among thirty-one men, a carrier rate of 13 per cent. In the fifth case twenty-nine contacts showed five carriers, and with the positive cases gives 20 per cent. carrier rate, all Type 1.

Treatment.

As soon as a likely case of meningitis was seen a lumbar puncture was made, and if the fluid was turbid and middle-ear disease excluded, pooled serum equal to two-thirds of the volume of cerebro-spinal fluid withdrawn was given intrathecally. The serum was given at body temperature and allowed to run in by gravitation, thus ensuring a slow and even flow. Generally 60 to 70 c.cm. of turbid fluid was withdrawn, and 40 to 50 c.cm. of pooled serum allowed to run in.

The fluid was at once examined for diplococci, and plated on at least four tryptic agar plates. By next morning there was always sufficient growth to enable one to determine the type. It is a matter of urgent importance to determine the type with the least possible delay in the manner described above. Agglutination is more rapid at 55° C. than at 37° C.; Tulloch has shown that this is due to the more rapid convection currents. Browning¹ in his work on the agglutination of the enterica group, points out that agglutination can be hastened by alternate heating and cooling. After the rack has been in the incubator at 55° C. it should be removed and left at room temperature for ten minutes and then returned. He shows that agglutination will sometimes occur suddenly in the cold. This principle applies to the meningococcus. A long narrow tube which exposes a greater surface to variations of temperature gives more rapid convection currents.

I always set up my agglutinations in a Wassermann tray. I use a hot-air incubator at 55° C. and remove the tray at the end of thirty minutes, allow it to stand for five minutes in the cold, and then return it. I can generally see agglutination beginning in three hours, and it is thus quite possible to give the patient his own type serum on the second day. I see the patient on the morning of the second day, and if he does not seem too distressed I wait for the type, and do the second lumbar puncture on the afternoon of the second day.

In the eight recoveries this procedure was adopted. Five of the cases were Type 1. One required fourteen injections of Type 1 serum before he finally recovered. A second required four injections; and the three others had each three injections of monotypical serum.

The first patient, who required fourteen injections, had to all appearance recovered after two monotypical injections, but relapsed three days later; he finally recovered with the use of serum and an autogenous vaccine. The injections were given daily, and every Type 1 case made a long stride towards recovery after the first injection of monotypical serum. Two cases of Type 2 were punctured morning and evening, one for three days and the other for five days. A monograph issued by Major Hine, of the Central Cerebro-spinal Fever Laboratory, pointed out that Type 2 serum was not so rich in anti-endotoxin as Type 1 serum, and he suggested puncture twice a day, a procedure which was followed here with excellent result.

The only case of Type 3 was the boy of 11 years. He had been ill for five days before he was seen. He only showed any change after the type was determined, and he was given Type 3 serum. He recovered after four injections. He was the only case to show any permanent defect as a result of the disease. He was deaf, and this nerve deafness was probably present before treatment was begun. As above mentioned, the one case that relapsed was also treated with an autogenous vaccine. If a vaccine is to be of any use it must be combined with lumbar puncture. In the ordinary case the intracerebral pressure is high, and until this pressure is reduced by puncture no antibodies can reach the seat of infection. The use of vaccine does raise the resistance, and combined with lumbar puncture the immunizing response can be carried to the centres of infection.

Since this paper was prepared for publication a thirteenth case came to my notice. The patient, a girl aged 14 years, was treated by Dr. W. F. Corfield, Medical Officer of Health, Colchester, at Myland Infectious Hospital. I ascertained that the infection was Type 3; she recovered after four daily injections of Type 3 serum. This case was complicated by unilateral iridocyclitis, no doubt of meningococcal origin. She had been ill for four days before admission, and the right iris was then seen to be fixed in semi-dilatation; the cornea was dull, and there was pericorneal injection. The eye was treated energetically with atropin ointment and hot fomentations; undoubted optic neuritis is present, and there is some injection which is regressive; the patient can see and count fingers. It

seemed at one time that panophthalmitis would develop. This complication is not uncommon,² and is stated to have been present in 3 to 6 per cent. in a Paris epidemic. It is worthy of note that the only two cases to have after-effects belonged to Type 3; I would not attribute any special virulence to Type 3, but believe that the complications were due to the cases coming under treatment late. In this connexion the constant warning of military medical officers to be on guard for any possible case of meningitis allowed of an early diagnosis. The boy of 11 years with deafness first received treatment on the fifth day of his illness, and this last case on the fourth day.

Summary.

1. Early treatment affords every prospect of success.
2. Type 2 is the most virulent.
3. A deep confluent rash is of grave significance, and many extracellular diplococci mean a severe case.
4. To ascertain the type early, and then use monotypical serum, affords the best chance of recovery.
5. Of ten cases that had serum eight recovered.
6. No case that lived long enough for the type to be determined died.
7. Vaccine treatment may help in a relapse when improvement is slow.

Nine of the ten cases who had serum were treated at Myland Infectious Hospital, Colchester. To the staff there, for careful nursing, and to my laboratory assistant, Miss Carder, grateful thanks are due.

