

LETTER TO THE EDITOR

A New Deflocculant and Protective Colloid for Barium Sulphate

SIR,—For use as a radiographic contrast medium in the gastrointestinal tract barium sulphate is usually presented as a concentrated suspension containing 100 per cent w/v or more of barium sulphate, which may or may not be diluted before use. In water and in solutions of many hydrophilic colloids such concentrations produce preparations lacking in pourability and other characteristics which allow easy manipulation and administration.

Satisfactory fluidity of concentrated suspensions may be achieved by deflocculating, and with barium sulphate it is well known that pastes can be made fluid by the addition of small quantities of suitable salts, for example, citrate. With the addition of suitable hydrocolloids, this procedure may allow the formation of concentrated suspensions satisfactory in flocculation, sedimentation rate and absence of claying on storage, but not necessarily satisfying other desirable criteria, such as easy dispersion in acid gastric juice containing mucin and absence of flocculation after dispersion in the gastric juice and during subsequent passage through the gut. With deflocculants like citrate used with the usual hydrocolloids to aid suspension, flocculation normally occurs immediately on pouring the suspension into an excess of dilute hydrochloric acid, dilute sodium chloride solutions or into acid gastric juice. Flocculation and gross clumping of the suspension is even more apparent when gastric mucin is present.

The efficiency of the preparation as an X-ray contrast medium will depend on the evenness and thickness of coverage afforded to the mucosa by the barium sulphate and the greater the flocculation which has occurred the less regular and less satisfactory the coverage is likely to be.

The very low solution viscosity of the sulphated polysaccharide, degraded carrageenan (Ebimar, Evans Medical Ltd.) (Anderson, 1961) and its negative charge, and the electrochemical properties of barium sulphate in aqueous suspension, suggested that degraded carrageenan should function as a useful deflocculant and protective colloid for barium sulphate and allow desirable fluidity in concentrated suspension. A suspension containing a small quantity of degraded carrageenan (for example, barium sulphate : degraded carrageenan ratio, 100 : 1) can be shown by microscopic and sedimentation volume methods not to flocculate on addition to dilute acid. Also, in conjunction with ghatti gum mucilage the degraded carrageenan appears to be capable of protecting the particles of barium sulphate from the much more potent flocculating effects of human acid gastric juice containing mucin. Although degraded carrageenan reacts with mucoprotein under certain conditions, it is not yet clear to what extent other factors are involved in the mechanism of the enhanced resistance to flocculation of the barium sulphate particles, and this is being studied further. Preliminary studies indicate that these properties are shared by certain other polyanions.

Studies of the effectiveness of suspensions of differing degrees of deflocculation *in vitro* by X-ray examination of the suspensions, in cells of narrow width (0.75 mm.) made from microscope cover glasses, have been unconvincing except where flocculation was so marked as to make complete coverage impossible. To evaluate fully such a deflocculating agent as degraded carrageenan appears to require clinical study as the preparation is of a complex nature and is involved in physiological conditions which are impossible to reproduce exactly *in vitro*.

The Evans Medical Research Laboratories,
Liverpool, 24,
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W. ANDERSON.

REFERENCE

Anderson, W. (1961) *J. Pharm. Pharmacol.*, **13**, 139–147.