of pus sucked out of the peritoneal cavity (Mr. J. C. Fitzherbert). On August 25 bowel sounds were heard, the intravenous drip which had run since operation was stopped, and fluids commenced by mouth. These were continued until August 28, when the patient vomited a few ounces of fluid. That day the pulse was 160 a minute, the blood pressure 82/60, the abdomen tightly distended and silent, and urine chlorides measured 1 g. per litre. Plasma chloride was 320 mg. per 100 ml. (as NaCl). This secondary dehydration soon improved with intravenous normal saline and Hartmann's solution, but on August 31 the abdomen remained distended and silent and gastric aspiration measured 5 pints (2.84 l.) in 24 hours. It was decided that a potassium deficiency must be present and 1.5 g. of potassium chloride was given intravenously in one pint (0.56 l.) of Hartmann's solution. That night diarrhoea commenced and continued over the next 10 days.

On September 1, serum potassium was 10.5 mg.%; serum chlorides, 445 mg.%; and alkali reserve, 71 vols. CO_2%. In the next two days 6 g. of potassium chloride was given intravenously and the abdomen became appreciably softer. On September 3 the serum potassium was 13 mg.%; serum chlorides, 480 mg.%; the gastric aspiration was small and was stopped, as was the intravenous therapy. Thereafter potassium citrate and bicarbonate, 1 g. of each, were given in a mixture twice daily. On September 5 the blood chemistry had returned to normal: serum potassium was 16.3 mg.%; serum chlorides, 549 mg.%; and alkali reserve, 49 vols. CO_2%. In spite of a suppurative parotitis and a large pelvic abscess, progress has been steady. The abdominal distension has subsided slowly, he is eating a solid diet, and has a single daily motion.

Comment.—(1) In this case, and in two others recently seen, there was an early return of bowel sounds. This encouraged early administration of oral fluids, which may have overtaxed bowel just beginning to move and been partly responsible for paralytic ileus. In this type of patient it is wise to continue intravenous or rectal fluids until the passage of flatus proves that the whole intestinal tract is active. (2) This boy vomited only a few ounces, yet on August 28 he was seriously salt deficient owing to the large volume of intestinal fluid lying in the dilated bowel and therefore lost to the circulation. (3) On August 31 it was permissible to assume that a potassium deficiency was present on the grounds that there had been no appreciable potassium intake for one week; that urine output—and therefore potassium excretion—had been well maintained, and that potassium had been lost in the large volumes of gastric aspiration. This deficiency was proved on the following day, and was confirmed by the persistence of hypochloraemia in spite of adequate saline infusions. (4) It is of interest that diarrhoea commenced a few hours after the start of potassium administration. In three other cases of severe paralytic ileus it was noted that flatus was passed shortly after the transfusion of 2 pints (1.13 l.) of stored blood. When one week old, stored blood contains about 100 mg. per 100 ml. of potassium, and therein may lie its value.

From the evidence presented both by Dr. Streeten and Mr. Ward-McQuaid and here, it is hard to avoid the conclusion that potassium lack has a real place in the causation of paralytic ileus. If, therefore, treatment can be started before appreciable deficiency is present, one may hope that prolonged ileus will be prevented. A patient on potassium-free parenteral fluids and gastric suction is losing 2–4 g. of potassium each day. For the first three post-operative days this loss does not appear to have a serious effect, but a continuation of this regime must lead to a cumulative deficiency. If the state of the bowel does not allow oral feeding after the third day, all further potassium loss should be carefully replaced subcutaneously or intravenously, always provided there is free urine secretion. 2–3 g. of potassium chloride should cover urinary losses, and a further 1 g. should be given for every litre of gastric aspiration, not more than 1.5 g. being given in a four-hour period. When, as here, the serum potassium is likely to be kept normal, it is important to have close biochemical control to detect overdosage. Provided the precautions mentioned are observed, this should not occur and then restoration of potassium loss is not a dangerous procedure. There is reason to hope that, with the other measures outlined, it will come to hold an established place in the prevention and early treatment of paralytic ileus.

I wish to thank Mr. W. P. Greenwood for permission to give details of this patient.—I am, etc.,

London, E.C.1. P. F. JONES.

SIR,—Dr. D. H. P. Streeten and Mr. J. N. Ward-McQuaid (September 13, p. 587) have given us a detailed account of the electrolyte changes in paralytic ileus. Despite their excellent studies, further work will be necessary before we can accept ileus as the cause and not the result of these changes. Some of their remarks about the local treatment of ileus are misleading. Surely it is incorrect to say that suction through a Ryle's tube plus oral fluids are in order? Ryle's tube was designed for the benefit of the clinical pathologist and is best left with him. The best type of nasal tube in use is the nine-hole Wangensteen or one of the similar makes.

