FACTORS AFFECTING THE ATOMISATION OF TABLET COATING SOLUTIONS

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Although many studies have been performed on the coating of tablets with polymeric films, the stages of solution atomisation and travel of the droplets to the tablet bed have received little attention (e.g. Cole et al 1980). This is because traditional methods of droplet size analysis involve sampling difficulties and are tedious and time consuming.

In order to determine how the atomisation stage is influenced by the various solution and operation parameters encountered in atomisation, it is necessary to have a knowledge of the following characteristics of the system:

(a) Solution physical properties. Experimentation with hydroxypropyl methylcellulose has shown that only solution viscosity varies significantly over the range of formulations likely to be encountered in practice. The concentration and grade of the polymer, temperature of the solution, and the inclusion of plasticisers and colourant dispersions were all found to influence the viscosity. These same variables had little or no effect on the surface tension and density of the formulations.

(b) Atomisation at the spray gun. The droplet size distributions produced during atomisation have been investigated using a Malvern 2200 droplet and spray particle sizer (Malvern Instruments Ltd., Malvern). This instrument has advantages in that it is non-obtrusive and rapid, 300 scans taking less than 10 seconds. Figure 1 shows the results of one such experiment in which a 9%w/w aqueous solution of hydroxypropyl methylcellulose (Methocel E5) was fed at a rate of about 25g/minute to a Schlick model 930 pneumatic atomising gun (Orthos Engineering Ltd., Market Harborough) set to produce a flat spray pattern. Analysis of these data showed that the droplet sizes correlated closely to a Rosin-Rammler distribution. The mean droplet sizes were characterised in a number of ways; mass median diameter (D_{MM}), volume mean diameter (D_{VM}), surface mean diameter (D_{SM}) and Rosin-Rammler mean diameter (D_{RR}). The dependance of these values on the atomising air pressure can be seen from Table 1.

FIGURE 1

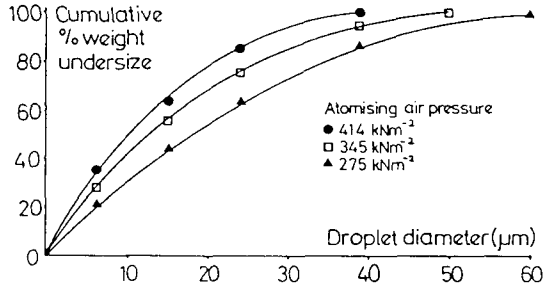

TABLE 1

Air pressure (kNm^{-2})		275	345	414
D_{RR}	(μm)	22.5	17.2	13.3
D_{MM}	(μm)	18.5	13.0	10.1
D_{SM}	(μm)	8.5	6.8	5.9
D_{VM}	(μm)	4.8	4.3	4.1
%wt.< 5.8μm		22.0	29.9	34.5
%wt.>30.0μm		25.4	13.3	2.1

(c) Travel of the drops to the tablet surface. This will be affected by the speed of droplet travel, and the velocity and temperature of the drying air. The two latter parameters have been examined within a Model 24 Accela-Cota (Manesty, Liverpool) using a Testovent 4000 combined anemometer and temperature probe (Testoterm Ltd., Emsworth). This information has allowed the situation occuring within the Accela-Cota to be mimicked in the labortory and during the use of the Malvern droplet size analyser.

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Cole, G.C. et al (1980) J. Pharm. Pharmacol. 32: 92P