It is difficult to estimate the magnitude of the economy in penicillin achieved by the addition of an antacid. The results show that, when no antacid is given, at least 6,000 units of penicillin per lb. of body weight must be administered to ensure a level of 0.06 unit per ml. or over at three hours in more than 90% of the children. When an antacid is given the minimal dose likely to have a similar effect, as it appears from the table, is 3,000 units per lb. of body weight. On this basis, the addition of an antacid would permit a reduction of approximately 50% in the dosage of penicillin.

It is generally advised that if penicillin is given orally the dose should be three to five (Poncher and Unna, 1950; György and Lee, 1947) or four to eight (Herrell, 1949) times larger than the parenteral dose. As the recommended single dose for parenteral use in mild and moderate infections is 500 units per lb. of body weight (or 4,000 units per lb. per 24 hours in eight doses) even an eightfold increase in dose is inadequate for oral use. When no antacid is given nothing short of 12 times the parenteral dose can be trusted to produce satisfactory blood levels in most children. This would mean that a 10-year-old child would need more than 3,000,000 units of penicillin a day, or more than 1,500,000 units if an antacid were given at the same time. Another disadvantage is the three-hourly administration. This method of giving penicillin must therefore be weighed against the parenteral injection of a slowly absorbed preparation such as procaine penicillin in 2% aluminium monostearate, which is effective if given once every 24 or 48 hours (Emery *et al.*, 1949).

Summary

Blood levels of penicillin after oral administration of the drug with and without an antacid have been estimated in 76 children, who were given 208 test doses.

To attain a reliable bacteriostatic level of 0.06 unit per ml. three hours after the ingestion the single dose of penicillin should be not smaller than 6,000 units per lb. of body weight—that is, 48,000 units per lb. of body weight in 24 hours.

Simultaneous administration of an antacid may allow a reduction of this dose by approximately 50%.

We would like to thank Mrs. E. L. Henderson, matron of Ash House Hospital School, and her nursing staff for their co-operation and assistance. The penicillin tablets were kindly supplied by Glaxo Laboratories Ltd., Greenford, Middlesex.

REFERENCES

- Buchanan, J. L. (1946). *Lancet*, 2, 560.
 Burke, F. G., Ross, S., and Strauss, C. (1945). *J. Amer. med. Ass.*, 128, 83.
 Charney, J., Alburn, H. E., and Bernhart, F. W. (1945). *Science*, 101, 251.
 Cohan, S. Q., Lewis, J. M., and Seligman, E. (1948). *Amer. J. Dis. Child.*, 75, 15.
 Emery, J. L., Rose, L. M., Stewart, S. M., and Wayne, E. J. (1949). *British Medical Journal*, 1, 1110.
 Fleming, A. (1943). *Lancet*, 2, 434.
 György, P., and Lee, H. F. (1947). *Advances in Pediatrics*, 2, 151. Interscience Publ., New York.
 ———, Vandergrift, H. N., Elias, W., Colio, L. G., Barry, F. M., and Pilcher, J. D. (1945). *J. Amer. med. Ass.*, 127, 639.
 Henderson, J. L., and McAdam, I. W. J. (1946). *Lancet*, 1, 922.
 Herrell, W. E. (1949). In Brennemann's *Practice of Pediatrics*, vol. 1, chapter 44. Prior, Hagerstown.
 Hildick-Smith, G., Scott, T. F., McNair, and Whitlock, C. M. (1950). *Pediatrics*, 5, 97.
 Hoffman, W. S., Hofer, J. W., and Gordon, H. (1948). *J. Pediatr.*, 32, 1.
 Husson, G. S. (1947). *Ibid.*, 31, 651.
 Moseley, J. H. (1948). *Arch. Dis. Childh.*, 23, 93.
 Poncher, H. G., and Unna, K. R. (1950). In Mitchell-Nelson's *Textbook of Pediatrics*, 5th ed. Saunders, Philadelphia.
 Reisman, H. A., Goldfarb, A. A., and Molloy, M. (1947). *Amer. J. Dis. Child.*, 74, 19.
 Tompsett, R., Timpanelli, A., Goldstein, O., and McDermott, W. (1949). *J. Amer. med. Ass.*, 139, 555.

