Assessment of the influence of air flow on the volume of NaCl 0,9% remaining in eFlow® aerosol chamber after completion of inhalation.

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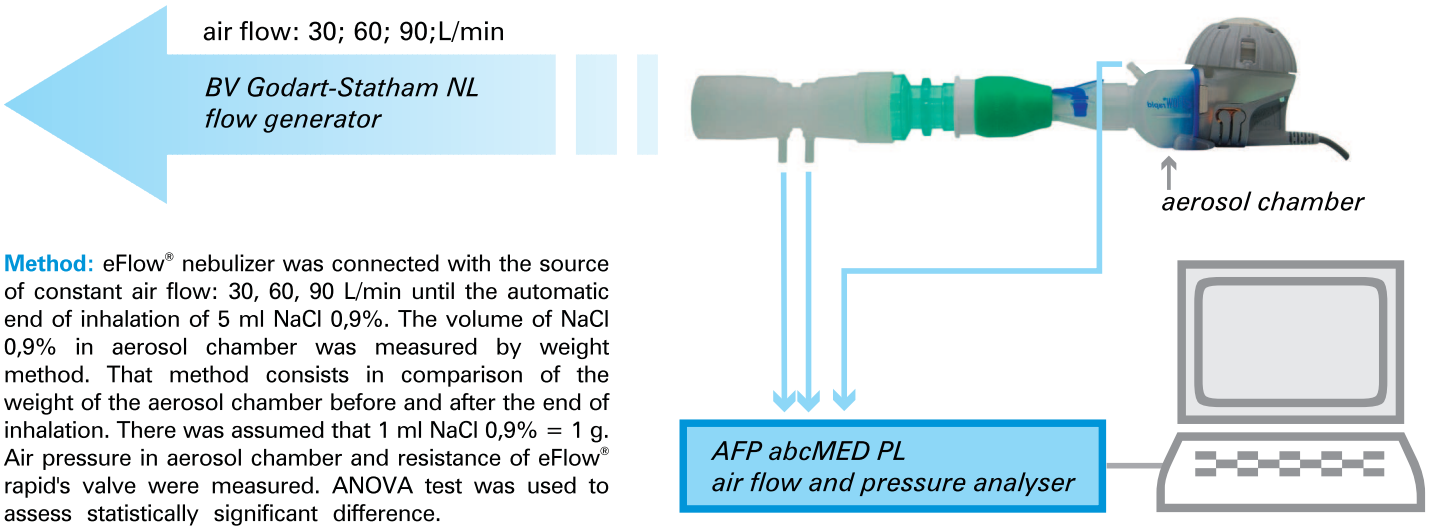
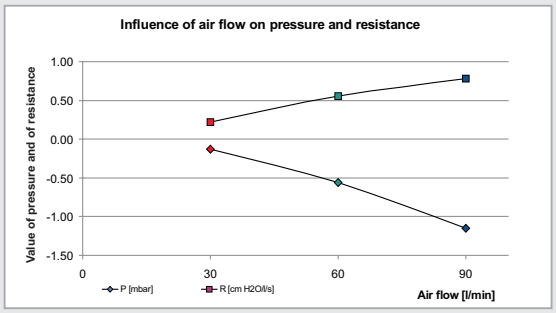
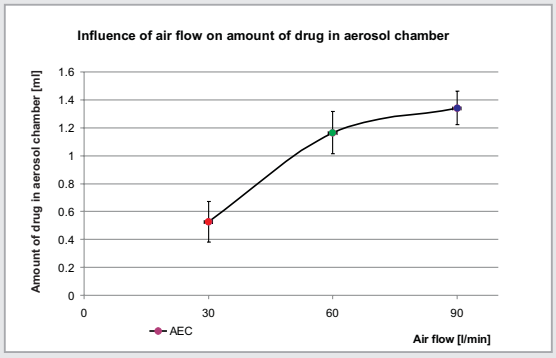
Introduction: eFlow® rapid nebulizer is widely used in clinical trials and medical practice in treatment of cystic fibrosis. Reason for research was the patients' observation that after finishing of inhalation the certain volume of drug remains in nebulizer's aerosol chamber. The aim of the research was to assess the influence of the constant air flow on the volume of NaCl 0,9% remaining in aerosol chamber after automatic termination of inhalation.



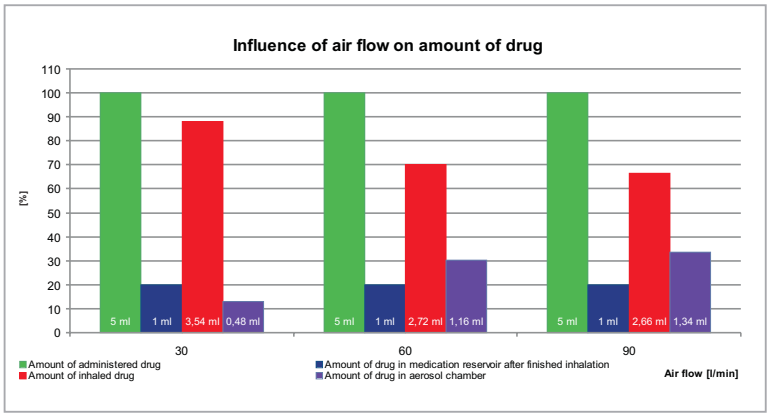
Method: eFlow® nebulizer was connected with the source of constant air flow: 30, 60, 90 L/min until the automatic end of inhalation of 5 ml NaCl 0,9%. The volume of NaCl 0,9% in aerosol chamber was measured by weight method. That method consists in comparison of the weight of the aerosol chamber before and after the end of inhalation. There was assumed that 1 ml NaCl 0,9% = 1 g. Air pressure in aerosol chamber and resistance of eFlow® rapid's valve were measured. ANOVA test was used to assess statistically significant difference.





NaCl 0,9%				
Nebulizer	eFlow rapid®	Type IIa - ventilated		
T [°C]	26			
RH [%]	50			
AF L/min	30	60	90	SSD
Test	A	B	C	P<0,05
P [SD] mbar	-0,13 [0,01]	-0,56 [0,04]	-1,15 [0,06]	P: A/B; A/C; B/C
R [SD] cm H_2O/ L/s	0,22 [0,02]	0,55 [0,03]	0,78 [0,03]	R: A/B; A/C; B/C
AC [SD] ml	0,53 [0,14]	1,16 [0,15]	1,34 [0,12]	AC: A/B; A/C; B/C

T – environment temperature; RH – environment humidity [air]
AF – air flow ; P – air pressure in aerosol chamber; R – resistance of eFlow® rapid's valve
AC – amount of drug in aerosol chamber; SD – standard deviation; SSD – statistically significant difference



Results: Our study demonstrates that constant air flow through eFlow® causes a loss of drug in aerosol chamber, the size of which depends on the volume of air flow. eFlow® is ventilated nebulizer. The probable reason of drug retention in aerosol chamber is vacuum pressure which depends on the inspiratory valve resistance and volume of air flow. That vacuum pressure can cause partial loss of ability to produce drug by nebulizer. Influence of flow on the quality of aerosol during aerosol inhalation was stated in varying degrees in all ventilated nebulizers.

Conclusion: Aerosol inhalation using ventilated nebulizers requires detailed explanation of the optimal method of patients' inhalation.