

## Hazards of glass ampoules

One of the hazards of intravenous infusions is particulate contamination.<sup>1,2</sup> Particles which have been identified include glass microflakes, rubber, cellulose fibres, plastics, antibiotic crystals, and micro-organisms.<sup>3</sup> The infusion of these particles has been associated with vascular occlusion<sup>4</sup> and subsequent embolism, formation of granulomas,<sup>3</sup> and septicaemia. We have observed when glass ampoules of water were opened for routine use that fragments of glass were visible in the water. We therefore aimed at finding out whether it was possible to inject these large particles intravenously.

### Methods and results

Five 10 ml ampoules of water for injection (Antigen Limited) were broken open by hand and the contents inspected. These were then drawn from the ampoules with a sterile 50 ml syringe and were infused through a 20 µm Millipore filter encased in an easily removable watertight plastic casing (made by Millipore). The plastic casing was dismantled and the filter examined for particles of glass. This was repeated with 19 and 21 gauge needles attached to the syringe. The empty ampoules were inspected for particles of residual glass. The needles used were inspected to see if any particles of glass had adhered to them. An attempt was made to draw up a free particle of glass from the contents of an opened ampoule of water. Photographs were taken at various stages of this procedure to demonstrate the presence of glass particles.

In all of the ampoules used particles of glass could be seen macroscopically in the water (figure (a)). All three Millipore filters had particles of glass on them which were visible to the naked eye (figure (b)). The empty ampoules had residual particles of glass inside them (figure (c)). Free particles of glass could be aspirated through a 19 gauge needle (figure (d)), but not through a 21 gauge needle.

### Comment

Using this simple method we have shown the potential for intravenous injection of visible glass particles. Whether no needle or a 19 or 21 gauge needle was used glass was still collected on the filter paper and therefore this

might have been injected intravenously. It is unknown whether injection of macroparticles is more harmful than injection of microparticles. In the care of high risk patients (sick neonates, the immunosuppressed, and those requiring long term intravenous infusions), however, all hazards should be eliminated.

Although plastic containers do not fragment and produce macroparticles, they are less inert than glass and give rise to more microparticles.<sup>5</sup>

The introduction of filters in intravenous infusion lines decreases the complications of microparticulate injection.<sup>3</sup> A filter would also prevent injection of macroparticles provided it was placed proximal to the site of injection into the intravenous line. Often this is not the case as additive injections are made through a rubber bung beyond the filter.

We therefore conclude that there is a place for the development and manufacture of end line micropore filters, which might be included either in the intravenous cannulas or at the end of infusion sets but certainly proximal to the site of additive injection.

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- 1 Dempsey G, Webber GS. Hazards of particle injection. *Pharm J* 1983;231:63-4.
- 2 Leong A S-Y. Particulate contamination in intravenous therapy and extra corporeal systems. *Med J Aust* 1982;ii:309-10.
- 3 Garvan JM, Gunner BW. The harmful effects of particles in intravenous fluids. *Med J Aust* 1984;iii:1-6.
- 4 Falchuk KH, Peterson L, McNeil BJ. Microparticulate induced phlebitis. Its prevention by in-line filtration. *N Engl J Med* 1985;312:78-82.
- 5 Whitlow RJ, Needham TE, Luzzi LA. Generation of particulate matter in large volume parenteral containers. *J Pharm Sci* 1974;63:1610-3.

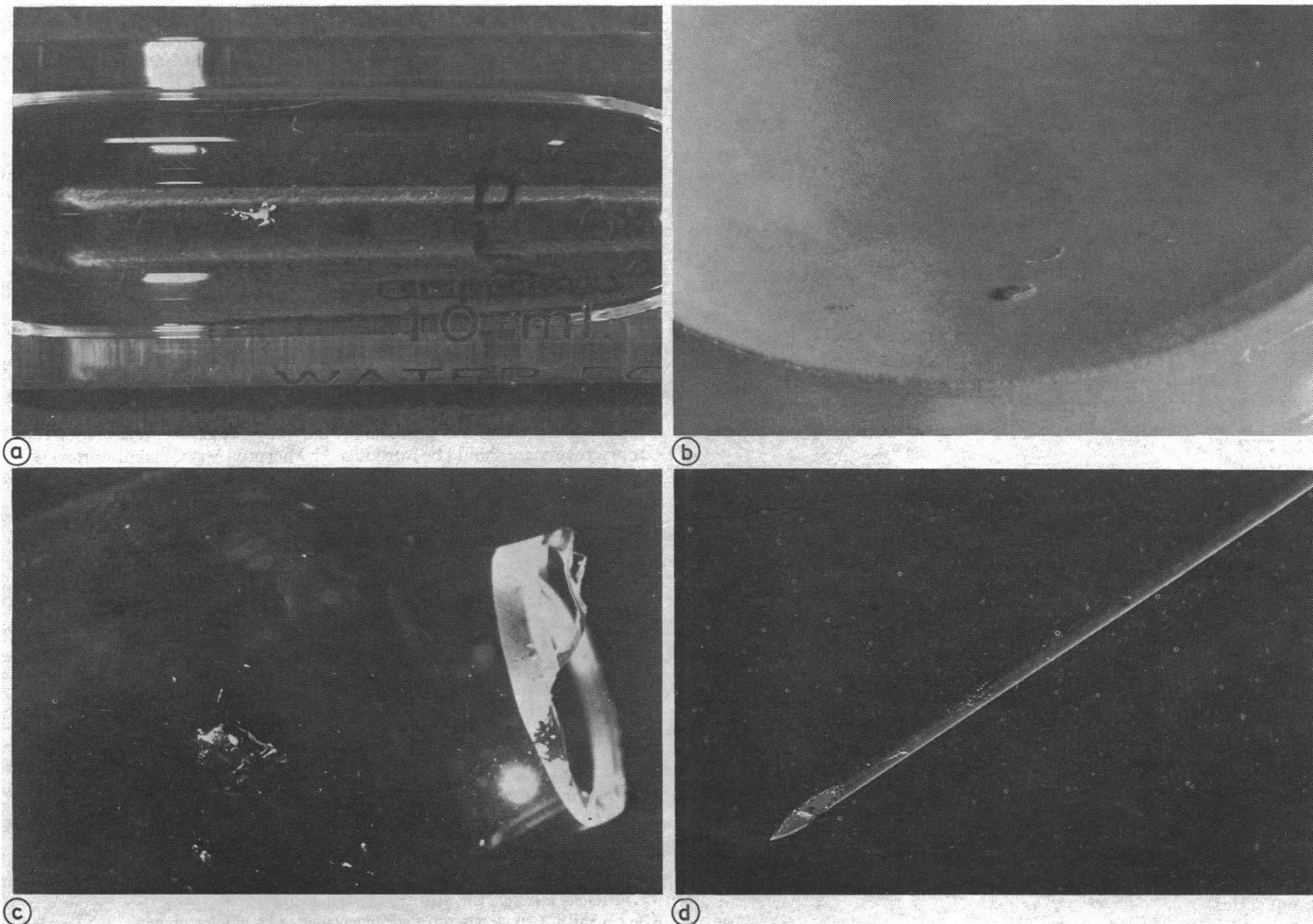
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(a) Ampoule before injection; (b) Millipore filter; (c) residual glass particles in empty ampoules; (d) glass particles in 19 gauge needle.