Failure was attributed to the low blood levels of sulphamerazine, and it was decided to repeat the course, using sulphamerazine in place of sulphamezathine, since it allowed higher blood concentrations to be reached without excessive dosage. For various non-medical reasons nearly two months elapsed before starting the second course on Feb. 2, 1948.

Sulphamerazine, 2 g., was given orally at eight-hourly intervals for two doses, and subsequently 1 g. eight-hourly for seven days, to a total of 25 g. Penicillin, 400,000 units intramuscularly, was given concurrently three-hourly night and day, to a total of 24,000,000 units for the same time.

Assay of the blood for penicillin, tested three hours after an injection, yielded a concentration of 3.2 units of penicillin per 100 ml. of blood.

Assay of the blood for sulphamerazine, tested at eight hours after an oral dose—i.e., just before the next dose—yielded a concentration of 12 mg. of total sulphamerazine and 7 mg. of free sulphamerazine. Stools were cultured daily for fourteen days after cessation of the course, and all were negative for *Salm. typhi*. Stool examinations were continued for the next nine months; three daily specimens were pooled and examined each week, making a total of 117 stools cultured.

All cultures were negative for *Salm. typhi*, and it seems probable that the patient has been freed from the carrier state, though he will remain under observation for a further three months to complete a year's observation. It is noteworthy that his agglutination titre against a VI suspension of *Salm. typhi* had fallen from 1 in 20 to nil.

Discussion

The largest series of faecal carriers submitted to the synergistic action of penicillin and sulphathiazole consists of 17 cases reported by Fry *et al.* (1948); of these only three remained negative for long periods—two were still negative at 36 weeks and one at 48 weeks. Eight of their failed cases received a course identical with that successfully employed by Comerford *et al.* (1946) upon two cases. Such evidence suggests that the result of treatment is capricious and unpredictable.

Success in a single case has no particular significance, and it is published only because it may draw attention to the value of estimating blood levels during treatment. It is difficult to avoid the conclusion that blood sulpha levels in excess of 10 mg. per 100 ml. may be necessary to obtain the synergistic effect of penicillin. It is possible that the same therapeutic doses may give different blood levels in different individuals, and what seems an adequate oral dose may not create an adequate blood concentration. Sulphamerazine has the merit of giving high blood levels with moderate oral doses, and it has a minimum of unpleasant side-effects.

It is suggested that in any future series of cases treated by combined penicillin and sulpha drug the blood levels should be estimated during treatment to note what relation exists between blood concentration and successful treatment.

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Executive councils are included among the bodies on whom no development charge under the provisions of the Town and Country Planning Act, 1947, will be levied. They will make no claim against the £300,000,000 provided as compensation for loss of development rights, in Part VI of that Act. Any claim which has already been submitted to the Central Land Board should be withdrawn.

"MYANESIN" IN THE TREATMENT OF TETANUS

BY

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The use of myanesin in tetanus was reported by Belfrage (1947) in two cases. Two further cases are described below, and these may be of interest in that they throw some light on the production of haemoglobinuria, a complication which has been reported in about twenty cases after myanesin.

Pugh and Enderby (1947) observed three cases of haemoglobinuria. The first urine passed after injection was discoloured, but no haemoglobinuria was found after two days. A death from renal anoxia after use of myanesin was reported by Hewer and Woolmer (1947), but it was pointed out by Mallinson (1948) that there were reasons for considering that myanesin was not the cause of death. A number of other cases have been described, but all were symptomless and cleared up spontaneously.

Hunter and Waterfall (1948) found myanesin useful in the control of epileptiform fits, a finding which is slightly at variance with those of Berger and Bradley (1946) that myanesin in non-paralysing doses had a powerful effect on strychnine-poisoning by depressing the reflex excitability of the spinal cord, but that the relative lack of antagonism to leptazol showed the midbrain to be influenced only when large doses were given. They thought that as myanesin does not affect consciousness or cause prenarctic excitement it had no action on the cerebral cortex.

Davison (1948) suggested that the action was on the internuncial neurones in the spinal cord, because of the production of relaxation, apparently by reduction in muscle tone, without marked interference with respiration or voluntary movements. Berger and Bradley (1946) found that paralysis in animals was of longer duration in the hinder half than in the anterior portion.

