Judging from the sugar reactions, the organism corresponds most closely with *Streptococcus faecalis*, except as regards raffinose, which is unaffected by *Streptococcus faecalis* as a rule. It grew easily on most media which had a somewhat alkaline reaction. On markedly acid medium I was unable to obtain a growth. It grew well both aerobically and anaerobically, but rather better in the presence of air.

According to Besson, some strains can only be isolated by growing the material anaerobically in the first instance, but once growth is established further subculture can be carried out in the presence of air. It is possible that failure to obtain a growth of the organism may be due to the fact that the observer omits to put up anaerobic as well as aerobic cultures of the material under investigation. This is a point of some importance in looking for the enterococcus.

As regards temperature, it was found to grow quite well as low as 18° C., and was found alive after eight weeks' incubation at this temperature. Growth at a low temperature and prolonged vitality are both considered by French writers to be characteristic of the enterococcus. Indeed, it is said to be capable of remaining alive for years in anaerobic fluid culture.

Agglutination reactions were not thoroughly investigated, but, while the patient's blood and that of inoculated animals caused definite agglutination in certain dilutions, there was an indication that normal blood serum was capable of agglutinating the enterococcus when the former was used in the undiluted condition.

Pathogenicity.

The organism was pathogenic to rabbits and mice, since all but one died about the fourteenth or sixteenth day, and from some of them the organism was recovered from the blood or other fluid.

Opinion appears to be divided on the question of pathogenicity, as very different results have been got by various men. The explanation probably is that the virulence varies in different strains, and the increased virulence of some may be due to a symbiosis with other more pathogenic agents such as *B. typhosus* or *B. paratyphosus*. The virulence probably becomes diminished after repeated subculture.

Several points about the enterococcus still remain to be cleared up. This ought not to be difficult in view of the frequency with which the organism is being found amongst the wounded. The organism is probably at most but a variant of the *Streptococcus faecalis* group.

REFERENCE.

¹ *Journal of Pathology and Bacteriology*, 1914, vol. xviii, p. 469.

DELAYED TETANUS IN CONNEXION WITH INJURIES TO BONE NOT PRESENTING OBVIOUS SIGNS OF SEPSIS.

BY

CAPTAIN M. FOSTER, M.D., F.R.C.P., R.A.M.C.(T.).

BETWEEN November 22nd, 1916, and January 8th, 1917, only three cases of tetanus occurred amongst the troops in the six and a half counties which comprise the administrative area of the Bedford district. In all these cases the incubation period was prolonged, all three had sustained gunshot wounds with fracture, and so far as could be ascertained a primary prophylactic dose of serum had been given in every instance.

CASE I.

Pte. A., Royal Sussex Regiment. Gunshot wound with fracture of right humerus on June 30th, 1916. Discharged from 1st Eastern Hospital, Cambridge, to convalescent home on October 6th, with good union and only a small sinus. This sinus subsequently closed. On November 12th he fell down in the street, and re-fractured the humerus. On November 20th he developed bronchopneumonia. He was readmitted to the Cambridge Hospital on November 21st. On November 22nd twitchings of the limbs were first noticed, followed by trismus. With intrathecal and intramuscular injections of antitetanic serum he completely recovered. A primary injection of antitetanic serum had apparently been given in France, but no subsequent injection in this country. In this case the period of incubation was 146 days.

CASE II.

Pte. B., Bedfordshire Regiment, sustained a gunshot wound with fracture of the left humerus on September 15th, 1916. While on leave at his own home from Bradford War Hospital on December 14th he fell on his arm, which became very painful. He was admitted to the 1st Eastern Hospital, Cambridge, on December 15th. There was then a good bony union, with a small sinus on the inner side of the arm with serous discharge. On December 30th he complained of twitchings and trismus was noticed. With intrathecal and intramuscular injections of antitetanic serum he completely recovered. Subsequent exploration revealed no sequestrum. The period of incubation was 106 days.

CASE III.

Pte. C., Canadians. Gunshot wound with fracture of right femur on October 8th, 1916. On admission to the Northamptonshire War Hospital, Duston, there was about three-quarters of an inch of shortening, with much callus about the seat of fracture. There was a small granulating wound over the great trochanter; no sinus. This wound had healed on December 14th. On January 3rd spasms began in the injured limb, and on January 6th these became general. With intrathecal and intramuscular injections of serum he completely recovered. Shortening of the injured limb increased, and signs of fracture appeared; a considerable quantity of pus was evacuated. One primary injection of serum had been given in France, but none subsequently, owing to the absence of any sign of sepsis. The period of incubation in this case was 86 days.

