contacts had no clinical or radiological evidence of disease. Two, a mother and son, developed active pulmonary tuberculosis and were treated apparently successfully with chemotherapy and discharged from the chest unit as cured years before their deaths.

Five cases of disseminated sclerosis over the years, though a fairly high percentage of my list, admittedly can prove nothing, but in my opinion they are suggestive of more than just coincidence. I think it likely that the vigorous immune reaction against a massive tubercular onslaught is directed against the lipoids of the tubercle bacillus and, having achieved its object, goes on to attack the myelin of the central nervous system, which has a similar chemical composition.—I am, etc.,

A. INGHAM

Darlington,
Co. Durham

Intravenous Glucagon

SIR,—We would like to comment on Dr. W. I. H. Shedden's letter (25 December, 1971, p. 815) concerning intravenous glucagon therapy.

Firstly, Dr. Shedden refers to experimental studies using glucagon in acute pancreatitis. "Experimental" means a procedure designed to elicit some fact previously unknown or to demonstrate a known principle, and this was not the object of the exercise. The hormone was given therapeutically because it is known that glucagon inhibits pancreatic exocrine secretion in man;¹ in addition it inhibits gastric secretion² and gastric and jejunal mortality,³ all features which are desirable to induce in patients with acute pancreatitis.

We now have results of 30 patients (10 classified as severe) with acute pancreatitis treated by intravenous glucagon at an initial dose of 1 mg intravenously and 1 to 1.5 mg four hourly for 24 to 96 hours—that is, a maximum dose of 9 mg/day. There were two deaths in the group, a mortality rate of less than 7%, in comparison to a mortality rate of 22 to 26% in most published series in Britain.^{4,5} Although further evaluation of glucagon therapy in acute pancreatitis is obviously required, in our limited experience the hormone may be of value especially if given in the early stages of the disorder.

Glucagon has also been given therapeutically by intravenous infusion in Paget's disease of bone (18 December 1971, p. 719). In this disorder glucagon given at a daily dose of 4 to 8 mg will, within days, result in relief of bone pain and rapid progression of biochemical abnormalities towards normal. The present indication for using the drug intravenously is severe bone pain, and the only alternative drug acting over a short period of time is mithramycin, a cytotoxic agent with serious side effects in man.

There is evidence that glucagon acts by both promoting bone uptake of calcium⁶ and by inhibiting bone resorption,^{7,8} so that logically the hormones may be useful in the treatment of patients with osteoporosis in the active stage, a disorder which may be complicated by severe skeletal deformities and loss of height. Since drug therapy in this condition is unsatisfactory glucagon might be indicated when the disorder is rapidly progressive.

In view of Dr. Shedden's findings we do

not wish to encourage the indiscriminate use of intravenous glucagon, but feel that under the circumstances outlined above its use is justifiable in our present state of knowledge. The side effects described by Dr. Shedden have not been described in man, but in dogs infused with 96 to 240 mg of glucagon a day, a considerably larger dose than induces a therapeutic response in man.

We would like to ask Dr. Shedden the following questions:

(1) Have serial lung biopsies been performed on the dogs given intravenous glucagon, and if so do the emboli resolve spontaneously when administration of the hormone is stopped?

(2) Is there any evidence of pulmonary emboli in dogs given less than 10 mg of glucagon intravenously per day?

(3) Do emboli occur if the large doses of glucagon given intravenously to dogs are given intramuscularly?

(4) Is 2 mg of glucagon given intravenously over a period of five minutes regarded as a safe procedure in investigation work?—We are, etc.,

JOHN R. CONDON

MICHAEL J. KNIGHT

JOHN DAY

St. George's Hospital,
London S.W.1

¹ Dyck, W. P., Texter, E. C., Lasater, J. M., and Hightower, N. C., *Gastroenterology*, 1970, **58**, 532.

² Dreiling, D. A., and Janowitz, H. D., *Gastroenterology*, 1959, **36**, 580.

³ Stunkard, A. J., Van Itallie, T. B., and Reis, B. B., *Proceedings of the Society for Experimental Biology and Medicine*, 1955, **89**, 258.

⁴ Efron, G., *British Journal of Surgery*, 1966, **53**, 702.

