

Supplemental Materials

Rapid, Selective and Homogeneous Brain Cooling with Transnasal Flow of Ambient Air for Pediatric Resuscitation

Raymond C Koehler¹, Michael Reyes¹, C Danielle Hopkins¹, Jillian S Armstrong¹, Suyi Cao¹, Ewa Kulikowicz¹, Jennifer K Lee¹, Harikrishna Tandri²

Departments of ¹Anesthesiology and Critical Care Medicine, and ²Medicine, Division of Cardiology, Johns Hopkins University School of Medicine

Supplemental Table 1. Arterial blood gases and pH during high nasal airflow at different rates.

	Airflow	Baseline	1 hour	2 hour	3 hour	4 hour
1.8-kg piglets						
pH	4 L/min	7.35 ± 0.07	7.34 ± 0.04	7.34 ± 0.06	7.33 ± 0.06	7.32 ± 0.05
	8 L/min	7.35 ± 0.06	7.37 ± 0.07	7.36 ± 0.04	7.38 ± 0.07	7.40 ± 0.08
	16 L/min	7.37 ± 0.07	7.37 ± 0.07	7.39 ± 0.10	7.38 ± 0.03	7.38 ± 0.02
PCO ₂ (mmHg)	4 L/min	42 ± 8	41 ± 5	39 ± 6	39 ± 6	42 ± 6
	8 L/min	44 ± 7	37 ± 4	38 ± 5	37 ± 8	35 ± 9
	16 L/min	43 ± 5	41 ± 3	37 ± 6	42 ± 8	42 ± 8
PO ₂ (mmHg)	4 L/min	178 ± 31	169 ± 41	157 ± 24*	144 ± 14*	145 ± 15*
	8 L/min	149 ± 11	155 ± 39	135 ± 32	139 ± 25	137 ± 27
	16 L/min	146 ± 12	146 ± 10	138 ± 16	119 ± 50	119 ± 53
4-kg piglet						
pH	16 L/min	7.38 ± 0.13	7.46 ± 0.06	7.45 ± 0.04	7.46 ± 0.03	7.45 ± 0.06
	32 L/min	7.36 ± 0.08	7.34 ± 0.14	7.32 ± 0.15	7.31 ± 0.14	7.30 ± 0.16
	48 L/min	7.43 ± 0.04	7.37 ± 0.07	7.38 ± 0.05	7.39 ± 0.06	7.40 ± 0.06
PCO ₂ (mmHg)	16 L/min	48 ± 19	36 ± 7	36 ± 8	33 ± 4*	35 ± 3*
	32 L/min	41 ± 6	43 ± 18	48 ± 18	46 ± 18	47 ± 18
	48 L/min	37 ± 1	41 ± 7	35 ± 3	37 ± 3	34 ± 2
PO ₂ (mmHg)	16 L/min	135 ± 52	138 ± 46	145 ± 37	147 ± 33	146 ± 27
	32 L/min	147 ± 42	157 ± 50	146 ± 33	152 ± 29	154 ± 59
	48 L/min	133 ± 35	135 ± 36	147 ± 60	124 ± 66	177 ± 47
15-kg piglets						
pH	16 L/min	7.42 ± 0.09	7.39 ± 0.05	7.39 ± 0.05	7.36 ± 0.09	7.36 ± 0.12
	32 L/min	7.45 ± 0.05	7.42 ± 0.03	7.47 ± 0.05	7.44 ± 0.05	7.46 ± 0.07
	48 L/min	7.39 ± 0.06	7.41 ± 0.05	7.41 ± 0.04	7.41 ± 0.04	7.41 ± 0.05
PCO ₂ (mmHg)	16 L/min	35 ± 6	37 ± 4	38 ± 7	40 ± 7	39 ± 8
	32 L/min	34 ± 5	42 ± 4	36 ± 7	37 ± 7	34 ± 6
	48 L/min	39 ± 8	41 ± 5	39 ± 7	38 ± 4	39 ± 8
PO ₂ (mmHg)	16 L/min	162 ± 19	151 ± 27	145 ± 35	143 ± 34	145 ± 34
	32 L/min	165 ± 12	159 ± 14	162 ± 17	155 ± 12	155 ± 14
	48 L/min	167 ± 14	157 ± 12	144 ± 23*	144 ± 25*	137 ± 31*

Values are means ±SD. * *P* <0.05 from baseline by repeated measures ANOVA and Dunnett's test.

Supplemental Table 2. Arterial and sagittal sinus blood analysis in blood flow experiment.

	Baseline	Duration of nasal airflow		
		15 min	30 min	60 min
4-kg piglets				
Arterial pH	7.33 ± 0.07	7.33 ± 0.12	7.32 ± 0.07	7.30 ± 0.10
Venous pH	7.26 ± 0.06	7.28 ± 0.11	7.23 ± 0.06	7.22 ± 0.07
Arterial PCO ₂ (mmHg)	41.3 ± 2.7	43.1 ± 9.6	40.6 ± 9.0	41.4 ± 7.6
Venous PCO ₂ (mmHg)	51.3 ± 7.4	49.1 ± 8.9	46.9 ± 7.6	50.2 ± 5.3
Arterial PO ₂ (mmHg)	143 ± 15	127 ± 27	133 ± 25	135 ± 26
Venous PO ₂ (mmHg)	43.6 ± 11.6	48.0 ± 12.5	47.9 ± 12.8	48.2 ± 16.0
Hemoglobin (g/dL)	8.7 ± 1.7	8.7 ± 1.2	8.3 ± 1.4	8.2 ± 1.5
Venous O ₂ saturation (%)	50.4 ± 16.9	60.4 ± 16.0	60.7 ± 16.2*	62.8 ± 17.6*
CaO ₂ – CvO ₂ (mL O ₂ /dL)	5.9 ± 1.6	4.7 ± 1.7*	4.5 ± 1.7**	4.1 ± 1.7***
15-kg piglets				
Arterial pH	7.38 ± 0.06	7.38 ± 0.08	7.34 ± 0.06	7.34 ± 0.08
Venous pH	7.33 ± 0.07	7.34 ± 0.08	7.30 ± 0.06	7.29 ± 0.08
Arterial PCO ₂ (mmHg)	37.5 ± 3.6	37.5 ± 5.5	37.7 ± 7.2	43.6 ± 9.1
Venous PCO ₂ (mmHg)	45.4 ± 6.2	44.2 ± 7.7	46.2 ± 6.4	51.7 ± 13.8
Arterial PO ₂ (mmHg)	153 ± 7	150 ± 17	144 ± 16	142 ± 16
Venous PO ₂ (mmHg)	51.1 ± 14.9	55.6 ± 18.0	64.9 ± 9.8	59.4 ± 7.3
Hemoglobin (g/dL)	10.9 ± 1.4	10.8 ± 1.6	10.6 ± 1.8	11.4 ± 1.6
Venous O ₂ saturation (%)	68.8 ± 14.4	78.8 ± 4.3	81.5 ± 9.0*	79.8 ± 7.6*
CaO ₂ – CvO ₂ (mL O ₂ /dL)	5.1 ± 2.6	3.4 ± 1.0	3.1 ± 1.6*	3.4 ± 1.4

Values are means ± SD; * $P < 0.05$, ** $P < 0.01$, $P < 0.001$ from baseline by repeated measures ANOVA and the Dunnett's test.