A survey of these cases illustrates the fact that tetanus can lie dormant for a long time in a wound not obviously septic. In two of these cases the direct injury of a fall would appear to have lighted up a quiescent focus. The injury, moreover, occurred at a time when the immunity conferred by the primary injection had presumably worn off. From a practical point of view, the conclusion to be drawn is, that in injuries of bone the absence of obvious sepsis in the wound affords no surety against the development of tetanus. Regarded in its bearing on the necessity for continued prophylactic injections, this fact points to equal consideration being given to the nature of the injury as to the degree of sepsis present in the wound. The aim of this communication is that repeated prophylactic injections should be given in all cases of gunshot wounds with fracture, irrespective of the amount of suppuration present in the wound.

SMALL-POX VACCINATION BY PUNCTURE.

BY

CAPTAIN H. W. HILL, M.D., D.P.H.,

DIRECTOR, INSTITUTE OF PUBLIC HEALTH, LONDON, CANADA.

YOUR issue of November 4th, 1916, p. 620, carries an account of a method of aseptic vaccination which is good, but we are using a method here in Military District No. 1, Canada, which is still better. It was introduced amongst the civilian population first in 1915,¹ and subsequently became the official military procedure in this district. The method is as follows:

1. The sleeve is rolled up.
2. Orderly 1 washes the arm with soap and water.
3. Orderly 2 washes the arm with rectified spirits.
4. Orderly 3 washes the arm with ether.
5. Orderly 4 breaks the capillary tube of glycerinated vaccine and sets the rubber bulb or other method of expelling contents, handing it to Orderly 5.
6. Orderly 5 expels the vaccine at three (or four) points on the arm, making a triangle (or square) having not less than 2 in. between the points.
7. Orderly 6 sterilizes an ordinary sewing needle and hands it to the medical officer.
8. The medical officer punctures the arm through the drops of vaccine. Six tiny punctures, drawing no blood, are made through each drop, each set of six occupying a space of not more than $\frac{1}{4}$ in. square. The needle is held almost parallel with the surface. Not over one-thousandth of an inch enters the epithelial layer. A peculiar little "snick" is felt as the needle point goes in.
9. Orderly 7 wipes off the vaccine.
10. The sleeve is pulled down.

Notes.

(a) The total time from pulling up the sleeve to pulling it down again need not exceed one minute.

(b) After the orderlies have had a little practice three men per minute can be vaccinated without haste or carelessness.

(c) No after-treatment whatever is required; none should be used; the only direction to the men is *leave it alone*.

The results are:

I. In those not previously successfully vaccinated (and who have not had small-pox) nothing is found for several

days; then develops a typical vaccinal lesion, consisting of one, two, three, or four firm pustules corresponding with the areas punctured. If left alone, without bandage or shield, etc., these remain firm and whole; then dry down into hard "buttons," which finally detach themselves, leaving a clean healed base, constituting a typical vaccine scar. If bandages, shields, etc., are used, the moisture from the perspiration, etc., thus retained, macerates the otherwise firm wall of the pustule, which then breaks, creating an ulcer open to infection.

II. In those who have been previously successfully vaccinated (or who have had small-pox), a raised red papule develops in a few hours; itches a little, sometimes develops a number of tiny vesicles over its surface, then dies down and disappears. This is the anaphylactic or accelerated reaction, indicating that immunity exists, sufficient to prevent typical vaccinal lesions.

III. Occasionally a mild reaction of this kind, instead of disappearing, develops into a typical vaccinal lesion, the anaphylactic papules developing into ordinary vaccine pustules instead of receding and drying up. These pustules then run the ordinary course described under II. Evidently here the immunity from the previous vaccination, while sufficient to give anaphylaxis, was not complete enough for protection.

IV. Very occasionally no reaction of any kind follows the puncture. Only in such cases need revaccination be done. The probable explanation in the few cases observed was improper technique or old vaccine.

Notes.

(a) Certain rare cases showed the anaphylactic reaction (II) although, according to the history given, they never had been successfully vaccinated and never had had small-pox. They showed history of "chicken-pox," however. We investigated two of these cases, communicating with the mother of each and securing from her a detailed account of the alleged attack of "chicken-pox." In one case it was quite evident from the mother's description that the attack was really small-pox; in the other, it was extremely probable that it was small-pox.

(b) The only "bad arms" out of many hundreds done that have come to my attention were constituted by slight inflammations about the bases of ulcers, due to prematurely knocking off the dried "buttons" after the vaccination process was quite complete, the buttons having become somewhat loosened but not ready for removal. It must be added, however, that some arms which had been bandaged despite instructions to the contrary flared up more than was necessary, and in a few instances the pustules opened.

For civilian practitioners, not able to employ eight or nine assistants to do the washing, etc., the technique, nevertheless, is so simple that no one vaccination operation need take over five minutes. Its great advantages in civil life are:

(c) Not even adolescent girls object to the punctures; there is no fainting, etc.

