not repeat them here. Dr. Buchner, as well as Dr. Greenfield, failed to cultivate *Bacillus anthracis* in hay infusion, as did the latter also in gelatine-water and several other fluids.

So far, then, Dr. Greenfield thinks he has succeeded in demonstrating that the virus of splenic fever (the *Bacillus anthracis*) is capable of modification in its physiological and pathogenetic properties by means of cultivation in certain indifferent fluids; and that, generation by generation, its power of producing disease becomes enfeebled, so that it acts less rapidly and with less certainty; that its morphological characters remain unaltered, although its power of growth is in no wise impaired. On the other hand, according to Dr. Buchner, it appears that the virulent property is not absolutely lost, but only held in abeyance; and that, when it is cultivated in another medium, its virulent properties may be restored. He also proves that the virulence may extend to a much longer succession of generations if a suitable medium is used; and that, when lost, it can be restored by cultivation in certain media. We ought also to bear in mind that, when any mild cultivation of anthrax produces death, however slowly, it will, by reinoculation in an animal, increase its virulence; and, if continued through a succession of animals, its original virulence will be restored.

Dr. Greenfield then alluded to the somewhat analogous results obtained by M. Pasteur with the so-called *fowl-cholera*, a disease which is very prevalent and fatal in some parts of France. It is a form of blood-poisoning attended by engorgement of the lymphatic glands of the neck and mediastinum, with a somnolent condition and other symptoms. It does not appear to spread by contagion from bird to bird, but by the excreta of diseased birds becoming mixed with the food, and inoculation takes place through the alimentary canal, usually in the mouth and pharynx. It is highly probable, says Dr. Greenfield, that this particular form is only one of a number of fatal diseases of this class amongst poultry; and he hopes, at some future time, to bring before us some evidence of another epidemic disease which occurs amongst fowls around London, and which appears to be due to a micro-organism of allied, although different, characters.

The organism of fowl-cholera was first discovered by M. Perroncito, of Turin, and was subsequently investigated by MM. Toussaint and Pasteur. M. Toussaint thinks that the disease is nothing more than a form of septicæmia, which may be produced at will, and which acquires special properties when communicated to fowls; for he can obtain exactly similar lesions and a similar micro-organism to those of fowl-cholera or septicæmia by injecting the blood from cases of septicæmia in other animals. M. Pasteur succeeded in cultivating the organism—which, he says, is a micrococcus, and not a bacillus—in neutral urine; and later, in a decoction of fowl's muscle, the latter being specially favourable to the maintenance of the virulence of the organism; and by special methods of cultivation he was able to modify—or, as he prefers to call it, attenuate—the potency of the virus. He found that, when the cultivations were made at short intervals, the effects produced were equally fatal; but if a period of three, four, five, or eight months were allowed to elapse between the successive generations, the effects were strikingly modified, *i. e.*, as the period between the generations was increased, so the effects became less certain and longer in being produced. M. Pasteur considers this modification to be due to the slow action of oxygen on the parasite; because, he says, if they are hermetically sealed, they retain their virulence for a long time; but if they are exposed to pure air, they gradually lose their virulence, and even become inert. But Dr. Greenfield does not consider this explanation conclusive; for he thinks that other conditions which are associated with the presence of oxygen ought also to be considered; and asks whether these results may not be due to vital phenomena, rather than to cosmical influences. He is inclined to attribute these modifications to conditions common to the whole cycle of plant-life, rather than to mere chemical action. Other facts seem to bear out this view; for whether the action of these pathogenic bacteria depend upon a virus excreted by them, or upon some direct influence exacted by them, all analogy warrants us in the belief that these are largely governed by the vital activity of the organism, and the soil and surroundings which are the conditions of its growth.

In conclusion, Dr. Greenfield pointed out that the above facts assist very materially in proving that the bacillus is the essential virus of anthrax, and the micrococcus that of fowl-cholera. He also exhibited various apparatus used for the cultivation of bacteria; and described the methods of use, and the modes of preservation suitable for these organisms and fluids supposed to contain them.

A CHILD, aged 2 years, residing at Pollockshaws, sucked the heads of a quantity of lucifer matches on Thursday last week. She was taken ill, had some medicine, and apparently got well; but, on Friday, she took ill again in the afternoon, and died soon afterwards.

