bacillus coli communis has been noted in the pus of a brain abscess operated on by him, or, as far as I know, by any other surgeon.

Since the above was written I much regret to state that the case has terminated fatally.

The patient was readmitted to the hospital on November 23rd, having only been nine days at the convalescent home. He was quite well up to the evening of the 22nd, except for feeling rather faint during the previous two or three days, but there was no pain. On the 22nd violent pain began in the frontal and occipital regions associated with frequent vomiting. There was no rigor. These symptoms have continued up to the time of readmission.

November 23rd. *Present Condition.*—The patient lies in bed groaning and complaining of severe pain over the eyes and at the back of the neck. He is quite rational, and there are no paralytic symptoms. He is frequently sick. Temperature 104.2° , pulse 140. The left knee-jerk is present, the right cannot be obtained. The skin over the old trephine opening bulges a little, but pulsates. There is some purulent discharge from the lower end of the original incision.

November 24th, 11 A.M. The patient has passed a restless night, with much pain and sickness; temperature 103° , pulse 120. The skin over the trephine opening bulges still more, has ceased to pulsate, and presents on the surface a small greyish, foetid, ulcerated patch. 4 P.M. Under chloroform Mr. Day opened up the lower part of the original wound, and with the gouge enlarged the track leading into the antrum and removed the upper part of the posterior bony meatus and the outer wall of the attic. The roof of the latter cavity was found to be perforated. The original passage through the trephine opening was then reopened and about 1 drachm of stinking brown pus evacuated from the temporo-sphenoidal lobe. The cavity was syringed out as before and a tube left in, although there was considerable difficulty in retaining it in position. Another tube was placed in the mastoid and the whole wound left widely open and stuffed with gauze.

November 25th. The operation has produced no amelioration in the patient's condition. During the night he was very restless, and morphine was necessary to quiet him. After the operation the temperature rose to 105° and the pulse to 150, and he died very suddenly at 8 A.M. this morning, ceasing to breathe without any warning. It was noticed at 3 A.M. that when the face was contracted in a spasm of pain only the right side moved, also that he used the right arm much more than the left, although the power of movement was not lost in the latter.

Necropsy (twelve hours after death).—The abdominal and thoracic contents were healthy, except that the right side of the heart was over-distended with clot. On removing the dura mater the convolutions were seen to be much flattened, and the veins in the pia mater, except posteriorly, empty, and this was especially noticeable over the cortex of the right parietal lobe, which was quite white. There was no meningitis on the vertex. On removing the brain yellow lymph was seen to thickly coat its base and to pass up anteriorly along the commencement of the Sylvian fissure. It also covered the interpeduncular space, together with the pons, bulb, and adjacent parts of the under surface of the cerebellum. The cortex was adherent to the dura round the trephine opening and to the tegmen tympani, where the membrane was thickened and converted into a granulation tissue overgrowth. As the temporo-sphenoidal lobe was being detached a little watery pus escaped from its interior. In the roof of the attic and antral-attic junction were three small perforations in the bone, the largest an eighth of an inch in diameter, and it was evidently through these that the infective process had spread to the temporo-sphenoidal lobe. Around them the bone was in a condition of rarefying osteitis. The attic, antrum, and tympanum contained foul granulation tissue, and the surfaces of the bone were much inflamed. The stapes was present, but the remainder of the ossicles were only represented by the head of the malleus and adjacent portion of the incus. The lateral sinus was quite healthy, but the lateral sulcus in the immediate neighbourhood of the antrum presented a boss of porous bone half an inch across and an eighth of an inch in thickness, evidently a protective new deposit, and explaining the fact that the lateral sinus never got infected notwithstanding fifteen years of middle ear suppuration.

After hardening the brain in spirit the abscess cavity was found to occupy the posterior part of the temporo-sphenoidal lobe, and to measure 2 inches in length from above downwards and outwards, and 1 inch from side to side. The walls were collapsed, and their surfaces sloughy. In vertical sections of the brain the immediate proximity of the inner wall of the abscess to the internal capsule was very clearly seen.

REFERENCE.

¹ See cases recorded by Acland and C. Ballance, *St. Thomas's Hospital Reports*, xxiii.

THE SERUMTHERAPY OF BLOOD POISONING: A PLEA FOR EXACTITUDE IN THE USE OF ANTISTREPTOCOCCUS SERUM.

By T. J. BOKENHAM, M.R.C.S., L.R.C.P.,
Late Research Scholar, British Medical Association.