Whatever the aetiology of paralytic ileus, the quickest and most certain method of treatment is by intestinal decompression using a long intestinal tube. To the average British surgeon, and to many of his American counterparts, a long tube means the so-called Miller–Abbott tube, a commercial product and not the one designed by Miller, Abbott, and Johnston. This tube is faulty in design, difficult to pass into the small intestine, and not efficient should one succeed in passing it. The inefficiency of the Miller–Abbott is responsible for most of the apathy regarding intestinal intubation. The Cantor, Harris, and Honor-Smathers tubes, though somewhat better, have not given good results in the hands of the average surgeon. The only long tubes which have given consistently good results are those designed by Wild and Grafton-Smith. Both have been very successfully used in Professor Owen H. Wangensteen's department at Minneapolis. Either can be easily and rapidly introduced into the duodenum. As intestinal contents are aspirated the bowel tone recovers and the tube is carried along to the next paralysed segment.

I have not seen an ileus persist for longer than three days, though intubation may be necessary for a day or two longer, when treated by a Wild or Grafton-Smith tube. Accordingly I feel that Dr. Streeten and Mr. Ward-McQuaid have been wrong in so lightly dismissing intestinal intubation, even if they were primarily interested in electrolyte changes.—I am, etc.,

Cork. T. J. NOONAN.

Admission of Poliomyelitis Cases to General Hospitals

SIR,—Mr. R. Scott Stevenson (September 13, p. 617), referring to my letter to you (September 6, p. 562), is mistaken if he thinks that the name of our hospital has been changed. In fact, it is now and has been the Western Hospital since the latter part of the last century. It appears in the regional board's list of hospitals as the Western Hospital.

During the last war the hospital, in addition to its infectious diseases unit, had 300 beds equipped for casualties, and it also admitted some 1,600 general medical cases. A 58-bed pulmonary tuberculosis unit has been in constant use during the past 10 years. There has never been an instance of infectious disease affecting any of these patients. Incidentally there have been many surgical operations, including E.N.T. procedures, on all classes of patients without harm. Nor should there be any risk in properly designed (wide spacing of blocks and free ventilation) hospitals, of which ours is an example.

Mr. Scott Stevenson may not be aware that there are many infectious diseases hospitals in this country which now house very successfully within their curtilage other specialties in addition to an infectious diseases unit. I quote one such example, the Brook, in Woolwich, which has thoracic and neurosurgical units in addition to others—for example, general medical wards.—I am, etc.,

Western Hospital, London, S.W.6. W. HOWLETT KELLEHER.

Dangers of Intrathecal Penicillin

SIR,—The letter by Drs. Vincent Edmunds and R. J. Porter (September 20, p. 668) encourages me to give a brief account of a case which I think bears out their contention than penicillin and not "myodil" is likely to have been the

toxic agent in the fatality recorded by your Medico-Legal Correspondent (August 30, p. 518).

The patient, a man of about 40, was admitted with meningitis following chronic suppurative otitis media. The cerebrospinal fluid was cloudy, and 500,000 units of crystalline penicillin was injected intrathecally by the house-physician. Hearing of this an hour later (and having heard of fatal convulsions following about 200,000 units of penicillin), I repeated the lumbar puncture, draining off all available C.S.F., some 15 ml. in all. Two hours later the patient had a very severe fit and lapsed into deep coma.

Two further fits occurred despite heavy sedation and the drainage of more C.S.F. to a total of about 100 ml. in all. The coma continued for 24 hours and then gradually consciousness returned. Finally, after exploration of the ear and systemic chemotherapy with sulphonamides, he recovered fully.

It is not certain how much penicillin reached the brain, as a considerable proportion must have been drained out at the second lumbar puncture; none the less he was desperately ill for 24 hours.

I am sure that the danger of even purified penicillin intrathecally needs to be more widely known.—I am, etc.,

Westgate, Kent. C. H. GOING.

Human Volunteers for Experiments

SIR,—In your leading article[1] on the work carried out at the American Cyanamid Company's laboratories by Koprowski, Jervis, and Norton on the production of immune responses in humans by oral feeding of a rodent-adapted strain of poliomyelitis virus, you say that the investigators "fed live virus by mouth to twenty human beings, who it is believed were infants." The investigators themselves refer[2] to the human beings as "volunteers," and this, to my mind, should rule out the possibility of the subjects having been infants. They add a footnote, however, to the effect that "for obvious reasons the age, sex, and physical status of each volunteer are not mentioned," so that the possibility that the subjects were infants cannot be excluded.

The age of the subjects may, I suspect, be of interest from the point of view of immunology, and in the present case it is certainly of ethical importance. Hitherto, while preserving due anonymity, it has proved possible to give adequate demographic descriptions of the volunteer subjects of an investigation, and the practice ought, I submit, to be continued.—I am, etc.,

London, N.W.10. RICHARD DOLL.

