

EFFECT OF ALUMINIUM HYDROXIDE ON "RAFT-FORMING" ANTACIDS

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There are a number of antacid preparations used in the treatment of gastro-oesophageal reflux which contain both alginate and sodium bicarbonate. The alginate entraps the carbon dioxide produced from the reaction of the bicarbonate and gastric acid. Consequently this forms a viscous gel layer which floats on the gastric contents (May et al, 1984). The neutral layer is reported to be refluxed into the oesophagus in preference to the acid gastric contents (Malmud et al, 1979). An additional mechanism of action might result from reduction of reflux events due to the mechanical properties of the barrier.

Apparatus has been developed to measure the strength of alginic acid rafts and to investigate the effect of adding aluminium hydroxide to the raft. This was also used to compare a number of alginate-containing antacid preparations. A beam balance was modified to pull a horizontal probe upwards through the raft at a constant rate. The probe consisted of a 25mm tinned copper wire (0.6mm diameter) suspended from one arm of the balance. The force was applied to the opposite arm by addition of a chain weight controlled by a stepping motor. The position of the beam was monitored by a linearly graded optical filter and the output from the photodetector recorded by computer. The results were corrected for the force required to pull the probe through the same distance in water.

Progressively increasing the percentage of aluminium hydroxide added to "Gaviscon" (Reckitt & Colman Pharmaceuticals, Hull) caused a corresponding decrease in the strength of the raft (Figure 1). This suggested that formulations containing aluminium hydroxide plus alginate might form weaker rafts than those containing alginate alone. To examine this hypothesis various alginate-based antacid preparations have been tested using the apparatus described above. Due to experimental restrictions, half the recommended doses were used for all the formulations. The results are shown in Table 1.

FIGURE 1 Effect of aluminium hydroxide on the breaking strength of a "Gaviscon" raft (n = 3-5).

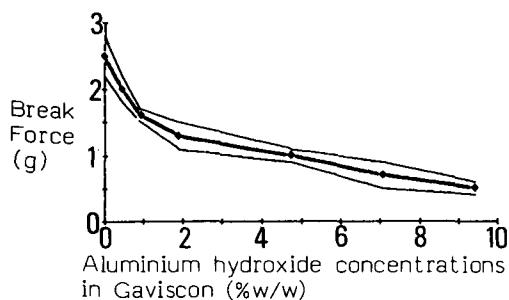


TABLE 1. Mean strength of rafts formed by various commercial antacid preparations (\pm s.d, n is greater than 6).

Formulation	Breaking Force (g)
1. Gaviscon Liquid (5 ml)	2.5 \pm 0.3
2. Gastrocote (1 tablet)	0.7 \pm 0.1
3. Gaviscon Granules	0.9 \pm 0.1
4. Gaviscon tablets	0.9 \pm 0.1
5. Pyrogastrone	1.5 \pm 0.2

Formulations 2 to 5 contained various amounts of aluminium hydroxide which may account for the weaker raft strength in these preparations. Formation of the raft is critically dependent on calcium concentration, since calcium ions permit the formation of extended parallel-linked alginic acid structures. However, the trivalent aluminium ions may compete for anionic binding sites on the alginate resulting in a less coherent structure which may not favour raft formation.

Malmud L. S. et al., (1979) J. Nucl. Med. 20: 1023-1028.

May H. A. et al., (1984) Int. J. Pharmaceut. 19: 169-176.