REFERENCES.

- ¹ Browning: *Applied Bacteriology*, pp. 26 and 27. ² Foster and Gaskell: *Cerebro-spinal Fever*, pp. 104 and 24.

THE ASSOCIATION OF LETHARGY WITH THE INFLUENZA BACILLUS.

BY

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In a paper published in the *BRITISH MEDICAL JOURNAL* for March 1st, 1919, I gave my reasons for considering that *B. influenzae* was the cause of influenza. They may be briefly recapitulated:

1. The bacillus can be isolated from the large majority of cases of influenza, 80 to 90 per cent.; between the epidemics from only an occasional case that must be considered a carrier.
2. A pure influenza antigen protects when used prophylactically. It is interesting to note the close correspondence of my figures using a pure antigen with Sir W. Leishman's figures for the army using a mixed antigen, approximately an 86 per cent. protection in both cases.
3. A pure influenza antigen rapidly aborts the disease in uncomplicated cases.
4. A pure influenza antigen during a reaction can produce transitory typical symptoms of the disease.
5. The serum of influenza patients agglutinates the influenza bacillus sometimes in a dilution as high as 1 in 1,000.

It is, in my opinion, a great pity that pure antigens are not being used for prophylactic purposes on a large scale. No conclusion can be come to by the use of mixed antigens.

If the connexion of influenza with the influenza bacillus is not generally accepted, still less is the connexion of it with encephalitis lethargica. This disease is vaguely thought to have some epidemiological connexion with the influenza epidemic. The following brief accounts of four patients treated with pure influenza antigen may encourage others to try the method and help to clear up the etiology of a dangerous condition.

CASE I.

A medical student had had for some days a temperature ranging from 100° to 102° before taking to his bed. He complained of seeing double. He became increasingly sleepy, was delirious, and had hallucinations; when spoken to he could be roused up, and talk fairly sensibly. His conjunctivae were congested; he was badly constipated, and passed urine under him. He had, in fact, symptoms suggestive of lethargic encephalitis. On the chance that the infection might be caused by the influenza bacillus (the case occurred during the epidemic) I gave him subcutaneously 2½ million pure influenza antigen. The improvement was marked at the end of twelve hours. Thirty-six hours later I gave him 5 million, and forty-eight hours later 7½ million. After this he had complete control of his functions and he was no longer lethargic, although his memory was still defective. He still had difficulty in reading, and his temperature was not quite normal—99° F. I then gave him 10 million in the morning, forty-eight hours after the last dose; that evening his lethargic symptoms returned in full

intensity, although there was no further rise in temperature. His mind did not become normal again for two days. He made a rapid convalescence, but could not read for any length of time or study for some months. The focal reaction after the last dose makes it, to my mind, certain that the influenza bacillus was infecting his brain.

CASE II.

An elderly gentleman when first seen by me had been ill for a week with lethargy and bronchopneumonia. *Micrococcus flavus*, streptococci, and influenza bacilli were isolated from his sputum. He was exceedingly ill. The temperature was 102°, the pulse 90 to 100. He was given at once a mixed antigen containing the above microbes pending the making of an auto-genous antigen. The first dose was 1½ million of each. There was a distinct improvement in twenty-four hours. Forty-eight hours after the first dose he was given 2½ million of each. The next dose of his own antigens contained the same amount, and was given at a similar interval. The doses were continued up to 20 million of each. All his symptoms and physical signs rapidly cleared up so that at the end of ten days he was convalescent. He had no recognizable reactions after any dose, and made an uninterrupted recovery.

CASE III.

A woman, aged 22, became ill on December 25th, 1919. She felt very exhausted and sleepy, and in her sleep talked continuously, was very restless, and had jerking movements of the limbs. She had been overworking, and had had two falls the week previously; she had had a previous nervous breakdown at the age of 16, when she suffered from undue sleepiness; for some time I thought her symptoms could be similarly accounted for. When awakened from sleep she roused with a start, and told me she was very well; after a few minutes her eyes became fixed, the eyelids closed, and she was asleep again, resuming the muttering and restless movements. She roused occasionally, and took food well. She was very constipated, but got out of bed to urinate. At first she used to get up to sit by the fire, but always went to sleep in her chair.

After a time, since the sleepiness was getting worse rather than better and her memory for my previous day's visit was a complete blank, I determined to give her a dose of 2½ million pure influenza antigen. It was given at 10.30 a.m. on January 13th. She was asleep within five minutes of getting it. Two hours after she woke up very excited, nervous, and shivering, and was given 10 grams of aspirin. The unpleasant symptoms passed off in an hour or two, and that evening she was much better, was able to talk rationally, and had no symptoms of lethargy. She slept much more normally that night and was much less restless in her sleep. When I saw her next morning she laughed and talked to me quite naturally. She improved steadily for some days, then began to get sleepy again and the other symptoms returned. On January 20th I gave her 2½ million, and she had the same symptoms as before but to a less extent, and next day was awake smiling and talking to me normally. Three days later, on January 23rd, I gave her 3½ million; she went to sleep after it, and remained lethargic that and the whole of the next day, being roused up to take food and then going to sleep again. Forty-eight hours after she was herself again. Since then she has been given 5 million on February 2nd and 5 million on February 13th; this dose was delayed by three rather severe attacks of palpitation and then an attack of colitis. On February 16th she was given 7½ million and on February 20th 10 million. On February 23rd she was quite convalescent. I shall continue her doses up to 20 million so as to leave a margin of safety. The temperature was normal throughout.

