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Antipeptic activity of antacids

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SUMMARY An *in vitro* experiment based on the digestion of haemoglobin with pepsin was carried out to test the claim made by some manufacturers that the antacids used in their proprietary preparations had an intrinsic antipeptic activity independent of the change brought about by alteration of *p*H. In no case could these claims be substantiated.

Antacids have played a traditional role in the treatment of peptic ulcer. Though there is no convincing proof to show that they increase the rate of healing, there is little doubt about their clinical effect of relieving the pain of peptic ulceration.

The antacids in common use are calcium carbonate, sodium bicarbonate, aluminium hydroxide, magnesium oxide carbonate and trisilate, and bismuth aluminium carbonate. These are marketed under proprietary names either in combination with each other or with sedatives and anticholinergics.

A perusal of the literature put out by drug manufacturers reveals that five methods of action have been claimed for antacids: they (1) diminish the quantity of hydrochloric acid in the stomach by direct neutralization, buffering of gastric acid, or absorption of H ions; (2) mechanically protect the floor of an ulcer by forming a coating on its surface; (3) stimulate mucus production which protects the ulcer; (4) absorb some of the pepsin; and (5) have an intrinsic antipeptic activity independent of alteration in *p*H.

The investigation was undertaken to find out whether antacids have any antipeptic activity apart from that produced by alteration of the *p*H.

Material and Methods

Anson and Mirsky (1953) described a chemical method of evaluating pepsin activity dependent on the photometric estimation of tyrosine which is split off haemoglobin after incubation with pepsin.

We use a modification of this test. Two ml of bovine haemoglobin (supplied by Armour Ltd) is adjusted to a *p*H of 2 and incubated with 1 ml of a 0·2% of swine pepsin mixture (supplied by John Winthrop) for 30 minutes at 37°C. This process was repeated with the addition of 20 mg of the antacid to be tested. The filtrate was read at a wavelength of 280 using a hydrogen lamp, blue photocell, and silica cuvette. Each test was repeated four times with 95% reproducibility.

The antipeptic activity for each antacid was calculated from the formula $\frac{x-y}{x} \times 100$ where x is the amount of tyrosine split off from the haemoglobin mixture and y is the amount of tyrosine split off from the haemoglobin-antacid mixture (see Table).

Antacid	*pH of Haemoglobin-antacid Mixture*	*Antipeptic Activity (%)*
Bismuth aluminate	2·3	1
Aluminium hydroxide	2·35	2·3
Bismuth aluminium carbonate	2·35	2·3
Magnesium trisilicate	3·0	52
Calcium carbonate	3·85	81
Magnesium carbonate	3·6	82
Sodium bicarbonate	4·0	85
Magnesium oxide	4·0	86

Table *Results*

Comment

Taylor (1959) showed that pepsin activity varies according to the source of pepsin, the type of protein, and the *p*H. Using bovine haemoglobin and swine pepsin at 37°C we find that the maximum activity was between *p*H 1·5 and 2·5, with a sharp fall to 30% activity at a *p*H of 3, minimal activity at *p*H 4, and zero activity at *p*H 5 (see Fig.).

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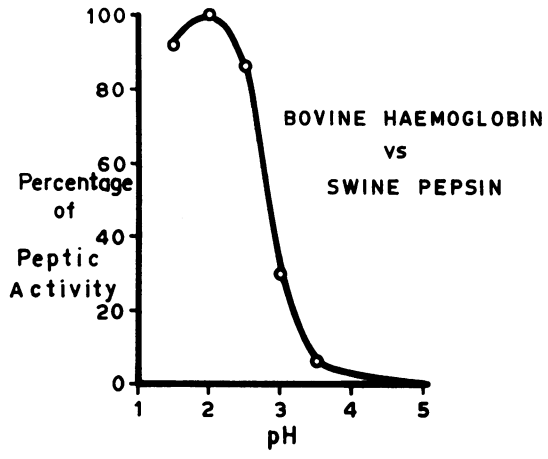

Fig. *Pepsin activity curve.*

It was noted that the antipeptic activity of the antacids tested parallel the changes in the *p*H of the haemoglobin-antacid mixture. When projected on the pepsin activity curve in no case did the antipepsin activity exceed that expected from the *p*H change.

This experiment proves that the antacids tested did not have any intrinsic antipeptic activity and produced their effect only by alteration of *p*H.

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References

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