Case 1

A farm labourer aged 40 suffering from tetanus was admitted to the Royal Victoria Infirmary on June 8, 1948. He had received a small splinter wound on the palm of the hand nine days before symptoms developed. A curious but probably entirely irrelevant fact was that he stated that his brother had died in childhood of "lockjaw." There was severe generalized muscular hypertonia, affecting particularly the gluteal muscles, abdominal muscles, and the muscles of respiration, and there was also very marked neck rigidity. The characteristic tetanic spasms occurred only half a dozen times. He was treated with sedatives, mainly intramuscular paraldehyde, but after about a fortnight his tolerance to these drugs had increased so much that they were practically valueless. Soon after admission, when the muscle tonus was very pronounced and was interfering greatly with respiration, he was given *d*-tubocurarine chloride ("tubarine") 7½ mg. intravenously and an equal dose intramuscularly. This abolished his muscle tonus but also paralysed all muscles of respiration. Artificial respiration was carried out with the Oxford insufflator for more than an hour. When subsequently he developed spasms these were treated with *d*-tubocurarine chloride, and artificial respiration was always necessary if sufficient was given to control the muscular movements. This was difficult, because the patient was edentulous and it was hard to secure effective inflation. On the fifth day after admission he developed a

cough, and two days later he had signs of patchy consolidation at both lung bases. These persisted for nine days. At a subsequent date myanesin in doses of 5 to 10 ml. was administered intravenously, with beneficial results. The abdominal and intercostal muscular rigidity disappeared for periods up to an hour after each injection, and respiration became much easier, but at no time did myanesin relax the rigidity of the posterior neck muscles or have much action upon the glutei. A total of 58 ml. of myanesin was given in 60 hours; haemoglobinuria was not seen.

In addition to the above treatment the patient was fed through a Ryle's tube, received penicillin to minimize the danger of respiratory infection, and was given massive doses of A.T.S. He recovered.

Case 2

A more serious case was admitted to the Royal Victoria Infirmary on June 18, 1948. The beneficial results obtained with myanesin in the previous case seemed to warrant its use, and in addition it was hoped to avert pulmonary complications by avoiding marked respiratory depression.

The patient, a man aged 58, had had an arthrodesis of the left knee performed four weeks previously, and was admitted about twenty-four hours after symptoms of tetanus made their appearance, the first being inability to insert his false teeth. An attempt to pass a nasal catheter failed on account of spasm of the pharyngeal muscles. He was given 200,000 units of A.T.S. Eight hours after admission the muscle spasms were recurring every two or three minutes; myanesin, 10 ml. intravenously, was given with considerable benefit, but a further 5 ml. became necessary thirty-five minutes later. A Ryle's tube was now passed with ease and glucose was given through it at hourly intervals. Penicillin was also given intramuscularly. An intravenous drip was set up containing 5% glucose in N/5 saline, to which myanesin was added in varying amounts as seemed to be dictated by the condition. It was found that the addition of more than 70 ml. of myanesin in 540 ml. of glucose-saline produced a white flocculent precipitate.

During 26½ hours the patient received 265 ml. of myanesin. The muscle spasms were completely controlled for considerable periods and the patient slept. At other times spasms occurred, but their severity was reduced. The continuation of these spasms in spite of the continuous intravenous myanesin drip necessitated the introduction of myanesin in quantities of 5-10 ml. from time to time; no sedatives were required. After 26½ hours haemoglobinuria occurred, the urine being deep red in colour. The intravenous drip was changed to glucose-saline without myanesin, and within a few minutes the muscle spasms became more frequent and more severe. Paraldehyde was administered intramuscularly, but failed to control the spasms, which increased in severity during the next two hours and terminated fatally.