It has often been thought by members of our profession that the ways of the worker in laboratories and of the family physician are but little likely to have much in common. This was certainly the general feeling at the time of my first initiation into hospital work, about fourteen years ago. The intervening years have, however, been crowded with events; our knowledge of the causation of infective disorders has ex-

ploded some of the pet theories of the old pathologists, and at the present time the skilled bacteriologist is applied to, not only to aid the clinician in determining the nature of an obscure or doubtful ailment, but also in many cases to furnish a remedy for the same. Specialism is looked at askance by many, but few will now be found to deny that the specialist in bacteriology has justified his existence. The small group of cases which I now report will serve well to illustrate how close should really be the relations between the treator of disease and the scientific investigator thereof, and how dependent the one is on the other:

CASE I. *Severe Erysipelas of the Head, successfully Treated with Anti-streptococcus Serum.* By ALFRED R. FRIEL, M.D., F.R.C.S.I. (Waterford).—The patient was a gentleman of good constitution and active habits, aged 61. On February 15th he presented erysipelatous inflammation of the nose and cheek. Was very restless, and suffering great pain. Temperature was 101° , pulse 116. The inflammation rapidly extended, and there was copious formation of bullæ. On the 17th the disease was well marked. There were headache, continued high temperature, and thirst. At 11.30 A.M., 10 c.cm. of antistreptococcus serum were injected under the skin of the abdomen. A similar amount was given at 5.30. These injections were repeated during the next two days. The patient's condition rapidly improved, the subsidence of the constitutional symptoms being especially marked. Pain disappeared, temperature and pulse returned to normal, and by the 21st he was practically convalescent. Mild aperients and small doses of morphine constituted the only additional treatment applied.

Note.—Some serum from one of the bullæ was collected by Dr. Friel, and sent to me in a sealed glass tube for examination. I made a plate culture therefrom, and within a very few hours was able to report that the specimen had yielded an absolutely pure culture of streptococci. The clinical diagnosis was therefore fully confirmed by laboratory observation. Both Dr. Friel, and Dr. Atkins who saw the case with him, were convinced that the rapid recovery was attributable to the prompt use of the serum.

The following two cases I am enabled to report by the kindness of Mr. Stephen Paget, in whose experience they occurred:

CASE II. *Lymphangitis from Inoculation from a Case of Septic Peritonitis: Rapid Recovery on the Fourth Day.*—S. P. wounded his finger while operating on a case of septic peritonitis following childbirth (the initial operation was performed as a last chance, and failed to save the patient's life). On that same evening the wounded finger began to throb, and next day, about twenty-four hours after the infection, there occurred a sharp rigor, and a temperature of 103° F. Within an hour of the rigor 20 c.cm. of antistreptococcus serum were injected; this was on a Sunday evening. Subsequent injections of 10 c.cm. each were given on the Tuesday, Wednesday, Thursday, and Friday following, so that the total amount injected was 60 c.cm. A year and a half before a somewhat similar infection of the same hand had occurred, leading to a slow and tedious supuration of the axillary glands; the whole mass of these glands had then been removed by Mr. Ballance. It seemed that a man suffering from a poisoned wound of the hand, and deprived of axillary glands, ran a very special risk of general infection, so that the case was one of exceptional interest. The subsequent history of the case was, however, as follows:—For three days the temperature ran high, rising on the third day to 104° F.; on the fourth day it fell to 99° . There was no swelling of the hand or arm nor any red streaks up the arm. About the second day diffuse patches of lymphangitis appeared over the deltoid and along the anterior fold of the axilla, with some swelling below the clavicle. On the fourth day the whole attack came suddenly to an end. The lymphangitis faded, desquamated, and slowly disappeared, the temperature fell to normal, and within a week from the commencement convalescence was well advanced. This is the fourth time that this patient has had a poisoned hand from a scratch during operation or during a post-mortem examination. In each previous attack supuration occurred and healing was slow. This time, however, although the source of infection was a most virulent one, though the onset of symptoms was very rapid, and though there were no axillary glands to arrest the poison and prevent its entrance into the general circulation, yet at the end of four days the whole trouble was ended. It is difficult to escape from the conclusion that this good result was due to the prompt use of the serum, which also seems to have prevented the occurrence of the headache and feeling of intense depression which form so prominent a feature in most cases of septic infection.

