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**Allergic Inflammation in the Human Lower Respiratory Tract Affected by
Exposure to Diesel Exhaust**

Marc A. Riedl et al.

Appendix C. Summary Statistics

Note: Appendices Available on the Web may appear in a different order than in the original Investigators' Report, and some remnants of their original names may be apparent. HEI has not changed the content of these documents, only the letter identifier.

Appendix C was originally Appendix B

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APPENDIX C

Summary Statistics

The following tables provide summary data for variables not reported in detail in the main text. These include breakdowns by phase, asthma status, and atmosphere for post-exposure sputum measurements (Tables B1-B4), serum changes before to after exposure (Table B5), symptom changes during and after exposure (Tables B6 and B7), and physiologic changes before to after exposure (Tables B8-B12). Table B13 shows summary statistics for pre-exposure measurements, as well as for "baseline" sputum cell counts separated from exposure studies.

Table B1. Total and Differential Sputum Cell Counts on Day 2 (~22 hr After End of Exposure), by Asthma Status and Atmosphere, Estimated Mean and Standard Error from Mixed-Model Analysis*

Asth.	Atm.	Tot. Cells (1000s/ul)	SE	Macrophages (%)	SE	Lymphocyt. (%)	SE	PMNs (%)	SE	Eosinoph. (%)	SE
(Phase 1)											
H	DE	0.86	0.51	51.50	9.85	6.75	5.55	39.25	10.99	0.00	2.24
H	NO2	1.25	0.51	65.25	9.85	5.50	5.55	29.25	10.99	0.00	2.24
H	FA	1.17	0.51	50.75	9.85	8.25	5.55	41.00	10.99	0.00	2.24
A	DE	1.59	0.26	45.62	5.39	2.62	3.07	49.46	5.98	2.60	1.21
A	NO2	1.63	0.28	45.62	5.39	1.94	3.07	49.13	5.98	3.79	1.21
A	FA	1.55	0.27	40.67	5.08	5.80	2.86	51.60	5.68	1.87	1.16
(Phase 2)											
A	DE	1.21	0.28	40.40	4.59	2.07	1.69	56.07	4.92	1.47	0.94
A	NO2	1.17	0.28	49.31	4.66	4.57	1.74	45.26	5.01	0.98	0.94
A	FA	1.10	0.28	46.13	4.59	2.00	1.69	49.87	4.92	1.33	0.94

Table B2. Sputum Cell Immunoglobulin Assays on Day 2 (~22 hr After End of Exposure), by Asthma Status and Atmosphere, Estimated Mean and Standard Error from Mixed-Model Analysis*

Asth.	Atm.	log IgA (ng/ml)	SE	log IgE (ng/ml)	SE	log IgG (ng/ml)	SE	log IgG4 (ng/ml)	SE	log IgM (ng/ml)	SE
(Phase 1)											
H	DE	1.308	0.335	-2.026	0.562	0.581	0.334	0.616	0.258	1.517	0.277
H	NO2	1.357	0.335	-2.478	0.562	0.608	0.334	0.703	0.258	1.713	0.277
H	FA	1.332	0.335	-1.984	0.562	0.463	0.334	0.544	0.258	1.556	0.277
A	DE	1.990	0.173	-2.495	0.290	0.836	0.173	1.025	0.133	1.439	0.143
A	NO2	1.958	0.173	-2.299	0.290	0.800	0.173	0.847	0.133	1.402	0.143
A	FA	2.004	0.173	-2.317	0.290	0.825	0.173	1.139	0.133	1.449	0.143
(Phase 2)											
A	DE	1.095	0.258	-1.566	0.171	0.385	0.074	0.360	0.318	1.250	0.174
A	NO2	1.083	0.264	-1.651	0.174	0.322	0.075	-0.216	0.324	1.380	0.178
A	FA	0.825	0.258	-1.377	0.171	0.412	0.074	0.275	0.318	1.181	0.174

*H = healthy subjects, A = asthmatic subjects. Analytical model tests main effect of atmosphere for phase 2, main and interactive effects of asthma status and atmosphere for phase 1. For each phase, atmosphere differences are nonsignificant for all variables.