⁵ Trapnell, J. E., *Annals of Royal College of Surgeons of England*, 1966, **38**, 265.

⁶ Williams, G. A., Bowser, E. N., and Henderson, W. J., *Endocrinology*, 1969, **85**, 537.

⁷ Stern, P. H., and Bell, N. H., *Endocrinology*, 1970, **87**, 111.

⁸ Tanzer, F. S., Kennedy, J. W., and Talmage, R. V., *Proceedings Society of Experimental Biology and Medicine*, 1970, **133**, 500.

Selective Proximal Vagotomy

SIR,—In company with many other surgeons who are evaluating the use of proximal vagotomy with preservation of antral vagal innervation and no drainage procedure, we are disappointed to read of the relatively unsatisfactory results of this operation experienced by Mr. C. Wastell and others (1 January, p. 28).

We have also been conducting a randomized controlled trial to compare proximal vagotomy and selective vagotomy both with and without pyloroplasty. In this trial so far 18 patients have been evaluated between three and twelve months after a proximal vagotomy. In all these the reduction of peak acid output after pentagastrin has been 70%. Only two patients have had a positive post-operative insulin test between three and four months after the operation, and all patients have a satisfactory clinical result (Visick Grade 1 or 2).

However, in those patients in our trial who have had a selective vagotomy without pyloroplasty the clinical results have been less satisfactory, and in a report shortly to be published in the *B.M.J.* we give details of delayed gastric emptying and the recurrence of peptic ulcers. We feel that if the technique of proximal vagotomy is not per-

formed meticulously it is possible to damage or divide the vagal supply to the antrum and so produce a selective vagotomy rather than the intended proximal vagotomy. In an attempt to ensure that the antral vagal innervation is intact at the end of our operations, we use a modification of the electrical stimulation test of Burge and Vain.¹ If the antrum fails to contract after electrical stimulation of the vagus we would then feel that a drainage operation is advisable to reduce the risk of future peptic ulceration.—We are, etc.,

R. J. CLARKE

J. ALEXANDER WILLIAMS

General Hospital,
Birmingham

¹ Burge, H., and Vain, J. R., *British Medical Journal*, 1958, **1**, 615.

SIR,—I read the report of Mr. C. Wastell and others on selective proximal vagotomy (1 January, p. 28) with great interest. I would like to make the following comments.

This procedure is based on the hypothesis that extrinsic innervation is necessary to pyloric function and that a functioning pylorus will ensure adequate emptying of the vagotomized stomach. It has been shown experimentally in animals that the pylorus functions normally after interruption of its nerve supply.¹ If this is true in man, as seems likely from endoscopic observations, the preservation of the nerve of Latarjet becomes irrelevant.

It has also been established that the vagotomized stomach, even with the assistance of a drainage procedure, does not always empty satisfactorily. It is difficult to see how the maintenance of a functioning pylorus can overcome the inertia of the remainder of the stomach produced by selective proximal vagotomy. In two of Mr. Wastell's three cases of recurrent ulceration (two definite and one presumptive) the insulin test indicated that vagotomy was complete. This makes gastric stasis the most likely cause of the recurrence.

Pylorus preserving gastrectomy² provides an alternative method of reducing gastric acidity, while maintaining pyloric function. Its advantage over selective proximal vagotomy would seem to be the provision of an innervated stomach remnant, thus providing the necessary *vis a tergo* to secure satisfactory gastric emptying in the presence of a functioning sphincter. A preliminary trial of this procedure for duodenal ulcer has shown prolonged emptying without stasis and absence of early recurrence.³—I am, etc.,

THOMAS P. J. HENNESSY

Department of Surgery,
University College,
Cork

¹ Quigley, J. P., and Louckes, H., *Gastroenterology*, 1951, **19**, 533.

² Maki, T., Shiratori, T., Hatafuku, T., and Sugawara, K., *Surgery*, 1967, **61**, 838.

³ Hennessy, T. P. J., Weir, D. G., and D'Auria, D., *British Journal of Surgery*, 1972, **59**, 27.

The Tropical Intestine

SIR,—Your leading article "The Tropical Intestine" (1 January, p. 2) followed an article by Dr. J. M. Falaiye on intestinal malabsorption in the tropics (20 November,