REFERENCES

1 *British Medical Journal* (1952). 2, 551.
2 Koprowski, H., Jervis, G. A., and Norton, T. W. (1952). *Amer. J. Hyg.*, 55, 108.

Streptomycin for Chronic Ambulant Tuberculous Patients

SIR,—Chemotherapy for the ambulant tuberculous patient is not a new concept, and isoniazid and P.A.S. offer even more attractive possibilities in this direction than does streptomycin. In my view, however, there is no justification for adopting this policy. In his report of a trial of 24 ambulant patients treated with streptomycin, Dr. Owen Clarke (September 20, p. 644) is not sufficiently precise in his description of the type of case selected; such terms as "widespread fibrotic disease" and "slight bronchiectatic condition" are vague. Moreover, we are not assured that alternative methods of treatment have proved unsuitable in groups B and C; and it is surely premature to relegate to the chronic class the patient with unilateral disease not controlled by artificial pneumothorax or pneumoperitoneum. It is therefore difficult properly to assess the results of this investigation.

The chronic cases familiar to all chest physicians are usually those who have derived maximum benefit from a period of treatment. They are, by definition, sputum-positive, and no further active measures are applicable. To reduce the degree of positivity of the sputum is itself a worthy public-health aim, but it is clear that this is limited by the emergence of resistant strains, especially when it is realized (1) that most of these cases have already received chemotherapy (Dr. Clarke offers us no information on this important point in his own series); (2) that it is recommended that the course of therapy be repeated if and when the sputum reverts to positive. Such repetition of streptomycin therapy after lengthy intervals is specifically stated to be a factor in the development of drug resistance.

It is agreed that the bacteriological standard is at least as important as the radiological one, but Dr. Clarke appears to be committing the same error as those he accuses of exaggerating the significance of *x*-ray appearances by overrating the significance of occasional negative sputa. The implication of his results is that these long-standing lesions are sterilized in a significant proportion of cases, and this is contrary to our experience even in minimal lesions.

The problem of the chronic case is rehabilitation and employability. I heartily endorse the writer's remarks about the tragedy of enforced idleness in these comparatively healthy individuals, but we have been defeated in our aim of sputum conversion when we classify a patient as a "good chronic." Chest physicians will continue to exercise restraint in the use of chemotherapy and, it is hoped, will adhere to the established principle that all cases of pulmonary tuberculosis requiring treatment really require rest. I await with interest the publication of a series of cases of minimal tuberculosis treated by ambulant chemotherapy.—I am, etc.,

Chesterfield. D. ROLAND LEWIS.

Sensitivity to Succinylcholine Chloride

SIR,—I am encouraged to record the following case by the fact that, among the numerous instances of sensitivity to succinylcholine chloride ("scoline") now reported, I cannot find one with similar features.

The patient, a female aged 46 and weighing 132 lb. (60 kg.), suffered from a large angioma of the right parietal region. Apart from pressure-effects of the tumour on the right abducent nerve and ophthalmic division of the trigeminal, and a blood pressure of 180/120, she appeared normal on clinical examination. On August 19 she underwent right vertebral arteriography; for this I administered 0.5 g. thiopentone, followed by 50 mg. succinylcholine chloride and intubation after spraying the cords with 10% cocaine. Normal respirations were resumed in less than three minutes and the course of anaesthesia with N_2O, O_2, and trichlorethylene was uneventful. Nine days later, on August 28, the same lady was to undergo left carotid arteriography followed by right common carotid ligation. Induction of general anaesthesia was carried out in exactly the same way as on the previous occasion, but 15 minutes after the injection of succinylcholine chloride respiration was still in abeyance. At this point I permitted the radiologist to commence his arteriography, but apnoea persisted for a further 14 minutes, or 29 minutes in all. The further course of anaesthesia was uneventful.

A sample of venous blood was withdrawn next day for plasma cholinesterase estimation. It exhibited activity equivalent to 5,000 microlitres CO_2/ml./hour. The normal range for the method employed is 4,000–6,000 units.

This case presents two unfamiliar features. The first is that the patient responded quite normally to her first dose of 50 mg. succinylcholine chloride and yet was apnoeic for 29 minutes after a similar dose administered nine days later. Succinylcholine chloride is frequently given repeatedly to the same patient in connexion with electroconvulsive therapy, and I have myself used it for that purpose on some 250 occasions and as often as 11 times in the same patient, but a sequence of events such as this does not appear previously to have been described. The effect cannot be ascribed to over-premedication, as the only drug used on each occasion was atropine 1/100 gr. (0.65 mg.). The description by Day[1] of a patient undergoing repeated electroplexies who was sensitive to succinylcholine chloride is of interest: in his case the duration of apnoea seemed to be related to the dose employed. The second unusual feature seen is the normal