THE INFLUENCE OF CARRIER SURFACE ON THE CHARACTERISTICS OF INSPIRABLE POWDER AEROSOLS

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Dry powder aerosols are generally formulated by mixing cohesive, micronized drug with larger carrier particles. Redispersion of the drug from agglomerates or carrier surface during inhalation is the most critical factor which governs the availability of the medicament to the lungs. The mechanical stability of these ordered powder mixtures is highly influenced by the surface properties of the carrier (Staniforth et al 1986). This study explores this effect when such mixtures are fluidized.

Three types of lactose, regular, spray dried and recrystallized, with different surface textures were employed as carriers in powder mixes containing micronized salbutamol sulphate.

Rerecrystallized lactose was prepared so as to favour the production of crystals having low surface roughness (rugosity). The surface was examined by scanning electron microscopy and the rugosity was determined by comparing the external specific surface area obtained by air permeametry with the theoretical surface area when the particles are considered as spheres. The results are given in Table 1. The powder mixes were prepared in a ratio of 1:67.5 with carriers of size 63-90μm. Capsules containing 400μg drug were assembled in a Rotahaler (Allen & Hanbury Ltd) and discharged into the air stream at flow rates of 60 and 150 L/min. The cloud was isokinetically sampled and fractionated by an inertial impactor (Anderson 1 CFM Ambient) (Kassem et al,1989). The salbutamol sulphate deposited on various stages was determined by HPLC analysis of methanolic washings.

The results in Fig.2 demonstrate that the respirable fraction was significantly higher with the recrystallised lactose. No difference was observed between the spray dried and the regular lactose. Similar results were obtained at air flow of 150 L/min. These data suggest that recrystallized lactose with low rugosity facilitates more effective redispersion of the drug particles even at low air speeds. Therefore generation of a deeply inspirable cloud is possible with a minimum inspiratory effort.

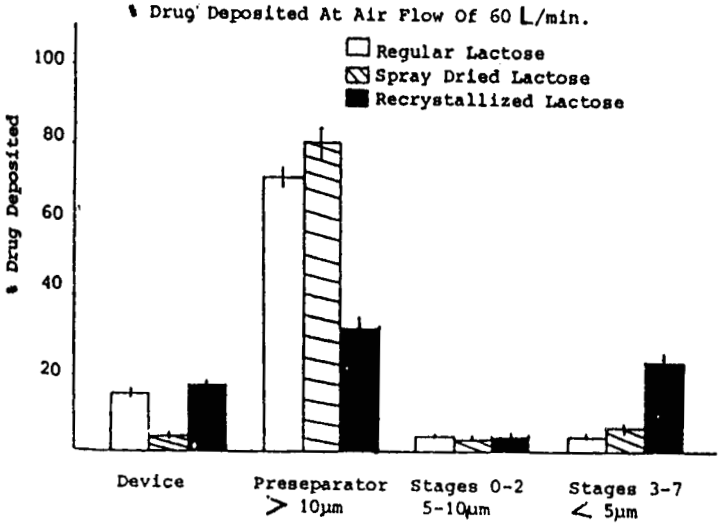

Table 1. Rugosity of the carriers

Lactose	Rugosity (dimensionless)
Regular	2.3
Spray dried	2.5
Recrystallised	1.2

Staniforth,J. et al (1982), J.Pharm. Pharmacol.,34,141-145
Kassem,N.M. et al (1989), J.Pharm.Pharmacol.,41(Suppl.),13P