CASE III. *Lymphangitis from Mixed Infection: Death.*—A man, aged 32, was admitted to hospital under Mr. Paget on January 4th, 1897. Five days before admission a small pimple was noticed on the skin of his upper lip, which he poulticed. On January 2nd the lip began to swell, and next day a little blood and pus came from the sore spot. On the day before admission he had rigors, sweating, and headache. On admission the upper lip was greatly swollen, hard, and dusky, and showed one or two minute points of supuration. It was at once incised, but no defined abscess was found. On the 5th his general condition was worse, and he complained of pain in the right side and back. Two injections of serum were given (10 c.cm. each time), and at midnight three more incisions were made, but no pus was found. On January 6th three more injections were given (10 c.cm. each), and on this day he seemed on the whole better. But on January 7th he was in every way worse—delirium, restlessness, hard infiltrating swelling over the whole side of the face, oedema of the neck. In the afternoon 10 c.cm. more serum were injected, and in the evening the lip and cheek were very freely incised, a little pus escaping from one of the incisions. Next day, January 8th, he was much worse; two injections of serum were given, one of 22 c.cm. and the other of 20 c.cm., but in the evening he began to sink. At midnight he was unconscious, bathed in sweat, pulse imperceptible, respirations 50, temperature 105.4° ; and half an hour later he died.

A bacteriological examination of the blood of this patient

during life indicated the case as one of mixed infection, for the streptococcus was not the only microbe present.

The prognosis in cases of this class is always much worse than in cases of simple infection, so that the failure of the serum to effect a marked improvement cannot fairly be used as an argument against its efficacy in other instances where the infective agent is a streptococcus unassociated with other microbes.

CASE IV. Infection by Staphylococci.—This may be described in a few words as one of long-standing purulent otitis associated with granulo-matous growths in the ears and with recent obscure mediastinal symptoms. The patient was a boy of 9 years, and injections of serum had been made, but without very definite result, with the idea that the infective agent was a streptococcus. Fortunately I was able to obtain a sample of the exudation, and to satisfy myself that staphylococci, not streptococci, were present therein. I therefore advised that treatment with antistreptococcus serum was but little likely to prove satisfactory.

REMARKS.

The above small group of cases must be of considerable interest at the present time, when the serumtherapy of septic infection is on its trial. It is objected by some that our knowledge of the efficacy of antistreptococcus serum and its mode of action is not yet sufficiently definite. Its possible, or even probable, value is not denied, but it is suggested that a far more extended series of observations thereon in the laboratory ought to be made, and its protective powers in artificial infection more amply proved, before the use of antistreptococcus serum is carried into the domain of practical therapeutics. I hold, however, that at the present time, when the resources of bacteriology are at the disposal of all, and when it is perfectly simple for a practitioner in any part of the country to have the co-operation of a skilled bacteriologist in determining the nature of a doubtful case, the argument against using antistreptococcus serum falls through, especially as the classical treatment of septicæmia is so eminently unsatisfactory. Laboratory experiments have already shown the serum to be harmless; they have also afforded much presumptive evidence in favour of the treatment. Serumtherapy in no way prevents the application of any other treatment desired, nor does it cause inconvenience to the patient. I am therefore unable to appreciate the scruples of a practitioner who hesitates to apply it to a patient suffering from septic infection, on the ground that laboratory observations are neither uniformly favourable nor sufficiently numerous to enable one to say definitely that serumtherapy is beyond all question the treatment for such a condition.

In each case of an infective disorder a doctor has to face a problem more complex than, but in its main points identical with, that which presents itself to his *confrère* engaged in investigating the same infective disease in the laboratory. In the case of septic infection accurate diagnosis is within the reach of all, thanks to modern developments of bacteriology. Having once ascertained that a given train of symptoms is associated with the presence of a streptococcus, and probably due thereto, no injustice can possibly be done to the patient by applying, among other things, a remedy which is certainly harmless and possibly efficacious. Experiments on animals are inconclusive; indiscriminate experiments on patients are unjustifiable. To exhibit to a patient, the nature of whose ailment has been proved by the combined observations of clinician and bacteriologist, a substance admittedly innocuous and possibly beneficial, is, in my opinion, a perfectly justifiable action; it may be called a justifiable experiment on the human subject, provided always that the clinical and bacteriological diagnosis have both been made. It is only the indiscriminate application of serumtherapy to any and every doubtful case that must be condemned.