A CASE OF EPILEPTIFORM NEURALGIA TREATED BY STRETCHING THE INFRA-ORBITAL NERVE: WITH REMARKS.

By W. J. WALSHAM, F.R.C.S.,

Demonstrator of Anatomy and of Operative Surgery at St. Bartholomew's Hospital; Surgeon to the Metropolitan Free Hospital and Royal Hospital for Diseases of the Chest.

A. B., a woman, aged 50, but looking ten years older, was admitted into the Metropolitan Free Hospital under my care on January 23rd, 1880, suffering from well-marked epileptiform neuralgia, chiefly confined to the infra-orbital branch of the fifth cranial nerve of the right side. Her family history was good. There was no hereditary tendency to nervous affections. She had been married twenty-six years, and had had nine healthy children, seven of whom were living. She had always had good health until ten years ago, when she first began to suffer attacks of pain in the parts corresponding to the distribution of the infra-orbital nerve. The attacks, which had never lasted more than a few seconds at a time, at first only occurred at distant intervals during the day, and did not prevent her performing her ordinary domestic duties; and occasionally she had intervals of complete cessation from the attacks for several months together. From year to year, however, they became more frequent, and the intervals of complete cessation from them shorter, till October 1867, when she was compelled, on account of their frequency and severity, to take to her bed, and there to remain for six months. During this time, she had six teeth extracted on the affected side, but obtained no relief. She somewhat improved during the summer, and was able to get about the house a little; but, in October 1878, she again took to her bed, and did not leave it until the following June, when she went into a general hospital. During these nine months, she only once got up for one afternoon, and then was so much worse for the exertion, that she did not again venture to do so until she was taken to the hospital. She remained as an in-patient for eight weeks, the attacks decreasing in frequency and severity under the influence of some medicine which, she said, deadened the pain and made her feel drowsy. The improvement lasted a short time after her discharge, but she subsequently had a relapse, and became as bad as before, her life being a misery to herself and her friends. On her admission into the Metropolitan Free Hospital, the attacks were occurring at frequent intervals, both day and night, and were excited on the slightest provocation, such as any mental emotion, swallowing solid food or hot or cold fluids, washing her face, or exposure to the least current of air. Slight pressure over the infra- or supra-orbital foramen, or on the gums, or pinching the cheek, lip, etc., was sufficient to bring one on. The attacks, which usually lasted for about half a minute, were limited to the right side of the face. They began in the upper lip in the labial branch of the fifth nerve, spread to the side of the nose, *i. e.*, to the nasal branches, and thence proceeded to the lower eyelid, *i. e.*, to the palpebral branches. There was also pain in the supratrochlear and supra-orbital branches of the ophthalmic, but this was of a subordinate character. During an attack, there was a slight twitching in the levator anguli oris, and the eye on the affected side became suffused with tears. The patient was emaciated and exhausted; the pulse was small and feeble, and intermitted every thirtieth beat. Dr. Champneys, who kindly examined the heart for me, reported it healthy.

On January 24th, she was ordered one-thousandth of a grain of aconitia (Hopkins and Williams') three times a-day. After three doses, the pulse intermitted every third beat, and the aconitia was consequently stopped. It produced no other noticeable symptom, nor did it relieve the pain. The same treatment, repeated a day or two afterwards, was followed by the same symptom, without any alleviation of the pain.

On February 3rd, I exposed the infra-orbital nerve just below the spot where it emerges from the bone, separated it from its companion artery, passed an aneurism-needle under it, and stretched both the proximal and the distal parts with considerable force. The wound was sponged out with carbolic acid lotion, the edges were brought into contact and secured with fine sutures, and then sealed with collodion. Immediately after the operation, the sensation of the parts supplied by the nerve was found to be nearly perfect, except that there was some slight numbness. The patient passed a good night. She had a few slight shooting pains, but no severe neuralgic attack.

From February 5th to 11th, she had a sharp attack of erysipelas of the face, head, and neck. After this, she progressed favourably with-

out any pain till the 21st, when she had another similar attack of erysipelas, during which she had two or three attacks of severe pain, each lasting about half an hour. This pain was continuous, did not occur in spasms, and had not the characters of her previous epileptiform seizures.

