rheumatoid arthritis should be excluded from studies of the effect of aspirin on atherosclerotic heart disease.—I am, etc.,

A. ELKELES

Prince of Wales General Hospital,
London N.15

- 1 Cobb, S., Anderson, F., and Bauer, W., *New England Journal of Medicine*, 1953, **249**, 553.
- 2 Elkeles, A., *Journal of the American Geriatrics Society*, 1968, **16**, 35.
- 3 Elkeles, A., *Journal of the American Geriatrics Society*, 1966, **14**, 456.
- 4 Elkeles, A., *Lancet*, 1957, **2**, 714.

Poliomyelitis after Contact with Recently Vaccinated Infant

SIR,—We have recently reviewed the progress of a child aged 2 years who appears to have contracted poliomyelitis during early infancy from a vaccinated infant.

He presented at four months with a flaccid areflexic left leg in which only the flexors and abductors of the hip were relatively strong (4 on the M.R.C. scale). Sensation has always been normal. When first seen by a neurosurgical colleague it was concluded that the condition resulted from spinal dysraphism because it was associated with spina bifida occulta and transient bilateral talipes equinovarus present at birth. However, air myelography and later laminectomy with exploration of the terminal cord and cauda equina gave entirely normal results. Electromyographic studies confirmed severe and widespread denervation confined to the left leg.

In retrospect, when pressed further on the possibility that the condition was acquired and not congenital, both parents (doctors with paediatric experience) acknowledged that, though there had been no obvious illness, they could not recall any asymmetry in leg movement before 2 months of age. Shortly before this (approximately 1-2 weeks) while on holiday their child had shared a perambulator with an older infant who had been given attenuated polio vaccine a few days earlier. The latter infant remained well.

When tested at 6 months of age our patient (who had not himself been vaccinated against poliomyelitis) had poliovirus neutralization titres in serum as follows: type 1, < 10; type 2, < 10; type 3, 300—values very similar to those in children inoculated with attenuated polio vaccine.

We suggest that the clinical and laboratory findings strongly suggest that the infant contracted poliomyelitis from the other, vaccinated infant. This phenomenon has been recognized before, and we think our patient is worth describing to emphasize the need to keep unvaccinated infants out of contact with others recently given attenuated polio vaccine.—We are, etc.,

JOHN WILSON

Hospital for Sick Children,
Great Ormond Street,
London W.C.1

ROGER ROBINSON

Guy's Hospital,
London S.E.1

Administering Drugs by Intravenous Infusion

SIR,—The chart summarizing drug incompatibilities in intravenous infusions was produced by Mrs. Patricia Brodrie and her

colleagues (2 March, p. 383) for practical use in hospital wards. Brevity and simplicity were therefore essential, but some of the information could be misleading if not qualified. The chart has a special note that penicillins should be added only to 0.9% sodium chloride, which might imply that they are incompatible with, or unstable in, other intravenous solutions. This, however, is not so. Benzylpenicillin,^{1,2} cloxacillin,³ flucloxacillin,⁴ and carbenicillin^{3,5} have good stability in 5% dextrose, dextrose saline, and Ringer's solution as well as in 0.9% sodium chloride solution. Ampicillin also has a high degree of stability in both Ringer's solution and 0.9% sodium chloride,^{2,3,6} though it should be infused within one hour if added to carbohydrate solutions.^{2,4,6} The penicillins tend to be somewhat less stable in M/6 sodium lactate solution, though even here ampicillin,³ cloxacillin,³ flucloxacillin,⁴ and carbenicillin^{3,5} have adequate stability for six hours at room temperature, as indeed they have in 1.4% sodium bicarbonate and 10% dextran 40 in 0.9% sodium chloride. Methicillin is less stable than other available penicillins in several intravenous fluids, but even this compound maintains a satisfactory degree of stability for five to six hours at room temperature.^{2,3}