Table B3. Sputum Cell Interleukin Assays on Day 2 (~22 hr After End of Exposure), by Asthma Status and Atmosphere, Estimated Mean and Standard Error from Mixed-Model Analysis*

Asth.	Atm.	log IL4 (pg/ml)	SE	log IL5 (pg/ml)	SE	log IL8 (pg/ml)	SE	log IL12 (pg/ml)	SE
(Phase 1)									
H	DE	0.376	0.497	0.603	0.512	1.425	0.219	1.110	0.353
H	NO2	-0.310	0.497	-0.361	0.512	1.708	0.219	0.868	0.353
H	FA	0.153	0.497	0.234	0.512	1.515	0.219	1.088	0.353
A	DE	1.314	0.257	0.241	0.264	2.083	0.113	1.001	0.182
A	NO2	0.908	0.257	0.278	0.264	1.961	0.113	1.321	0.186
A	FA	1.094	0.257	0.458	0.264	2.134	0.113	1.017	0.182
(Phase 2)									
A	DE	1.427	0.064	0.059	0.338	1.986	0.145	1.887	0.140
A	NO2	1.453	0.066	0.056	0.350	2.008	0.146	1.981	0.142
A	FA	1.477	0.064	-0.336	0.338	2.030	0.145	1.812	0.140

Table B4. Other Sputum Cell Assays on Day 2 (~22 hr After End of Exposure), by Asthma Status and Atmosphere, Estimated Mean and Standard Error from Mixed-Model Analysis*

Asth	Atm	log RANTES (pg/ml)	SE	log ECP (ng/ml)	SE	log Eotaxin (pg/ml)	SE	log Inf. ... (pg/ml)	SE	log TNF... (pg/ml)	SE	log GMCSF (pg/ml)	SE
(Phase 1)													
H	DE	1.824	0.341	0.542	0.298	-0.649	0.399	0.292	0.334	0.763	0.259	-3.301	0.532
H	NO2	2.219	0.341	0.677	0.298	-0.197	0.399	-0.012	0.334	0.763	0.259	-3.301	0.532
H	FA	1.930	0.341	0.182	0.298	-0.389	0.399	0.343	0.334	0.763	0.259	-3.301	0.532
A	DE	1.834	0.176	1.445	0.154	-0.443	0.206	0.407	0.173	1.546	0.134	0.929	0.275
A	NO2	2.059	0.176	1.334	0.154	-0.447	0.209	0.148	0.173	1.286	0.134	0.737	0.283
A	FA	2.042	0.176	1.515	0.154	-0.203	0.206	0.375	0.173	1.335	0.134	0.837	0.275
(Phase 2)													
A	DE	1.441	0.099	1.054	0.132	1.072	0.068	1.707	0.234	1.491	0.084	0.095	0.087
A	NO2	1.474	0.102	0.981	0.134	1.025	0.069	1.790	0.236	1.508	0.086	0.107	0.087
A	FA	1.478	0.099	1.025	0.132	0.996	0.068	1.912	0.234	1.667	0.084	0.090	0.087

*H = healthy subjects, A = asthmatic subjects. Analytical model tests main effect of atmosphere for phase 2, main and interactive effects of asthma status and atmosphere for phase 1. See text for explanation of significant variation. (For TNF..., GMCSF, all H subjects' values were below quantifiable level.)

Table B5. Serum Assays: Change from Pre-Exposure to Day 2, by Asthma Status and Atmosphere, Estimated Mean and Standard Error from Mixed-Model Analysis*

Asth	Atm	log IgA	SE	log IgE	SE	log IgG	SE	log IgG4	SE	log IgM	SE	log IL6	SE	log ICAM	SE
		ng/ml		ng/ml		mcg/ml		ng/ml		ng/ml		pg/ml		ng/ml	
(Phase 1)															
H	DE	0.884	0.236	-0.079	0.203	-0.010	0.429	0.016	0.159	0.085	0.078	-0.029	0.167	-0.022	0.067
H	NO2	0.363	0.272	-0.006	0.203	-0.137	0.429	0.122	0.159	0.142	0.078	0.153	0.167	0.045	0.067
H	FA	-0.280	0.272	-0.019	0.203	0.185	0.429	-0.023	0.159	-0.011	0.078	0.001	0.167	-0.015	0.067
A	DE	-0.056	0.122	0.013	0.108	-0.095	0.230	0.150	0.082	-0.044	0.049	0.112	0.086	0.027	0.035
A	NO2	0.077	0.122	0.009	0.108	-0.456	0.238	0.074	0.082	0.044	0.049	0.114	0.086	-0.019	0.035
A	FA	0.017	0.126	0.192	0.113	0.311	0.272	0.040	0.082	0.040	0.052	0.114	0.089	0.005	0.036
(Phase 2)															
A	DE	-0.058	0.025	-0.050	0.014	0.033	0.110	-0.150	0.108	-0.037	0.046	0.017	0.093	0.038	0.033
A	NO2	-0.007	0.026	-0.020	0.014	0.143	0.114	-0.006	0.112	-0.056	0.048	0.019	0.089	-0.052	0.036
A	FA	0.006	0.026	-0.003	0.014	0.009	0.114	0.219	0.112	0.003	0.048	0.125	0.086	-0.016	0.034