From this time, she convalesced favourably, without any pain whatever, and was discharged March 4th. When last heard of, five months after the operation, she had had no return of pain.

REMARKS.—The case offers another example of the hitherto intractable nature of epileptiform neuralgia. During the ten years the patient had suffered from it, she had tried almost every known remedy in the way of drugs (tincture of aconite, belladonna, strychnia, bromide of potassium, cannabis Indica, morphia, iron, iodide of potassium, croton-chloralhydrate, arsenic, and salicin). Galvanism had also been tried. She had not had aconitia; and, as this remedy is stated by Gubler (*London Medical Record*, 1877, page 150), in his hands, never to have failed, even in cases of long standing, I gave it a trial before resorting to stretching. Although administered in very small doses, it had such a marked effect upon the pulse, that I felt it would be unwise to continue it; and in this opinion I was supported by my colleague Dr. Champneys, who saw the patient with me. It certainly did not cause any alleviation of the pain. Acupuncture of the corresponding parts on the side opposite that on which the pain was felt—highly spoken of by Dumontpallier, Charcot, Westphal, and others—as I expected, did not have the least effect. In the performance of the operation, I followed the dictum laid down by Dr. T. Grainger Stewart, of making traction upon the distal as well as upon the proximal part of the nerve, by pulling the lip and cheek downwards, and at the same time holding the nerve at its point of emergence.

The question, perhaps, of most interest in this and in similar cases of nerve-stretching for neuralgia is, whether or not the pain will return. There seems to be a general impression among surgeons that it will return; and Baum, writing in 1878, suggests as a cause for the small number of cases then published, that the operation had probably not been generally successful. When we remember, however, that nerve-stretching was only performed for the first time in 1872, and that a new operation always takes time to find general favour with surgeons, it does not seem very surprising that so few cases should have been published. Since Vogt, in 1877, collected the then recorded cases of nerve-stretching, amounting to only fifteen, I have, from various sources, obtained notes of thirty-three more, making altogether forty-eight. Of these, twenty were for neuralgia of various forms, and three for neuralgia of the epileptiform variety. Many of these cases were published, as is unfortunately too frequently the practice, within a few days or weeks after the operation, and others at periods too short to furnish any reliable data as to the question of the return of the pain. In all, however, relief from pain was obtained, and in none of them had any return of pain been experienced at the date of publication. In Mr. Bartlett's case, the patient had been free from pain for eighteen months after the operation; in Mr. Callender's, fourteen; in Mr. Spence's, seven; in Dr. Stewart's, five; and in my own, nearly five.* The length of time, then, that has elapsed between the operations and the date of their publication, although hardly sufficient to enable us to say whether the cure will be permanent, encourages us to hope that it may be so. But, even should the relief be only temporary, the fact that the operation has procured a respite, varying from five to eighteen months in different cases, seems alone sufficient to give it the foremost place as a remedy for obstinate neuralgia.

Another point of considerable interest in the case of A. B. was the occurrence of attacks of pain during convalescence; and it is remarkable that, in several of the cases collected, a similar phenomenon was observed. The pain, however, did not recur in the parts supplied by the nerve that had been stretched, but in parts supplied by other nerves; or, when the stretching was confined to a single branch, in a different branch of the same nerve. Thus, in Dr. Masing's case, in which the sciatic nerve was stretched, the pain recurred in the parts supplied by the anterior crural and long saphenous. In Dr. Stewart's case, in which the infra-orbital branch of the fifth was the nerve operated on, it returned in the parts supplied by the mental branch; in Mr. Higgins's, in the infra-orbital; in my own, chiefly in the infra-orbital. In Mr. Spence's, the pain returned in the parts supplied by the same nerve. In five of these cases, when the secondarily affected nerve was stretched, the recurring pain ceased. Dr. Stewart suggests that, to avoid this return, all the branches of the affected nerve should be included in the operation, and not only the one in which the pain is chiefly localised. In my own case, I should have followed Dr. Stewart's

