Introduction, aim

A new tendency in the development of dry powder inhalers (DPIs) is the design of carrier-based microcomposites particle size (3-5 μm) as pulmonary drug delivery systems involving different carriers and adjuvants. The adjuvants are applied in small amounts in the microcomposites in order to promote physicochemical stability, wettability, dispersibility and aerodynamic properties.

A new possibility in drug formulation is applying Meloxicam in a salt form (Meloxicam Potassium (MXP)) to develop DPI. Using its salt form could be a novel application, through alternative routes, because it has never used before in the drug therapy.

Our aims were therefore to apply aqueous solution of MXP containing additives in different concentrations (using one-step green technology), which help to improve the aerodynamic properties of the product.

Experimental methods

**Materials**

Meloxicam Potassium (MXP) purchased from EGIS Ltd., Budapest, Hungary, PVA 3-88 from ISP Customer Service GmbH, Cologne, Germany, Leucin (LEU) from Hungaropharma, Budapest, Hungary.

**Preparation of products**

The heated solutions containing MXP, LEU and/or PVA, were spray-dried with a Büchi Mini Dryer B-191 (Fig. 1).

**Particle characterization**

The particle size distribution of the microcomposites was also estimated by laser diffraction (Malvern Mastersizer Scirocco 2000, Malvern Instruments Ltd., Worcestershire, UK). The morphology of the microcomposites was examined by SEM (Hitachi S4700, Hitachi Scientific Ltd, Tokyo, Japan), Anderson Cascade Impactor (ACI) (Copley Scientific Ltd., Nottingham, UK) is used for measuring the mass distribution of pharmaceutical aerosols via the aerodynamic diameter using 50L/min flow rate. The products were filled into hard gelatin capsules (size 3). The inhaler device applied was a plastic DPI (R6, Plastiap, Italy).

**Structural investigations**

XRPD was carried out in order to determine the crystalline form and crystallinity of the produced materials. Samples were measured with a Bruker D8 Advance diffractometer (Bruker AXS GmbH, Karlsruhe, Germany). The scanned angles ranged from 10° to 80°. The measurements were also applied (Mettler Toledo, Stare AXS GmbH, Karlsruhe, Germany). Thermoanalitical measurements were also applied (Mettler Toledo, Stare AXS GmbH, Karlsruhe, Germany).

**Discussion**

The particle sizes of the samples satisfied the pharmacopoeial requirements, the average size was between 2.5-4.5 μm. Moreover, the particle size distribution of MXP and many products was heterogeneous only MXP-PVA, MXP-LEU and MXP-LEU-PVA. Results show the homogenous distribution (Fig. 2 and Table 1).

The morphology of the microcomposites was examined by SEM (Fig. 3). The nearly spherical form of the particles was determinative. The nearly spherical form of the microcomposites could be advantageous for suitable pulmonary depositions.

**Concluding remarks**

In conclusion, the MXP-LEU2-PVA0.1 resulted homogenous distribution (Fig. 2-3 and Table 1). The morphological appearance of the particles affects the aerodynamic pattern of the drug delivery system. It is a novel possibility in anti-inflammatory treatment and for the mono- and combination therapy of cancer, pulmonary fibrosis and pain.