*H = healthy subjects, A = asthmatic subjects. Analytical model tests main effect of atmosphere for phase 2, main and interactive effects of asthma status and atmosphere for phase 1. See text for explanation of significant variation. Additional data for phase 2 only: Mean (SE) cat-specific IgE (units/ml, log-transformed): 0.091 (0.098) for DE, -0.086 (0.101) for NO2, 0.144 (0.101) for FA, differences not significant.

Table B6. Symptom Score Mean Change During Exposure Period (Total, Respiratory, Cardiac, Miscellaneous) Relative to Pre-Exposure, by Asthma Status and Atmosphere, Estimated Mean and Standard Error from Mixed-Model Analysis*

Asth	Atm	Total	SE	Respir.	SE	Card.	SE	Misc.	SE
(Phase 1)									
H	DE	0.84	0.68	0.09	0.12	0.00	0.14	0.75	0.54
H	NO2	1.06	0.68	0.19	0.12	0.22	0.14	0.66	0.54
H	FA	0.09	0.68	0.00	0.12	0.09	0.14	0.00	0.54
A	DE	3.46	0.86	1.36	0.62	0.55	0.16	1.55	0.28
A	NO2	1.83	0.86	1.19	0.62	0.26	0.16	0.38	0.28
A	FA	0.79	0.86	0.17	0.62	0.34	0.16	0.28	0.28
(Phase 2)									
A	DE	2.03	1.11	0.48	0.64	0.39	0.22	1.17	0.45
A	NO2	1.66	1.11	0.62	0.64	0.32	0.22	0.72	0.45
A	FA	1.89	1.11	0.84	0.64	0.36	0.22	0.69	0.45

Table B7. Symptom Score Mean Change After Exposure Period (Total, Respiratory, Cardiac, Miscellaneous) Relative to Pre-Exposure, by Asthma Status and Atmosphere, Estimated Mean and Standard Error from Mixed-Model Analysis*

Asth	Atm	Total	SE	Respir.	SE	Card.	SE	Misc.	SE
(Phase 1)									
H	DE	0.69	0.37	0.19	0.84	0.00	0.11	0.50	0.35
H	NO2	0.56	0.37	0.25	0.84	0.00	0.11	0.31	0.35
H	FA	0.25	0.37	0.25	0.84	0.00	0.11	0.00	0.35
A	DE	1.00	0.54	0.27	0.48	0.18	0.06	0.55	0.19
A	NO2	1.28	0.54	1.22	0.48	0.05	0.06	0.02	0.19
A	FA	0.31	0.56	0.05	0.49	0.10	0.06	0.18	0.19
(Phase 2)									
A	DE	-0.23	0.82	-0.40	0.48	0.17	0.16	0.00	0.43
A	NO2	0.28	0.82	-0.06	0.48	0.15	0.16	0.20	0.43
A	FA	1.12	0.82	0.42	0.48	0.12	0.16	0.58	0.43

*H = healthy subjects, A = asthmatic subjects. Each score is averaged from multiple questionnaire administrations during (or after) exposure period, then pre-exposure baseline score is subtracted. Analytical model tests main effect of atmosphere. Separate analyses for healthy Phase 1, asthmatic Phase 1, asthmatic Phase 2.

Table B8. Forced Vital Capacity and Forced Expired Volume in 1 Second: Percentage Changes Post-Exposure and Day 2 Relative to Pre-Exposure*

Asth	Atm	FVC % Change				FEV1 % Change				
		post	SE	day 2	SE	post	SE	day 2	SE	
(Phase 1)										
H	DE	-1.02	1.92	-3.60	3.43	0.59	2.95	-1.97	3.69	
H	NO2	0.05	1.92	-3.54	3.43	-0.54	2.95	-3.77	3.69	
H	FA	0.26	1.92	-0.33	3.43	0.98	2.95	1.25	3.69	
A	DE	0.87	0.99	-1.14	1.82	2.98	1.53	0.04	1.97	
A	NO2	0.44	0.99	-2.67	1.82	2.97	1.52	-1.42	1.97	
A	FA	0.58	0.99	-1.44	1.77	1.75	1.52	-0.72	1.91	
(Phase 2)										
A	DE	0.27	1.85	1.75	1.72	0.22	1.60	-0.15	1.65	
A	NO2	-0.07	1.85	2.78	1.67	2.21	1.60	2.97	1.59	
A	FA	-1.24	1.85	-1.49	1.67	0.10	1.60	-0.91	1.59	