INSTILLATION OF STREPTOMYCIN INTO THE PERICARDIAL SAC IN TUBERCULOUS PERICARDITIS

BY

R. P. K. COE, M.D., M.R.C.P.

Consulting Physician, West Middlesex Hospital; Late Medical Registrar, St. Helier Hospital, Carshalton

Several cases of tuberculous pericarditis treated with streptomycin by the intramuscular route have been reported in the literature. Reference is made in a report of the Medical Research Council (1950) to one case of tuberculous pericardial effusion in which streptomycin was injected into the pericardial sac, but no details or dosage were given. Tapie *et al.* (1950) also report the case of a man of 44 with chronic pulmonary tuberculosis who developed a pericardial effusion. They gave five injections of streptomycin, totalling 1.15 g., into the pericardial sac without obvious improvement.

The following case is recorded because it shows that streptomycin injected into the pericardial sac, in conjunction with streptomycin by the intramuscular route, constitutes a safe and rational form of treatment in tuberculous pericarditis with effusion, and that it may be beneficial, especially in cases characterized by rapid reaccumulation of fluid after paracentesis.

Case Report

A Post Office electrician aged 20, whose brother was suffering from a pleural effusion, was found to have enlarged hilar glands on mass radiography in September, 1948. He was asked to attend for further radiological examination, but did not do so. On January 8, 1949, he developed sub-sternal pain, malaise, fever, and vomiting, and two weeks later was admitted to hospital.

Examination on admission on January 22 revealed a well-built, pale, ill man, moderately dyspnoeic, and with a temperature of 103.2° F. (39.5° C.). There was pulsus paradoxus and moderate engorgement of the neck veins, the apex beat was just palpable in the fifth left space in the mid-clavicular line, and cardiac dullness extended from 1 in. (2.5 cm.) outside the right sternal border to the mid-axillary line. Pericardial friction was heard over a wide area of the praecordium. There was an area of dullness with bronchial breathing and increased vocal resonance over the left lower chest posteriorly near the midline. The blood pressure was 130/70.

Diagnostic pericardial paracentesis on January 26 yielded dark straw-coloured fluid which grew *Mycobacterium tuberculosis* on guinea-pig inoculation, but direct examination and Lowenstein culture were negative.

On January 30 he developed cardiac tamponade, and 32 oz. (907 ml.) of fluid was aspirated, with immediate relief of symptoms. Signs of tamponade returned, however, in 24 hours, and a further 22 oz. (624 ml.) was aspirated the following day. Within the next two months recurrent tamponade necessitated five further aspirations, and amounts varying from 14 to 32 oz. (397 to 907 ml.) were removed on each occasion.

Intramuscular streptomycin, 0.5 g. twice daily, was started on February 12, and, although this resulted in some lowering of the temperature, the pericardial effusion continued to accumulate at about the same rate as before. It was therefore decided to give streptomycin into the pericardial sac. On March 24 1 g. dissolved in 2 ml. of water was injected into the effusion. The procedure was repeated weekly for another five weeks. No adverse effects occurred and after the third injection there was a considerable drop in fever.

The fluid re-formed very slowly, only 6 oz. (170 ml.) being aspirated on two occasions after beginning treatment (see Chart).

On April 21 he developed a left-sided pleural effusion, which was aspirated several times. Intramuscular streptomycin was stopped on May 2 because of toxic symptoms.

On May 3 there were signs of superior mediastinal obstruction and a large mass of enlarged mediastinal glands was seen on radiological examination. Two weeks later ascites, oedema of the legs, and enlargement of the liver to 3 in.

definitely colicky in nature, doubling the patient up and preventing sleep. A small amount of yellow fluid was vomited two hours before admission, and the pain then continued as a dull central abdominal ache. There were no urinary symptoms. The bowels had been regular before the onset of the pain.

