SHORT COMMUNICATION

Binder property of ethanol-acrylate methacrylate-water coarcevated systems in tabletting.

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Whereas colloidal solutions of hydrophilic polymers (e.g. HPMC) are frequently used as binders in wet granulation procedures, the hydrophobic polymers (e.g. certain acrylate methacrylate copolymers) do not find similar application readily because of their insolubility in water and the fact that organic solvents are expensive, inflammable, and toxic. In this study an aqeous based granulation fluid of the arcylate-methacrylate copolymers was prepared by a coarcevation technique[1] and used as binder, with the hope that inclusion of a hydrophobic polymer in tablets by this technique may minimize the moisture uptake potential of the tablets.

Two analogous acrylate methacrylate copolymers designated A and B were received under the trade names Eudragit RL 100 and RS 100 respectively from Pharma, Darmstadt. A and B differ only in their content of polar quarternary ammonium (cation) groups in a ratio 2:1 (A:B). HPMC (USP) was received from Shin-Etsu Co. Japan. Salicylic acid (Analar grade, BDH) was used as drug model because of its ease of analysis by colorimeter methods. The diluents used in tablet formulation were lactose (BP) and tapioca (obtained from a local market and purified to a fine powder as described earlier)[2,3]

The coarcevated system was prepared thus: the polymer A or B (5g) was dissolved in ethanol (10ml) using overnight stirring, after which water (90ml) was added while shaking continuously. The resulting aqueous dispersion (10ml) was used to granulate 25g powder comprising lactose (10g), tapioca (10g) and the drug (5g). The powders were similarly granulated with HPMC solution (10ml, 5%). The granules were compressed to tablets of mean weight 501±8mg, at a pressure 5.5 (arbitrary units) with the Kari Kolb single punch machine.

The tablets were evaluated for hardness with an electronic tester (serle 7310, 2E.205), disintegration and dissolution by BP methods, and friability (i.e. % dust after 10 min. shaking) with the Erweka fraibilator, % moisture uptake was assessed by measuring tablet weight increase after storage for 7 days under ambient conditions (temp. 28-30°C, and relative humidity 22-25%). All evaluation tests were carried out in triplicate.

The coarcevated system of polymer A or B is a hydrophobic colloid while the solution of HPMC in water is a hydrophillic colloid. Characteristic of tablets produced with these 3 systems as binders are summarised in table 1. Polymer B gave harder, less friable tablets compared with the more hydrophillic analogue, polymer A or the water soluble HPMC, suggesting a higher binder effect of B. Consequently B tablets displayed a longer disintegration time. In spite of the slow disintegration rate of B-tablets drug dissolution in B compared favourably with HPMC tablets (table 2). This finding relates to the presence of low content of polar cationic groups in B which conferred some degree of swelling [4], thus increasing particle porosity. Dissolution was highest in tablets of polymer A because of its higher content of cationic groups. The lower degree of moisture uptake in tablets of polymer B can be associated with the lower hydrophilic character of the polymer.

The conclusion is that the less hydrophilic polymer produced harder tablets with lower potential for moisture uptake. This finding may be exploited when materials with high moisture uptake tendency and\or poor self-binding property (e.g. tapioca)[2,3] are to be used as tablet bases. The coarcevation technique adopted for the water-insoluble polymers is cost-saving because of the low requirement for ethanol. Also, drug dissolution rate can be enhanced by using a more hydrophilic analogue of the water insoluble polymer, when a fast onset of drug action is desired.

REFERENCES:

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TABLE 1
Characteristics of the tablets containing the different polymers, 2% w/w.

Evaluation parameters	Values for tablets containing binders 2% w/w.		
	A	B	HPMC
a	3.4	2.8	4.8
b	12.4	18.6	14.7
c	5.84	8.42	5.82
d	3.3	1.6	2.2

Evaluation parameters: a, moisture (%); b, disintegration time (min); c, tablet hardness (kp) and d, friability (%).

Table 2
Amounts of drug dissolved from tablets containing the different polymers, 2% w/w.

Time (mins)	Amount released (mg) from tablets contain polymers:		
	A	B	HPMC
10	67	50	58
20	83	72	62
30	88	78	64
40	91	78	69
50	91	78	69
60	93	86	70

Note: Initial amount of drug in each tablet = 100mg.