advice, and stretched the supra- as well as the infra-orbital at the same time, had I not been anxious to see whether the pain would recur in the other branches, and, if so, whether it would not subsequently cease of its own accord. I felt, moreover, that it could but add considerably to the discomfort of the patient, if not to what there might be of risk in the operation, to stretch both branches of the fifth at the same time, while I could but repeat the operation in the affected branch should the pain return and become permanent. As related in the history of the case, the pain did cease; and it seems equally possible that it might have done so in Mr. Higgins's and in Mr. Spence's cases, in which the second operation was performed on the sixth and fifth days respectively. It is true that, in Dr. Stewart's and Dr. Masing's cases, the recurrent pain had lasted some months, and it is quite possible that it would not have disappeared without a second operation. But, again, there is the fact that, in another case of Dr. Masing, in which the sciatic nerve was stretched for hyperæsthesia and muscular spasms, the hyperæsthesia, which reappeared, but in the course of other nerves, ceased spontaneously after some months' duration.

The beneficial effects which nerve-stretching undoubtedly exercises on neuralgia is somewhat difficult to account for—especially when, as in tic and sciatica, the cause of the neuralgia is involved in obscurity. The benefit derived from stretching in painful stumps, and in other instances where the nerves are apparently involved in cicatrices, etc.—although even here the explanations that have been offered are not altogether satisfactory—is more easy of explanation. In the case of neuralgia of obscure origin, the evidence at present extant seems to point rather to the benefit depending upon some alteration in the irritability and nutrition of the nerve-trunk, or of its peripheral terminations, than to any primary effect which the stretching may induce in the nerve-centre, or in the conducting power of the nerve. For it has been shown, by experiment, that, “in the simple laying bare and stretching of a spinal nerve, the traction is not conveyed to the central organ”; but, conversely, “that the centripetal stretching of a nerve-stem is conveyed to its peripheral terminations, and may thus act on the parts which it supplies”. With regard to the cranial nerves, I have myself found that when, on the dead body, the infra-orbital nerve is exposed and stretched, no effect is produced on the trunk of the superior maxillary, where it leaves the skull at the foramen rotundum. It has been further shown, that “a nerve is only elastic and stretchable within certain limits, the limits of the normal elasticity only corresponding to the physiological limits of the motions of the human body; and, consequently, that the conducting power of the nerve cannot be altered within those limits, and the limits cannot be passed without rupture of the continuity of the nerve”. Now, as, in the majority of the cases, there has been no paralysis of the parts supplied by the nerve immediately after the stretching, it follows that in these cases the continuity of the nerve cannot have been broken; and hence, that the relief obtained does not depend upon a primary alteration in the conducting power of the nerve.

In the face of these considerations, it would seem that we must look for the cause of the relief obtained by nerve-stretching in some alteration in the irritability and nutrition of the nerve-trunk, or of its peripheral terminations. Such an explanation is suggested by Vogt, who believes that the irritability of the nerve is lessened by the separation of the sheath; and its nutrition, and consequently its function, materially modified by an alteration in the vascular supply, brought about by stretching the blood-vessels of the sheath. It has been further shown, by Valentine and others, that stretching reduces the reflex excitability of the peripheral terminations of the nerve.

This explanation of Vogt seems more probable than that of Mr. Callender: “That the stretching is of use by numbing the nerve for a short time through breaking the transit of the abnormal impressions conveyed along the fibres of the nerve, so that, in the interval thus gained, the centres may have resumed their natural control.” Against this, there is, moreover, the fact that the same effect is not permanently obtained by the complete division of a nerve, which should surely exercise—if mere breaking of the transit of the abnormal impressions were the reason—an effect as beneficial as, if not more so than, simple stretching; since, in the division of a nerve, the transit of such impressions will be completely cut off. As is well known, however, dividing, or even cutting, a piece out of a nerve has often no effect whatever on the pain, which, even though it may cease for a short time after the operation, will often rapidly return—in some cases even before the continuity of the nerve has been restored.

The benefit derived from nerve-stretching would seem to show that neuralgia of obscure origin depend rather upon a peripheral than upon a central cause. Dr. Anstie, among others, was strongly in favour of the view that all neuralgia have a central origin. He believed them to depend either on an atrophy, or tendency to atrophy,

* It is now several months since this paper was written, and as I have not again heard from the patient, although she promised to let me know if she had a relapse, I think I may conclude that he is still free from pains.

in the posterior or sensory roots of the painful nerve, or in the central grey matter, with which it comes into closest contact. But, as cessation of the pain is almost immediate when the nerve is stretched, and as it has been shown that the stretching of a nerve does not primarily influence the centre, it would appear that, at any rate in these cases, the neuralgia should be ascribed to change of function in the trunk, or in its periphery.

