

Supplementary Materials: Water Uptake by Evaporating pMDI Aerosol Prior to Inhalation Affects Both Regional and Total Deposition in the Respiratory System

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Table S1. Algebraic Expressions for Aerodynamic and Thermodynamic Deposition by Mouth Breathing in the ICRP Model (adapted from ICRP 66. *Annals of the ICRP*, 1994).

		Aerodynamic			Thermodynamic			
		a(ICRP)	R _(ICRP)	p	a(ICRP)	R _(ICRP)	p	
Inhalation	ET*	1.1 x 10 ⁻⁴	$d_{ae}^2 (\dot{V} SF_t^3)^{0.6} (V_T SF_t^2)^{-0.2}$	1.4	9.0	$D(\dot{V} SF_t)^{-1/4}$	0.5	1
	BB	4.08 x 10 ⁻⁶	$d_{ae}^2 \dot{V} SF_t^{2.3}$	1.152	$22.02 SF_t^{1.24} \Psi_{th}$	D _{tB}	0.6391	1-(V _D (ET)/V _T)
	bb	0.1147	$(0.056 + t_b^{1.5}) \times d_{ae}^{t_b^{-0.25}}$	1.173	$-76.8 + 167 SF_b^{0.65}$	D _{tB}	0.5676	1-[(V _D (ET)+V _D (BB))/V _T]
	AI	0.146 x SF _A ^{0.98}	$d_{ae}^2 t_A$	0.6495	$170 + 103 SF_A^{2.13}$	D _{tA}	0.6101	1-[(V _D (ET)+V _D (BB)+V _D (bb))/V _T]
Exhalation	bb	0.1147	$(0.056 + t_b^{1.5}) \times d_{ae}^{t_b^{-0.25}}$	1.173	$-76.8 + 167 SF_b^{0.65}$	D _{tB}	0.5676	1-[(V _D (ET)+V _D (BB))/V _T]
	BB	2.04 x 10 ⁻⁶	$d_{ae}^2 \dot{V} SF_t^{2.3}$	1.152	$22.02 SF_t^{1.24} \Psi_{th}$	D _{tB}	0.6391	1-(V _D (ET)/V _T)
	ET*	1.1 x 10 ⁻⁴	$d_{ae}^2 (\dot{V} SF_t^3)^{0.6} (V_T SF_t^2)^{-0.2}$	1.4	9.0	$D(\dot{V} SF_t)^{-1/4}$	0.5	1

*For this region alternative equation is used to determine the aerodynamic Regional Deposition Efficiency, η_{ae} .

$$\eta_{ae} = 1 - 1 / (a_{(ICRP)} R_{(ICRP)} p_{(ICRP)} + 1).$$

d_{ae} Aerodynamic diameter

SF Scaling factor to account for subject's size (see Table S-2)

D Diffusion constant

Ψ_{th} Empirical correction factor to account for the turbulent airflow in the initial generations of the tracheal-bronchial tree

t Residence time (s) in a given region (region indicated by subscript).

Table S2. Physiological Parameters used in the ICRP Model (adapted from ICRP 66. *Annals of the ICRP*, 1994).

Parameter	Female (Sitting)	Male (Sitting)
Functional Residual Capacity (FRC) (mL)	2681	3301
Extrathoracic Dead Space (V _D (ET)) (mL)	40	50
Bronchi and Tracheal Dead Space (V _D (BB)) (mL)	40	49
Bronchiole Dead Space (V _D (bb)) (mL)	44	47
Tracheal Scale Factor (SF _t)	1.08	1.00
Bronchiolar Scale Factor (SF _b)	1.04	1.00
Respiratory Bronchiole Scale Factor (SF _a)	1.07	1.00
Tidal Volume (V _T) (mL)	464	750
Volumetric Flow Rate (\dot{V}) (mL s ⁻¹)	217	300

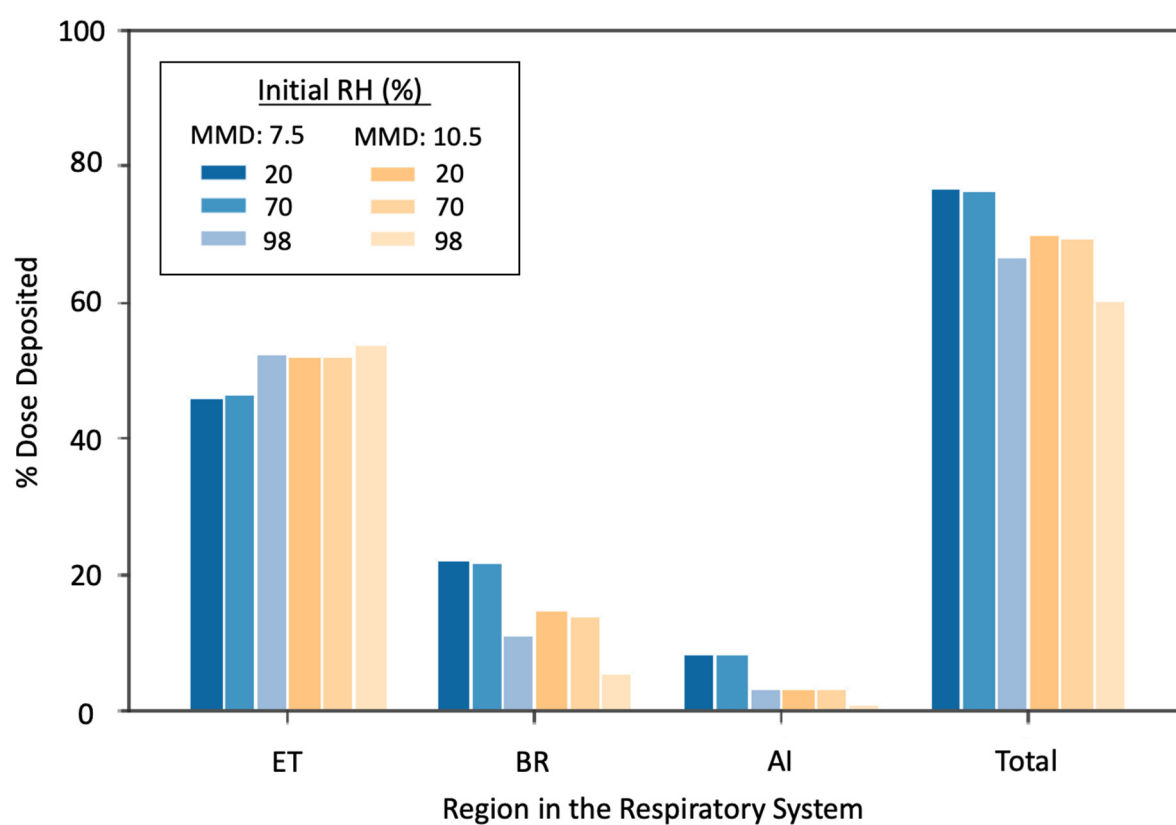


Figure S1. The regional and total dosage depositions in the respiratory system of two glycerol droplet distributions (MMAD: 7.5, 10.5, GSD: 1.8, 1.8) initially equilibrated in either 20, 70 or 98 % RH. ICRP simulation set to an adult Caucasian male who was seated.