Different Types of Lactose Fines Have an Impact on Different Dry Powder Inhalers Properties

Introduction

The excipient of choice for dry powder inhalers (DPI) is lactose monohydrate. It plays an important role in the whole formulation process from bulking the dose chamber in the devices to facilitate dose delivery by the respiratory action of a patient [1-3]. A number of scientific papers and opinions have been devoted to the specific effect of lactose fines on DPI formulations. The type of fines, i.e. fine (<30 µm) or very fine (<4.5 µm) is of utmost importance. Fines affect different properties, the definition of what we consider ‘fines’ is of utmost importance.

Materials and methods

Pre-blends of coarse lactose with 2.5, 5, 10, and 20 wt-% of fine type of lactose were prepared in 100 g quantities by sandwiching the fines between three layers of LH100 in an earthed 500 mL stainless steel vessel and blended using a Turbo Top mixer (Glencrest Ltd, Middlesex, UK).

The formulations were in-vitro tested for aerosol performance using a Next Generation Impactor (NGI) equipped with a pre-separator capsules, filled with 12.5 mg of the desired formulation, were Handihaler with 4 kPa pressure drop. Fine Particle Fractions (FPFs) are determined in triplicate.

Results and discussion

The data shows that adding more fines resulted in an increased dose delivery by the respiratory action of a patient 

The type of fines, i.e. fine (<30 µm) or very fine (<4.5 µm) is of utmost importance in designing a DPI formulation. In this investigation it has been demonstrated that flow of powders is dominated by lactose fine particles smaller than 30 µm, and that drug deposition is dominated by lactose very fine particles smaller than 4.5 µm. By using combinations of different types of fine grade lactose with coarse grade lactose, a formulation can be fine-tuned on all relevant properties.

Conclusions

The concept of total fines, cohesive energy and interaction parameters.

References