In a previous note I have briefly indicated the method adopted by myself in preparing the antistreptococcus serum issued under my signature, and supplied to the profession by Messrs. Burroughs, Wellcome, and Co. I have also described its general characters, and the method of ascertaining its efficacy. Since that time I have found it advantageous to adopt slight modifications of the original methods employed, and to use the horse in preference to the ass as a yielder of serum. A full description of the technique of immunisation will form the subject of a future communication. I will only now repeat that this serum is obtained from animals which have been rendered resistant—either by repeated injections of living

streptococci, of the germ-free filtered broth in which streptococci have grown, or by combinations of these means—to enormous quantities of streptococci of great virulence. Evidence as to activity of the serum is sought by observing its power to protect an animal previously inoculated with a known fatal dose of streptococci. Unless further investigation should place at our disposal a specific streptococcus toxin comparable with that produced by the diphtheria bacillus, I fear it will be difficult to apply a test of greater accuracy.

I have advocated the employment of scientific methods for confirming clinical diagnoses in cases of apparent septic infection. One of the cases already quoted illustrates the injustice which may be done to serumtherapy if this precaution be neglected. The plan I would recommend for the collection and transmission to a bacteriologist of material for examination is as follows; it may be carried out by anyone possessing a supply of capillary glass tubes such as are used for collecting vaccine lymph:

Thoroughly cleanse the skin over the suspected area, and wash with an antiseptic lotion; sterilise a capillary tube by passing it through the flame of a spirit lamp or gas burner, taking care not to fuse up the open ends; if there be bullæ or free discharge the sterilised tube may now be filled either with the discharge or with the liquid of the bullæ. Otherwise a sufficient quantity of liquid may be obtained by pricking the skin with a needle or sterilised lancet so as to allow a drop or two of blood or lymph to escape. Finally, the ends of the tube should be sealed in the flame. The tube should then be packed in wool, placed in a protecting envelope, and sent to the laboratory for examination. In most cases I find it possible to wire the result of examination within twenty-four hours of receiving a specimen, so that the delay is very slight, and the practitioner is enabled to decide whether to continue serum treatment (if he has commenced it) or to apply it, if he has not already done so.

Finally, I would repeat that serotherapy in streptococcus infection is still on its trial; that absolute evidence for or against its value can only be afforded by cases the nature of which has been accurately demonstrated; that this proof presents no great difficulties, and is readily obtainable even by those unversed in modern methods of research.

TWO CASES OF ACUTE LOBAR PNEUMONIA TREATED WITH ANTIPNEUMOCOCCAL SERUM.

By ARTHUR COOKE, *M.B. Oxon.,
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By the kindness of Dr. Washbourn we were enabled to make a trial of his antipneumococcal serum, an account of which he has already published in the BRITISH MEDICAL JOURNAL of February 27th, 1897. At his desire these cases are reported independently.

CASE I.—A. B., aged 36, a trained nurse, was admitted to the London Hospital under the care of Dr. Percy Kidd on November 16th, 1896. Her family history was good. She usually enjoyed good health, but had enteric fever seven years previously, and an ovarian tumour was removed eighteen months before admission. The present illness began on November 12th, 1896, when she first shivered and felt ill. She did not, however, take to her bed until November 15th, when her temperature was 103°. Up till November 5th she had nursed a patient, who died of pneumonia on that day.

On November 16th, when admitted to the hospital, there was flushed face, hot dry pungent skin, temperature 106°, respirations 32 per minute, not laboured; pulse 100, with full regular forcible beat. No cough was noticed, although she complained of a dry cough before admission. There was no herpes. On examining the chest no dullness on percussion was noted; a few very fine crepitant *râles* were heard during inspiration at the base of the right lung. Five hours later there was slight dullness on percussion at the right base; the crepitant *râles* had increased in distribution, and were well marked from the base of the right lung up to the fourth rib posteriorly on the right side. The expiratory breath sound was prolonged at the angle of the scapula. The heart was normal. The abdomen was of medium size, supple, and free from tenderness. The spleen was felt below the costal margin. No abnormality of other organs.

On November 17th the physical signs in the right lung were rather more marked, the breath sounds being faintly tubular at the angle of the right scapula. The general condition of the patient was much the same as on the preceding day. The diagnosis of acute lobar pneumonia was made. At 5 P.M. 56r units (17 c.cm.) of Dr. Washbourn's antipneumococcal serum were injected under the skin of the flank.

On November 18th the general condition of the patient was not much