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Title: In vitro performance of 5 nebuliser systems mimicking a child's breathing pattern

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Body: Nebulisers are recommended in the treatment of acute asthma in children. As choosing the right system can be a crucial factor for a successful aerosol therapy in children, the performance of 5 relevant jet nebulisers was determined. Methods Aerosol delivery of albuterol (Sultanol forte® 2.5 mg/2.5 ml) with 5 different jet nebuliser systems (from PARI, MPV, Omron and PHILmed/3A HEALTH CARE) was assessed over 4 min and analysed by HPLC. With a PARI Compas II breath simulator a child's breathing pattern was mimicked according to Barry/O'Callaghan (1995; n=6). The aerodynamic particle size distribution was determined by a Next Generation Impactor (NGI, Ph.Eur.7.0, Copley Scientific, 15 L/min, n=4). Respirable Drug Delivery Rate (RDDR) was calculated by multiplying the drug delivery rate (DDR) by the Respirable Fraction (%of droplets $\leq 5\mu\text{m}$). Results The DDR during the first 4 min of nebulisation differed from maximal 80 $\mu\text{g}/\text{min}$ (PARI LC Sprint Junior) to minimal 28 $\mu\text{g}/\text{min}$ (AmpollaNebjet). Two of the nebulisers (PARI; MPV MicrodropCalimero) showed a Mass Median Aerodynamic Diameter (MMAD) of approx. 3 μm which is considered as eligible droplet size for children. The RDDR (a predictor for the respirable drug dose per time) varied by a factor of 4 between the systems tested.

	PARI LC Sprint Junior/PARI BOY SX	Medeljet/MPV Family	Calimero Jet/MPV Microdrop	Omron V.V.T.01/Omron CompAir NE-C801	AmpollaNebjet/MIDINEB
Total Output Rate [mg/min]	406	303	237	261	215
RDDR [$\mu\text{g}/\text{min}$]	54	34	41	24	15
MMAD [μm]	3.4	4.6	3.2	4.5	4.7

Conclusion In vitro performance of the 5 nebulisers differs considerably. For children nebulisers with a high RDDR should be selected in order to ensure the best possible therapeutic outcome and adherence.