AN EVALUATION OF SOME MUCOSA-ADHESIVE DOSAGE FORMS FOR DRUG DELIVERY TO THE ORAL CAVITY

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Drug delivery to, or via, oral mucosa is of interest with regard to local drug therapy within the oral cavity and the systemic administration of peptides and drugs that are inactivated by first pass metabolism. The retention of dosage forms within the oral cavity has been achieved by the use of materials that adhere to mucous membranes and several formulations have been developed and marketed. This investigation used a quantitative method for assessing the adhesive force between some mucosa-adhesive formulations and a model membrane. Rabbits stomachs and mouse peritoneal membrane have been used as model mucous membranes in other adhesion studies (Leung et al. 1988). In an initial investigation rat small intestine was found to be a suitable model membrane and yielded rank orders of adhesiveness similar to those reported in other studies. Fresh intestine was frozen until required, then cut into 3cm lengths, washed and mounted on a platform in an isotonic phosphate buffer (pH 6.8) at 37^0C to expose a 1.1cm diameter circular section of tissue. It was found that convex shaped buccal tablets did not adhere to the flat surface of the mucous membrane so these were ground into a fine powder. 50mg samples of test material were compressed into 6.2mm diameter discs using a 1 tonne force for 5s. The test disc was attached to a 1.5g weight suspended from a balance (for the paste preparation, a thin layer was spread onto the lower surface of the weight), which was lowered onto the mucosal surface and left for 2min. The platform was lowered at a rate of 1mm/min until the disc pulled clear of the membrane and the force at which the adhesive bond failed recorded. The results were calculated in terms of a standard $1cm^2$ disc (Table 1).

Table 1.

Formulation	Number	Mean Force(Ncm^{-2})	S.D.
Carbopol EX55	4	4.81	1.08
Carbopol 934P	5	2.98	0.65
Carbopol 934P 2:1 HPC	5	1.95	0.80
Suscard Buccal	4	0.45	0.22
Buccastem	5	0.09	0.05
Adcortyl in Orabase	5	0.09	0.05

As noted in previous studies (Leung et al 1988), the polyacrylic acids, Carbopol 934P and Carbopol EX55 (polycarbophil), demonstrated the greatest adhesive force. Mucosa-adhesive formulations containing Carbopol 934 and a long chain hydroxypropylcellulose (HPC) have been developed (Nagai 1986). The presence of HPC reduced, but not significantly ($P > 0.05$, Student's t-test), the adhesive force. Cohesive failure of the paste, rather than adhesive failure, was seen to occur with Adcortyl in Orabase. Both Suscard Buccal, containing modified hydroxypropylmethylcellulose, and Buccastem, containing ceratonia and xanthan gum, would be predicted to be less adhesive than the polyacrylic acids (Smart et al 1984), and this is confirmed in this study. As both are established buccal delivery systems it may be concluded that only a small adhesive force is required to retain a dosage form within the buccal cavity.

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