On examination the temperature was 101° F. (38.3° C.), pulse 140, and respirations 24. The abdomen showed generalized rigidity, maximum over the lower right rectus and right iliac fossa. Tenderness was present over the central part and right side of the abdomen, but there was no hyperaesthesia. Rebound tenderness was also present. There was dullness to percussion in both flanks, and shifting dullness could be demonstrated on moving the patient to one side or the other. Peristaltic sounds were present. There was no tenderness on rectal examination, but a smear of dark-red blood-stained faeces (benzidine ++++) was seen on the examining finger. The Hess capillary fragility test was negative, and bleeding and clotting times were normal. A tentative diagnosis of perforation of Meckel's diverticulum was made and operation arranged.

At operation, performed by Mr. F. J. Jauch, the peritoneal cavity was found to contain a large quantity of dark-red blood. Flecks of fibrin were adherent to the lower ileum, and a small Meckel diverticulum measuring 3 by 1 cm. was found arising from the antimesenteric border of the ileum about 18 in. (46 cm.) from the ileo-caecal valve. The diverticulum was adherent to the antimesenteric wall of the intestine for the whole of its length except for the tip, and was covered with flecks of fibrin. At its base there was a small punched-out lenticular perforation measuring $\frac{1}{4}$ in. (0.6 cm.) in diameter. The ileum distal to the lesion was slightly distended and the coat was bluish in colour. The appendix was normal. No other lesion was detected in the abdomen. The diverticulum was then excised, together with a diamond-shaped cuff of intestinal wall surrounding it. Free dark-red blood was present in the intestinal lumen. The gap was sutured transversely, the excess blood mopped away from the peritoneal cavity, and the abdominal wall closed in layers without drainage.

The patient made a satisfactory recovery from the operation, being allowed up on November 16. A barium meal examination carried out on December 1 showed no abnormality and no delay in the passage of the meal through the small intestine. When last seen, on January 6, 1949, the patient was in good health, eating well, and ready to go back to school.

Pathological Report.—Section shows typical gastric mucosa with numerous well-defined oxyntic cells. At the base of the diverticulum encroaching on both ileal and gastric mucosa there is a subacute type of peptic ulcer which has perforated.

COMMENT

This case is typical in many ways. It falls into the usual age group: 85% of the cases reviewed by Johnston and Renner (1934) were under 16. The perforation was preceded by haemorrhage—this is a common occurrence, 70 to 80% of such perforated ulcers having been associated with haemorrhage. The blood passed per rectum was said to be unmixed with mucus, and this was confirmed by rectal examination. Schullinger and Stout (1934) stress this point in the differential diagnosis from intussusception. The ulcer found at operation was marginal—this is the usual site of ulcer associated with Meckel's diverticulum—and there was an early attempt at walling off the process, a point stressed by Vaughan and Singer (1932).

Chart showing maximum daily temperatures, streptomycin therapy, and amounts of pericardial effusion aspirated.

(7.6 cm.) below the costal margin were present. All these manifestations were unaccompanied by any notable recurrence of fever or toxæmia, and they slowly subsided with rest in bed over the course of the next six months.

When last seen (May 6, 1950) the patient was extremely well and back at full work, and was able to walk five to six miles (8 to 9.7 km.) at a brisk pace without dyspnoea. Radiologically there was moderate enlargement of the cardiac shadow, with slightly diminished cardiac pulsation, and still some enlargement of the hilar glands on the right side. The blood sedimentation rate was 2 mm. per hour (Westergren, 200 mm.).

I wish to thank Dr. J. B. Harman for permission to publish this case.

REFERENCES

- Medical Research Council (1950). *Lancet*, **1**, 841.
Tapie, J., Laporte, J., Pinel, and Monnier (1950). *Pr. méd.*, **58**, 226.

Medical Memoranda

Perforated Peptic Ulcer of Meckel's Diverticulum

A case of Meckel's diverticulum containing gastric mucous membrane and presenting with perforation of an associated peptic ulcer is described. The salient features are discussed, with special reference to the occurrence of peptic ulceration in these cases.

CASE REPORT

A girl aged 7 was admitted to the children's ward of Grantham General Hospital at 1 p.m. on November 14, 1948. She had always been healthy until three days before admission, when she began to complain of diffuse vague abdominal pain. It was noted that the stool soon after the onset of the pain was dark red. On the day before admission two small stools of similar colour were again passed, and on that night the pain became more severe and was