The final spasm was extremely severe and caused marked cyanosis; *d*-tubocurarine chloride was given and artificial respiration undertaken with the Oxford insufflator, but without effect. At necropsy the naked-eye findings included the following:

1. The bladder contained about a quarter-pint (140 ml.) of urine, which was only slightly smoky in appearance; the colouring matter had decreased considerably in the two hours before death.
2. The kidneys were normal in appearance, colour, and consistency, and showed no abnormality on section. This is surprising in view of the softening which is likely to occur in the kidneys of patients dying from tetanus.
3. In spite of the haemolysing action of tetanus toxin and of post-mortem changes, little or no haemoglobin could be detected by the naked eye in serum removed at necropsy.
4. There were many severe haemorrhages into muscle, including particularly the left quadriceps femoris and the two psoas muscles.
5. The surgical wound in the left knee appeared healthy, but on bacteriological examination a growth of tetanus bacilli was obtained.

Discussion

The first case apparently had an incubation period of nine days, but there is some doubt about this because the site of infection was not definitely proved. It is very

probable that the infection occurred through the splinter wound of the hand, but it was noticeable that no local symptoms of tetanus were associated with it.

In the second case these local signs were fairly marked, spasms of the left leg being severe enough to produce considerable muscular haemorrhages.

It is a generally accepted statement in the textbooks that the toxin of tetanus acts upon the ventral horn cells of the spinal cord. If this be true, the efficacy of myanesin suggests here that its main action is upon the spinal cord, since there is reason to believe that in normal doses it does not act peripherally. Certainly, in the second case, to which such a large dose of myanesin was administered, there was no dulling of consciousness, although sleep did occur from fatigue.

The four-weeks incubation period in the second case was surprising in view of the severity of the illness. It is possible that the million units of penicillin which he had received after operation may have lengthened the incubation period without comparable mitigation of the attack. It may be remarked that, although penicillin destroys the bacillus of tetanus *in vitro*, it is unlikely to do so *in vivo*, because, the bacillus being anaerobic, it flourishes in areas cut off from blood supply and consequently inaccessible to penicillin. Various sources of infection have been considered: the grey wool with which the limb was packed before being put into plaster was "stoved" before use and was separated from the wound by complete sterile dressings and bandages; the sulphanilamide powder which was introduced into the wound was alleged to be sterile; and no other cases have occurred, which suggests that the catgut was not at fault. There remains the possibility that infection had occurred during a previous injury to the knee, of which many were sustained at football, and had lain dormant until activated by the interference with the blood supply which may have occurred following operation.

These cases, although one of them unfortunately ended fatally, indicate not only that myanesin acts efficiently in controlling the spasms of tetanus but also that its use in massive doses will bear further investigation. Tolerance did not develop, which was in marked contrast to the reaction of the first case to sedative drugs.

Haemoglobinuria occurred in the second case, but in the short space of two hours which the patient lived after the myanesin was discontinued the urine had become almost free from haemoglobin. This supports the view that the haemoglobinuria may be temporary and might perhaps be disregarded. The most important practical attribute of myanesin was its ability to control muscle spasms and to relax hypertonus without paralysing the muscles of respiration, so that artificial respiration was unnecessary.

Summary

The reported cases of haemoglobinuria after myanesin are mentioned. Death has probably never resulted from this complication.

The evidence concerning the site of action of myanesin is recapitulated, and its value in tetanus supports the belief that it acts on the spinal cord.

Two cases of tetanus are reported. The first patient was treated mainly by sedatives and *d*-tubocurarine chloride ("tubarine") and received 58 ml. of myanesin. He recovered and had no haemoglobinuria. He did, however, have signs of pulmonary consolidation. The second, a much more severe case, was treated solely with myanesin, which efficiently controlled the spasms until haemoglobinuria developed, after 265 ml. had been given in 26½ hours. The myanesin was then discontinued; sedatives were ineffective, and he died two hours later. During these two hours haemo-

globinuria almost disappeared, and the kidneys were normal to the naked eye and on section.

The entry point of the infection is discussed.

Further investigation of myanesin in the treatment of tetanus seems to be warranted.

We wish to acknowledge the courtesy and promptitude with which a large consignment of myanesin was dispatched to us by British Drug Houses, Ltd., in response to the urgent action of Mr. Foggan, the chief pharmacist.

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A "MINOR" INJURY OF THE TERMINAL PHALANX

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Terminal phalangeal injuries are often regarded with a great deal of indifference and, indeed, sometimes scorn. They are the Cinderella of hand injuries, and yet these injuries are amongst the commonest in casualty departments, causing as they do a varying amount of pain, discomfort, and unemployment to the patients.

