FUNCTION OF SIZE HETEROGENEITY IN BARIUM SULPHATE USED AS RADIOCONTRAST MEDIUM

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Imaging gastric lesions in the double contrast examination (James, 1978) of the stomach involves imaging the mucosa in which lesions may be identified as abnormally irregular areas in which barium sulphate has deposited. Grossly, the normal mucosal surface appears as a pattern of areas or tufts, the areae gastricae, bounded by grooves and these may be seen in radiographs as a network pattern. Lesions are usually identified as irregular disturbances of this pattern. Certain barium sulphate preparations are preferred for gastric examination using the double contrast technique and one reason for this preference is now demonstrated.

The mucosal surface of a strip of washed adult pig stomach obtained within 2h of slaughter was covered with barium sulphate suspension (EZ-paque - HD) for 20s then flooded with water and gently rinsed at the tap. Samples of barium sulphate were carefully removed from the mucosal grooves and particle sizing carried out using the microscope. Two strips from the body of two stomachs were coated and from each strip samples were taken from three mucosal grooves and slides prepared for sizing. The barium sulphate preparation was sized similarly.

Table 1. Redistribution of barium sulphate particles during stomach coating

Particles greater than 3.3µm (mean % $\pm$ s.e.m.) in the original preparation	samples recovered from mucosal grooves	Significance of difference
12.2 ± 2.3	a) 27.5 ± 2.7	$t=4.10; p < 0.01$
	b) 23.6 ± 2.0	$t=3.74; p < 0.01$

a), b) are results from two stomachs: percentages are means of 4 readings (in the preparation) and 6 readings (recorded from the grooves)

Redistribution of particles has occurred with a tendency for larger particles to be found in the grooves. Generally the smaller the size of particles the greater is any (smooth) area covered by a given weight of solid and whilst area covered by the dose of barium sulphate is a factor in producing good radiographs, nevertheless, the mucosal surface is grooved. As a result the heavy large particles of barium sulphate tend to settle into the grooves as the suspension flows over the mucosa, the smaller sizes tending to remain on the tuft surface or to be washed away thus promoting distinctive imaging of grooves (dense) and tufts (less dense) and giving rise to the characteristic radiographic network pattern of the areae gastricae. Against this uniform pattern, lesions into which large particles tend also to gravitate may be easily seen by contrast. Maintenance of the predetermined barium sulphate size distribution, until the redistribution which occurs during flow over the grooved mucosal surface is complete, is therefore important and protection by the formulation against the particle aggregating tendency of acid gastric secretion is required (Anderson, Harthill and others 1978). Obviously the relatively non-viscous extemporaneously prepared high concentration suspension of which the one presently used is an example will flow readily and permit rapid sedimentation of large particles predominantly in the grooves.

Anderson, W., Harthill, J.E., & others, (1978) J. Pharm. Pharmac. 30, 76P
James, W.B. (1978) Brit. J. Radiol. 51, 1020-1022.