CASE IV.

This was a minor case. The patient, a bank clerk aged 20, had to leave her work early in December on account of feeling ill, having a severe headache and backache, feeling very drowsy and seeing double. When the acute symptoms had disappeared she went back to work, but could not do her work on account of not being able to focus. I saw her on December 22nd; she was then fairly well, with the exception of the diplopia and being very easily tired. I assumed from her history that she was a case of influenza. I gave her three doses of pure influenza antigen, namely, 5 million, 7½ million, and 10 million, at weekly intervals. She had marked general and focal reactions, beginning a few hours after the first two inoculations, becoming so drowsy that she had to go to bed, and slept without stirring. The diplopia was intensified the next day, but then gradually improved until the reaction after the second injection; she had much less reaction after the third, and then improved so rapidly that I found it unnecessary to continue treatment.

I have found that pure influenza antigen rapidly relieves other cases of post-influenzal debility.

No doubt those who do not believe in the specificity of antigen-therapy will question the diagnostic conclusions I have drawn from these cases, and also my belief in the specific therapeutic results obtained. I believe that such results can only be obtained with a specific antigen or antigens, and think the test is just as specific and significant as the subcutaneous tuberculin test.

APPENDICITIS WITHOUT PROTECTIVE STIFFENING OF THE ABDOMINAL WALL.

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PROTECTIVE contraction of the abdominal wall over the caecal region is a well known indication of appendicitis, but its importance is sometimes exaggerated. Twice recently it has been suggested to me that appendicitis could not exist because of the absence of this sign. The following case is to the point:

On January 24th a lady, aged 23, being apparently quite well, was seized with intense abdominal pain about 3 p.m. At 5 p.m. Dr. J. A. MacLaren found a round swelling in the appendix region. It was very tender, but the fingers could be pushed deeply into the tissues all round and close to it without causing pain or muscular resistance. The temperature was 102° F., the pulse 100. A dose of castor oil was given, and two days later all swelling, pain and fever had gone. On January 30th I detected only the slightest tenderness at one spot deep in the caecal region. There was no resistance to palpation.

At the age of 3 months and again at 12 years this patient had severe illnesses affecting the abdomen. Occasional stitches in the side and indigestion, characterized chiefly by breathlessness, had been increasingly troublesome within the last half-year. Stone in the ureter was excluded by x-ray examination, and appendicitis of old standing was diagnosed.

When the abdomen was opened, the appendix, except about half an inch at its base, was firmly adherent in a peritoneal pouch behind the caecum. It measured 4½ in. by ½ in. throughout its length, and it was of firm consistence, all its coats being thickened and its canal containing a little soft faeces. It was removed and recovery was uncomplicated.

There is little doubt that this patient had her first attack of appendicitis in childhood. The absence of protective contraction of the muscles was due to the position of the appendix and to the fact that a spreading peritonitis was prevented by the adhesions, which had long existed. In such circumstances the danger is not so great as when the appendix lies free amongst the coils of small intestine. But in this case it would have been a serious mistake to have delayed surgical treatment. The operation was not easy, and it would have been much more difficult and dangerous had it become necessary during an acute inflammatory attack.

A dose of castor oil is sometimes the best treatment for an appendicitis, always provided that an immediate operation can be arranged if this method is not successful, and that the rapid and apparently complete cure which may be effected does not mislead the medical adviser.

A NOTE ON ARTIFICIAL PNEUMOTHORAX,

WITH DESCRIPTION OF A NEW NEEDLE.

BY

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I HAVE been using for many months a pneumothorax needle which has, I believe, several important practical advantages. The ordinary Saugman's needle with which I began to work has an obvious defect. It has no provision for excluding communication with the external air when the stopcock is opened to admit the stylet. This is the more objectionable because the stylet is required just when such communication might be most dangerous, namely, when oscillations of the manometer are absent or imperfect. If the stylet has been successful in clearing the needle and establishing free oscillations, it will be practically impossible to prevent some air from being sucked into the pleura while the stylet is being withdrawn, before the stopcock can be closed, and that air will not be aseptic. Dr. Olive Riviere obviates this difficulty by tying a piece of sheet india-rubber over the open end of the instrument. I believe he uses this either with his own trocar and cannula in primary operations, or for an ordinary needle in doing "refills." I have secured the same object; I believe more effectually and simply, by attaching to the mount of the needle a little stuffing-box like that of a Potain's aspirator. But in Potain's instrument the stuffing-box simply plugs into the mount of the needle. This