A morbid condition of the spleno-maxillary ganglion has been recently suggested as a cause for intractable facial neuralgia; and the ganglion has been several times removed with, it is said, good results. It is, however, not improbable that, as the superior maxillary nerve must be stretched in the operation, the benefit obtained depended on the stretching of the nerve, rather than on the removal of the ganglion.

THE IMMEDIATE CURE OF INGUINAL HERNIA BY A NEW INSTRUMENT.

By W. DUNNETT SPANTON, M.R.C.S.ENG.,

Surgeon to the North Staffordshire Infirmary.

(Continued from page 921.)

APPENDIX OF CASES.

CASE I. Right Oblique Inguinal Hernia.—W. H., aged 18, a farmer's son, living in Shropshire, working on the farm, was seen at Hanley on December 12th, 1877. He was a healthy muscular lad, had always enjoyed excellent health, but, for about a year, had been the subject of right oblique inguinal hernia. I saw him in consequence of strangulation of the hernia, caused by lifting some heavy baskets from a market-cart. After fomentations and a dose of opium, the hernia was reduced by taxis; and, keeping him quiet until December 5th (four days after), I performed the operation for radical cure, in the manner already described. The rupture was small, and the opening of the internal ring was small also. Ether was administered by Mr. W. A. Frost, who assisted me, and the operation was performed without any difficulty. He suffered no pain worth mentioning, and had no constitutional symptoms. No medicine of any kind was given until on the third day a dose of castor-oil; after which time, the bowels acted naturally. On the tenth day, the instrument was removed, both of the openings in the skin at that time discharging a little pus, and the scrotum and testis of the same side being swollen. There was a firm band of adhesion along the whole line of the inguinal canal. The wounds quickly healed under the application of terebene oil, and a hard thickened plug remained, **completely closing the hernial opening**, so that no impulse could be felt on coughing. He wore a truss for better security. I saw him about two months afterwards, when the adhesions remained quite firm. About six months afterwards, he felt so secure, that he gave up wearing the truss; and, during some violent exertion in the hay-field, there was a partial giving way of the adhesions, with a tendency to a return of the hernia. He has since that time worn a truss, and had no further trouble. In this case, I think I was rather too timid, and failed to take as secure a hold of the abdominal rings as I ought to have done; but, as a test-case, the result was so far a source of satisfaction to me, **inasmuch as it showed that the operation could be carried out without a symptom to cause any uneasiness.**

CASE II. Congenital Hernia in a Child.—T. B., aged 4 years, was healthy and strong, and had a right congenital rupture. On admission into the North Staffordshire Infirmary, on October 2nd, 1878, there was a large scrotal hernia of the size of a large duck's egg; and two fingers could be easily passed through the hernial opening. He had worn a truss for some time, but it was quite impossible to keep up the hernia, and it would even force down under the pressure of the fingers. On October 7th, 1878, chloroform being administered, I operated, some of my infirmary colleagues being present. In this case, there being no proper sac, the scrotal fascia and tunica vaginalis formed the invaginated plug; and it is noteworthy that, with the free communication with the general peritoneal cavity which existed, there was no sign whatever of peritoneal irritation. The child suffered from chloroform-sickness for some hours, but afterwards progressed most favourably. He made no complaint of pain except when disturbed, and no constitutional symptoms showed themselves. Considerable oedema of the scrotum followed; and, on October 13th (six days after operation), there was free suppuration from both the openings. The instrument was removed under chloroform. A hard thickened mass of tissue occupied the inguinal canal, and, on straining or coughing, no impulse could be felt. On the 18th, the wounds were quite healed, and the child was in perfect health. The opening was securely closed, and remains so.