The statement that no other drugs should be added to an infusion containing ampicillin is rather sweeping, though no doubt this is sound advice where particular drug mixtures have not been investigated. On these grounds, however, one would surely apply such a recommendation to any drug. Addition of ampicillin sodium, which has buffering properties, raises the pH of intravenous solutions to above 8.0 and this could adversely affect the stability of certain other agents. Nevertheless, to mention only one important exception, we have recently shown that there is no adverse interaction when 5 g of ampicillin sodium and 10,000 U of heparin sodium are mixed for 24 hours at room temperature in 0.9% sodium chloride or 5% dextrose.² The same applies to heparin mixtures with benzylpenicillin or methicillin.² The statement that "antibiotics" are incompatible with heparin is therefore too vague and generalized, though there was evidence of incompatibility, or of limited stability, in dextrose or saline solutions containing heparin with erythromycin, cephaloridine, gentamicin, kanamycin, tetracycline, or oxytetracycline.² Moreover, relative to its stability in 0.9% sodium chloride, heparin lost 40-55% of its anticoagulant activity within one hour in solutions containing dextrose or lactate.² This finding reinforces the recommendation of Mrs. Brodrie and her colleagues that 0.9% sodium chloride is the diluent of choice for heparin infusion.

Since antibiotics differ so considerably in structure, one wonders whether the statement that "antibiotics" in general are incompatible with hydrocortisone sodium succinate is meaningful. We found that hydrocortisone sodium succinate adversely affected the stability of ampicillin and methicillin in intravenous infusion solutions, but that it had no effect on cloxacillin and carbenicillin.⁴ One well-documented antibiotic incompatibility that the authors do not include is that between penicillins and aminoglycosides.^{7,9}

Decisions about the advisability or otherwise of drug administration by intravenous

infusion must take into account the potential problems as well as the obvious attractions, but should not be made on the basis of incorrect or misleading stability or incompatibility data; hence my reason for drawing attention to these specific points. I am pleased, however, that Mrs. Brodrie and her colleagues emphasize the danger that adequate serum concentrations may not be obtained when antibiotics are given in relatively low dosage by slow continuous infusion, a view which I have also expressed.^{4,5}

In recent years drug incompatibility charts have been produced in numerous individual hospitals and by some pharmaceutical companies, and these charts contain many anomalies and apparent contradictions. These sometimes reflect conflicting reports in the published literature, but in other instances they are the result of incomplete review of the published work or of differing criteria for incompatibility and differences in interpretation of the available information. If it is widely accepted in hospitals that such charts do in fact serve a useful purpose, then perhaps the time has come to adopt a unified and co-ordinated approach to their design and content. This is a task which could well be undertaken by one of the official bodies in consultation with hospital personnel and others concerned—I am, etc.,

BRIAN LYNN

Head of Medical Information Services,
Beecham Pharmaceuticals

Brentford, Middlesex

- 1 Im, S., and Latiolais, C. J., *American Journal of Hospital Pharmacy*, 1966, **23**, 333.
- 2 Jacobs, J., et al., *Journal of Clinical Pathology*, 1973, **26**, 742.
- 3 Lynn, B., *Journal of Hospital Pharmacy*, 1970, **28**, 71.
- 4 Lynn, B., *Journal of Hospital Pharmacy*, 1971, **29**, 183.
- 5 Lynn, B., *European Journal of Cancer*, 1973, **9**, 425.
- 6 Savello, D. R., and Shangraw, R. F., *American Journal of Hospital Pharmacy*, 1971, **28**, 754.
- 7 Noone, P., and Pattison, J. R., *Lancet*, 1971, **2**, 575.
- 8 Lynn, B., and Jones, A., in *Advances in Antimicrobial and Antineoplastic Chemotherapy*, ed. M. Hezlar, M. Semonsky and S. Masák, p. 701. Munich, Urban and Schwarzenberg, 1972.
- 9 Lynn, B., *Proceedings of the VIII International Congress of Chemotherapy*, Athens, 1973. In press.

Correction of Plasma Calcium Measurements

SIR,—The concern expressed by Mr. C. Sanderson (9 February, p. 245) about the difference in the corrected plasma calcium value which results from applying the formula suggested by Dr. R. B. Payne and others (15 December, p. 643) and the equation proposed by the University College Hospital team (15 December, p. 640) is understandable.

The subsequent letter from Dr. Payne and his colleagues (2 March, p. 393) suggests that the explanation for the discrepancy may lie in the accuracy and precision of the calcium and albumin measurements. While we are convinced that discrepancies in albumin results frequently stem from the use of albumin standards of differing origin and purity, it seems that differences of accuracy and precision alone cannot adequately account for the different formulae derived at Leeds and London. Our reason for saying this is that in the six-month period of the Wellcome Group Quality