutenant R. Francis Jones for carrying out the bacteriological work, and to Temporary Lieutenant D. J. Legge for the surgical work.

VESICAL CALCULI IN VERY YOUNG BOYS.

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The following brief details of two cases of vesical calculi in boys may be worth placing under the notice of readers of THE LANCET.

In the first case the patient, a plump little Arab boy aged 2½ years, was brought to hospital in November, 1911, because he was passing blood from the penis and his urine was constantly dribbling away. The sound entered the bladder with difficulty and there was no click heard. As the father of the boy was much upset at the child's screams the sound was at