Time resolved measurement of the size distribution of pharmaceutical aerosols under realistic respiratory conditions

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The most frequently used medications commonly applied during the therapy of human airway diseases are the inhalation medicines and systems that can introduce the active substances directly into the respiratory system. Determination of the deposition properties of aerosol medications is of particularly great importance during their development and approval, where the delivery of the proper dose to the targeted area and the overdose has to be controlled precisely. The size distribution and the delivered dose of pharmaceutical aerosols are commonly determined by cascade impactors, however optical particle spectrometry were also introduced recently as an alternative method (Kuhli *et al*., 2010). Optical particle counters determine optical or aerodynamic size distribution of aerosols based on elastic light scattering from individual particles passing their sensing volume. The advantage of this method compared to the gravimetrical measurements is its temporal resolution.

We built a measurement setup (fig.1.) to study the temporal development of the size distribution of the generated mist of pressurized metered dose inhalers (pMDI) which influence the spatial deposition distribution of the particles in the human airways. While the pump with the flow controller generate constant flow rate in a closed loop, the breath simulator (Kerekes A., *et al.* 2011) and the mixing inlet (Copley Sci) ensures realistic breathing patterns at the pMDI device.

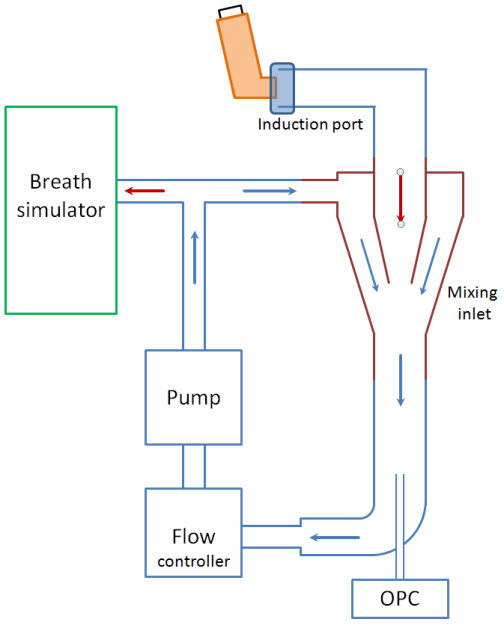

Figure 1. Schematic figure of the measurement setup.

The optical particle counter (OPC) isokinetically samples particles from the main flow providing the necessary dilution to avoid coincidence of particles in the measurement volume caused by the high concentration.

We performed measurements to determine the temporal variation of the size distribution of the aerosols generated by pMDI devices and also studied the effects of the synchronization problems commonly raise during the usage of these devices. Figure 2. shows measurement results for a pMDI device where the mass median aerodynamic diameter were determined with optical particle conter.

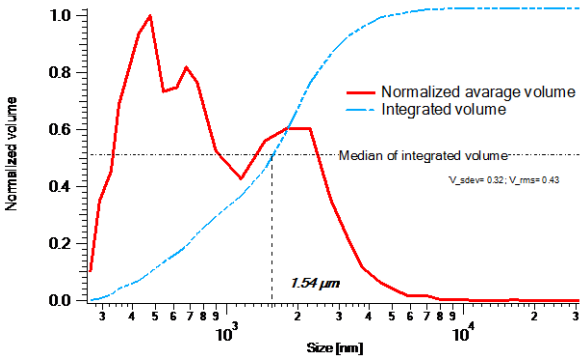

Figure 2. Determination of the mass median aerodynamic diameter from the data of the OPC.

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