The particular injury under review here is a common one, a crush injury to the terminal phalangeal area, usually caused by a heavy weight—e.g., an oxygen cylinder or metal bar falling on to the finger. The finger is caught by the object and crushed against the floor or a wall, the lesion produced being somewhat characteristic. There is always a degree of "dislocation" of the nail; the proximal end may be dislocated wholly or partially from the nail-bed, the cuticle usually being damaged with this uplift as well. The soft tissue is split, the amount of laceration varying a great deal; there is some oozing of blood; and the radiograph may show a fissure or an appreciable fracture of the terminal phalanx.

I would like to advocate here a procedure that has yielded good results even with the most badly crushed fingers, the essential feature being the removal and replacement of the nail.

Method

The hand is cleansed of any grit and oily material by a good soak and "scrub" in C.T.A.B. Procaine 2% is then injected by a fine needle lengthwise along the margins of the nail (Fig. 1). When the finger is anaesthetized the nail is lifted or cut clean off and placed in C.T.A.B. and then manicured and trimmed with scissors.

On examination of the nail-bed area the amount of laceration and dirt is often surprising. There is always free oozing of blood, and a fracture of the terminal phalanx may be clearly visible. If bleeding is severe the usual attempts to stop it—haemostats or topical thrombin—are made. After cleaning the area with C.T.A.B., suturing of soft tissue is carried out and the nail-bed is sprinkled with sulphanilamide or penicillin powder. The clean nail is then placed in its correct anatomical position and sutures of either horse-hair or silkworm-gut are passed through the

nail at about four points to anchor it to the finger (Fig. 2). The whole is then covered in "tulle gras," a firm dressing is put on, and a plaster shell is finally applied.

FIG. 1.—A schematic drawing of an injured phalanx. Sites of procaine injection (P). The nail is avulsed proximally, showing the nail-bed.

FIG. 2.—Nail replaced in correct position by four sutures.

An injection of A.T.S., A.G.G.S., and 250,000 units of penicillin is given. The dressing is removed a week later, when it will be found that the sutures can be removed without difficulty: the nail does not drop off, as might be expected, but stays on for a variable but appreciable time. There is usually a small haematoma under the nail, but the whole finger is pleasingly free from pain and infection. A powder dressing, with or without another plaster shell, is applied for another week. At the end of about three weeks the patient's finger is quite satisfactory and the cosmetic result good. A new nail will eventually form.

On the other hand, in cases in which the nail has been left dislocated proximally excessive granulation tissue constitutes a troublesome complication at the break, and often pus forms under the nail. Where the nail is avulsed and not replaced there is often oozing of blood for a few days, for which repeated dressings of the area may be necessary, and even after two weeks the finger may be very tender.

Recently a man received this type of injury when working in a dockyard. The finger had not been cleaned, but was placed straightway in a plaster cap with just a gauze dressing. When we saw him a month later, he having moved from the town where he sustained the injury, his finger was still in plaster, and on its removal the terminal phalanx was one mass of foul-smelling slough. It took many weeks to get anything like a satisfactory result for him.

The method outlined in detail for these injuries is a satisfactory one; it is simple to perform and can be carried out with a slight amount of material. It is well within the range of minor surgery work of general practice, and it can be performed with complete confidence on the practitioner's part.

A memorandum issued by the Department of Health for Scotland states that under the National Health Service hospital almoners should be released as far as possible from office duties and allowed to concentrate fully on the medical social work for which they have been specially trained. The duties of the almoner should properly include investigation and interviews to provide understanding of the social and personal background of the patient, and in particular to give the doctor information of this kind which is relevant to diagnosis and treatment; social action to minimize personal anxieties; helping the patient in his adjustment to home life, to resume employment, or to a continuing disability; and advising on the planning of facilities for patients. At present the supply of trained almoners is well below demand, and it is therefore particularly important that their services should be confined to these tasks for which they have special qualifications. The salary of an almoner holding the certificate of the Institute of Almoners is on a scale of £340—£390 per annum. Head almoners earn up to a maximum of £660.