In Vitro Effect of Different Airflow Rates on the Aerosol Properties of Nebulized Glycopyrrolate in the eFlow® Closed System and Tiotropium Delivered in the HandiHaler®

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KEY FINDINGS

Delivery of GLY via eFlow® CS nebulizer resulted in consistent drug particle size within the respirable range, high rate of particle delivery and greater deposition of drug particles within the later stages of the NGI across all breathing patterns evaluated in this study.

This study highlights differences in deposition patterns between an eFlow® CS nebulizer and a Handihaler® and may help inform device selection and treatment decisions in COPD.

OBJECTIVE

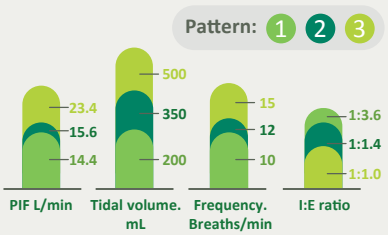
To compare the aerosol performance and drug-delivery properties of two LAMAs – TIO delivered via Handihaler® high resistance DPI, and GLY delivered via eFlow® CS nebulizer

STUDY DESIGN

A next-generation cascade impactor (NGI) was used to assess particle size distribution. Aerosol properties were determined using Copley inhaler testing software.

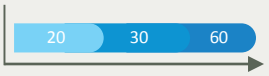
eFlow® CS nebulizer

A breathing simulator was used under three breathing patterns. Pattern 1 represents severe COPD.



Handihaler®

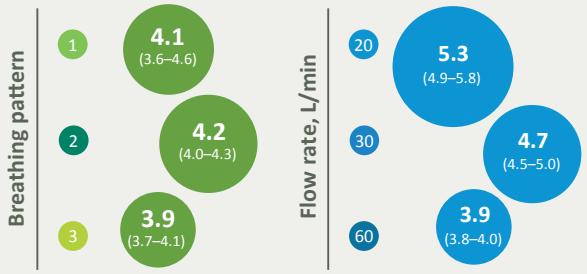
A constant flow rate of 20, 30 or 60 L/min was used



RESULTS

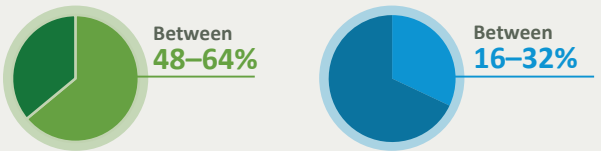
PARTICLE SIZE

MMAD, µM, mean (range)

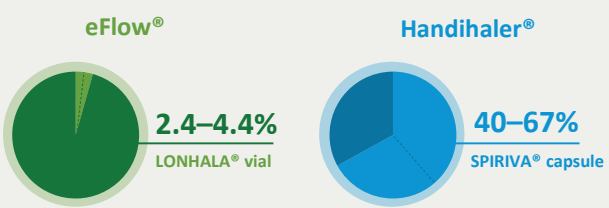


Delivery of GLY via eFlow® CS nebulizer resulted in **consistent drug particle size**

FINE PARTICLE FRACTION

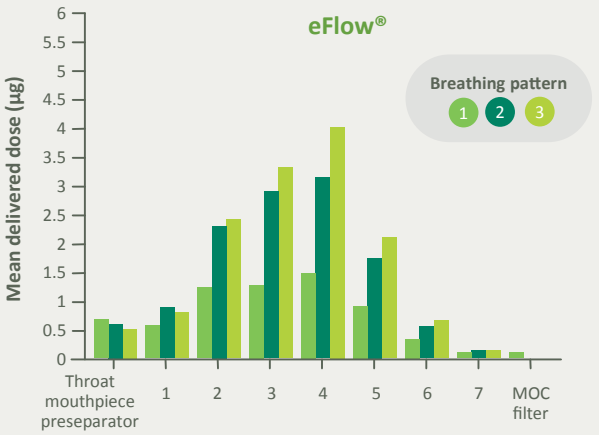


RESIDUAL DOSE

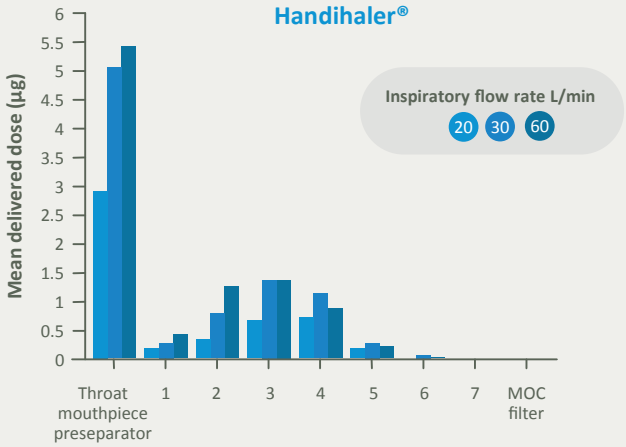


Delivery of GLY via eFlow® CS nebulizer resulted in **high rate of particle delivery**

NGI DEPOSITION PROFILE



Greater deposition in the later stages of the NGI, representative of lower airways



Majority of deposition in the preseparator cup of the NGI, representative of the mouth

Abbreviations: COPD, chronic obstructive pulmonary disease; CS, closed system; DPI, dry powder inhaler; GLY, nebulized glycopyrrolate; I:E ratio, Inspiratory:Expiratory ratio; LAMA, long-acting muscarinic antagonist; MMAD, mass median aerodynamic diameter; MOC, micro-orifice collector; NGI, Next Generation cascade Impactor, PIF, peak inspiratory flow rate; TIO, tiotropium