(d) There is no waiting, after the vaccination is done, for the vaccine to dry. The instant the puncturing is finished the surplus vaccine is wiped off and the sleeve pulled down.

(e) No bad arms, and no loss of time due to bad arms.

(f) In all open methods of vaccination (scraping, scarifying, cross-hatching, etc.) one obvious source of "bad arms" is infection of the open wound, during and after the removal of the epidermis, from the mouth spray of the vaccinator, his assistants, and the patients themselves, especially if there be a number of the latter, crowding the office and all talking at once, as often happens. In the puncture method no epidermis is removed; moreover, the process is so rapid, and the exposure of the arm so short, that this really serious source of infection in the older methods is almost completely eliminated.

REFERENCE.

¹ Canadian Medical Journal, March, 1916.

THE twenty-fifth meeting of the Italian Congress of Surgery, which is to be held this year at Bologna on March 4th, 5th, and 6th, under the presidency of Professor Durante, will practically be given up to war subjects. The programme consists of communications on wounds of bones and joints; of vessels, nerves, and spinal marrow; of the head; of the chest, and of the abdomen.

THE TREATMENT OF MALARIA AND MALARIAL COMA BY INTRAVENOUS INJECTION OF QUININE URETHANE.

BY

LIEUT. RICHEL AND WALTER B. GRIFFIN, F.R.C.S.,

SOUTH AFRICAN AMBULANCE, SOUTH OF FRANCE.

THE cases of malaria that reached this hospital from Salonica were of a severe type; in all anaemia, loss of weight, and exhaustion were marked; there were rigors in which the temperature reached 107.8°. Most of the men had received numerous intramuscular injections of quinine, some as many as ten or twelve, and all had been treated with quinine by the mouth. In the severe cases quinine by the mouth and intramuscularly had little effect in controlling the fever or the recurrence of rigors.

The type of case in which the patient passed into a state of coma in twenty-four hours was new to most of us. The men were usually markedly anaemic and wasted, but the temperature rarely exceeded 102°. Quite suddenly the patient would complain that he had difficulty in swallowing, rapidly followed by inability to speak, loss of power in the limbs, coma, and incontinence of urine and faeces. The pupils were dilated, reacting sluggishly to light, pulse feeble and quick, and respiration resembled the Cheyne Stokes characteristic. The spleen was enlarged and tender, knee-jerks diminished, Babinski's sign was absent, and there was no ankle clonus. Examination of the blood showed the presence of numerous gametes and schizontes.

These symptoms all came on within twenty-four hours, and it was for this type of case that intravenous injection of quinine urethane was first tried.

The injection was made with a fine needle mounted on an ordinary serum syringe of 15 c.cm. capacity, and the solution was made up as follows:

Chlorhydrate of quinine	...	...	0.40 c.cm.
Urethane	...	...	0.20 c.cm.
Distilled water	...	...	1 c.cm.

To this solution in the syringe was added 14 c.cm. of physiological serum well warmed. The skin was sterilized with tincture of iodine and alcohol and a bandage applied above the elbow to render the veins more prominent. When the needle enters the vein blood will flow back into the syringe, and this sign will prevent the solution being injected into the tissues. Remove the bandage and inject the solution very slowly; conscious patients noticed a bitter taste in the mouth, buzzing in the ears, and slight giddiness within a minute.

The results in cases of coma were remarkable. In five hours the patient became more conscious, and in periods varying from twelve to twenty-four hours he had recovered completely and all symptoms had disappeared.

For some cases one injection was sufficient, and for weeks after there was no further rise of temperature; other cases were given a second injection within twelve hours if the return to consciousness appeared slow.

In no case had the injection any ill effect; only one patient in a series of seventy cases had slight thrombosis of a vein for a few days. Within twelve hours of the injection Lieutenant Richet found evidence of disintegration in the gametes and schizontes, and it was difficult to find any after forty-eight hours.

Two cases of coma only proved fatal, both complicated by dysentery. Each case had two attacks of coma, recovering from the first after intravenous treatment, but relapsing three days later into a second, from which no effort could restore them. Intravenous injections of serum and adrenalin, oxygen by the mouth and subcutaneously, proved of no avail. All cases had been treated with quinine by the mouth and intramuscularly over long periods at Salonica, and we continued to give them fifteen grains daily by the mouth after intravenous injections. An attempt was made to treat all cases of malaria with continued high temperature and constant rigors with intravenous injections of quinine urethane, and the results were more than satisfactory. Practically every case yielded to this treatment, and the rapid improvement in the physical condition of the men was most marked.

Sometimes it was necessary to give two or three injections before the temperature remained normal and the gametes disappeared from the blood, and every endeavour was made to give the injection six hours before the rigors