CASE III. Right Oblique Inguinal Hernia.—A. S., a warehouseman,

aged 15, was admitted into the North Staffordshire Infirmary under my care on October 29th, 1878. Three weeks before admission, while lifting a weight, he first noticed the hernia. There was a small right inguinal hernia, which had never been strangulated. The general health was good. After the usual preparation, I operated under ether on November 9th. Considerable pain was complained of after the operation, which was at once relieved by loosening the bandage, and the administration of a hypodermic dose of morphia. He had no sickness. On November 12th, there was considerable oedema of the scrotum, and some purulent discharge from the wounds, especially the lower one. He slept well, and the general health remained good. On November 18th, he complained of some abdominal pain on the right side, with tenderness in the right inguinal and iliac regions. There was a slight erysipelatous blush in the same neighbourhood, with moderate discharge of pus. The temperature rose for the first time to 101.2° Fahr. After an enema, the bowels acted; the instrument was removed, and a warm-water pad applied, with immediate relief. From this date, the pain, swelling, and discharge gradually subsided, so that, nineteen days after operation, he was able to be shown to a meeting of the Staffordshire Branch of the British Medical Association. He left the hospital about a fortnight afterwards, when the occlusion of the inguinal canal was so complete, that no truss seemed to be needed. In this instance, much more irritation was set up than in either of the preceding ones. The result showed, however, that it was purely local; and this, of course, within certain limits, is likely to prove beneficial rather than injurious in its ultimate effects.

CASE IV. Left Inguinal Hernia.—Annie B., aged 9, living at Stoke, was admitted, under my care, into the infirmary on December 7th, 1878. She was a ruddy, healthy-looking, plump girl. Her mother stated that while playing, about a year previously, the hernia appeared. It was readily reduced on lying down, was about the size of a small hen's egg, and had never been strangulated. The hernial opening admitted one's finger easily. With the ordinary preparations, the operation was performed on January 1st, 1879, under chloroform, and with strict antiseptic precautions under carbolic spray. Carbolic gauze was used to protect the point of the instrument. The temperature never rose beyond 99° Fahr. There was an entire absence of sickness or other constitutional disturbance. On January 4th, the bowels acted naturally. On the 8th, the instrument was removed (the temperature rising on that day, affording us a good indication for doing so). There was some induration along the track of the screw, and a few drops of pus at each opening. On January 13th, the wound was again dressed under spray. There was very slight discharge; a firm cord was felt along the line of the inguinal canal. There was no tendency to any protrusion. On January 16th, the antiseptic dressings were left off. The wounds were quite healed, and firm. She was kept in bed a few days, and a pad and bandage applied. She left the hospital ten days afterwards, perfectly well, and not requiring a truss. She has continued sound up to the present time.

CASE V. Right Oblique Inguinal Hernia.—S. T., aged 11, a school-boy, was admitted into the infirmary, under the care of my colleague, Mr. Folker, on January 7th, 1879.* Six months before admission, the hernia was caused by a strain. The tumour was small, the internal ring easily admitting the point of the finger. On January 11th, the operation was performed under chloroform. On the 14th, there had been no complaint of pain; the discharge was slight, and the temperature and pulse normal. On the 17th, there was some oedema of the scrotum, and increased discharge, with slight pain. Castor-oil was ordered. On the 18th, the instrument was removed, some little difficulty being encountered in taking the gauze off the point. On the 26th, he was allowed to get up, with a pad and bandage applied. The inguinal opening was firmly closed by a hard band, and there was not the slightest impulse to be felt. On February 10th, he left the hospital cured. The boy came to the infirmary three weeks afterwards, to show a "lump" which had appeared where the hernia had been. This was found to be fluid—an artificial hydrocele of the cord, in fact—which was conclusive in showing, not only that the internal ring was closed, but the external opening effectually closed also. The fluid has since gradually become absorbed, and there exists now only a fibrous cord along the track of the inguinal canal.

CASE VI. Right Congenital Inguinal Hernia.—W. B., aged 3, was admitted, under the care of Mr. Folker, on April 1st, 1879. The internal ring easily admitted the index finger. The left ring was closed, and both testes had descended. Operation, having been delayed, in order to improve the child's general health, was performed on May 10th, under chloroform. The next day, the little fellow wanted to get

* For the notes of this and the following cases I am indebted to our house-surgeon, Mr. G. Russell, M.B.