In silico modelling of regional lung deposition for metered dose and soft mist inhalers

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In-silico modelling analysis has been performed to assess the impact of inhalation variables on the regional lung deposition of an exemplar pressurised metered dose inhaler (pMDI - QVAR®), and an exemplar soft mist inhaler (SMI - Respimat ® Spiriva ®). Both products are manually actuated press and breath devices.

The analysis, performed using Mimetikos Preludium™, shows that the breath profile, actuation delay and breath hold may have a significant effect on the fate of the inhaled drug in terms of the deep lung penetration and exhaled fraction. Control of these inhalation variables for such products will therefore likely reduce variability of the pharmacokinetic (PK) profile, and ultimately affect the product efficacy. Both SMI and pMDI data indicate optimum conditions for increasing deep lung penetration are: 1) An elongated breath profile, 2) An elongated breath hold time, 3) Delayed actuation timing.

Data also indicated significant differences in penetration index between SMI and pMDI, as expected due to the significant difference in their measured *in vitro* particle size [Mass median aerodynamic diameter (MMAD) = 5µm (SMI), 1µm (MDI)] – the pMDI predictions showed higher deep lung penetration.