Table B9. Specific Airway Resistance [thoracic gas volume x airway resistance: l x cmH₂O/(l/sec)]: Percentage Changes Post-Exposure and Day 2 Relative to Pre-Exposure*

Asth	Atm	SRaw % Change			
		post	SE	day 2	SE
(Phase 1)					
H	DE	-9	19	7	23
H	NO2	-15	17	-31	23
H	FA	16	20	7	23
A	DE	18	10	51	13
A	NO2	-4	10	-11	12
A	FA	-4	10	-12	11
(Phase 2)					
A	DE	-5	8	3	8
A	NO2	-3	8	-15	8
A	FA	-6	8	-8	8

*H = healthy subjects, A = asthmatic subjects. Analytical model tests main effect of atmosphere for phase 2, main and interactive effects of asthma status and atmosphere for phase 1. See text for explanation of significant variation.

Table B10. Blood Pressure: Changes Post-Exposure and Day 2 Relative to Pre-Exposure*

Asth	Atm	Systolic BP Change (mmHg)				Diastolic BP Change (mmHg)			
		post	SE	day 2	SE	post	SE	day 2	SE
(Phase 1)									
H	DE	-5.0	5.8	-2.8	6.4	7.0	3.8	3.5	4.4
H	NO2	-1.8	5.8	3.5	6.4	-5.0	3.8	-6.3	4.4
H	FA	-2.5	5.8	-4.0	6.4	0.3	3.8	0.8	4.4
A	DE	1.1	3.0	5.4	3.4	1.7	1.9	2.9	2.4
A	NO2	-3.5	3.0	4.7	3.4	3.9	1.9	2.8	2.4
A	FA	-5.9	3.0	-2.0	3.4	-2.1	1.9	-0.3	2.4
(Phase 2)									
A	DE	-0.2	3.1	-1.6	3.5	1.1	2.6	2.7	2.4
A	NO2	-1.2	3.1	-0.9	3.4	0.1	2.6	-0.3	2.3
A	FA	-5.3	3.3	-4.1	3.4	-2.3	2.7	-3.1	2.3

Table B11. Arterial Oxygen Saturation (% oxyhemoglobin estimated by fingertip pulse oximetry) Changes Post-Exposure and Day 2 Relative to Pre-Exposure*

Asth	Atm	SaO ₂ Change			
		post	SE	day 2	SE
(Phase 1)					
H	DE	-0.75	0.58	-0.14	0.60
H	NO2	-0.50	0.58	-0.75	0.52
H	FA	-0.75	0.58	-0.01	0.60
A	DE	-0.48	0.31	0.47	0.29
A	NO2	-0.24	0.33	-0.50	0.29
A	FA	-0.13	0.30	0.11	0.29
(Phase 2)					
A	DE	-0.31	0.37	-0.17	0.31
A	NO2	-0.10	0.35	-0.37	0.30
A	FA	-0.46	0.36	-0.29	0.31

*H = healthy subjects, A = asthmatic subjects. Analytical model tests main effect of atmosphere for phase 2, main and interactive effects of asthma status and atmosphere for phase 1. See text for explanation of significant variation.

Table B12. Exhaled Nitric Oxide and Carbon Monoxide: Changes Post-Exposure and Day 2 Relative to Pre-Exposure*

Asth	Atm	FeNO Change (ppb)				FeCO Change (ppm)					
		post	SE	day 2	SE	post	SE	day 2	SE		
(Phase 1)											
H	DE	0.45	3.22	1.67	4.38	0.71	0.37	0.54	1.49		
H	NO2	1.32	3.27	0.27	4.35	0.59	0.37	0.04	1.49		
H	FA	0.76	3.22	1.45	4.36	0.04	0.37	0.11	1.49		
A	DE	0.21	1.71	2.99	2.32	0.27	0.19	1.97	0.77		
A	NO2	-1.27	1.68	-2.41	2.24	-0.25	0.20	0.01	0.83		
A	FA	1.75	1.71	2.54	2.34	-0.19	0.20	0.49	0.77		
(Phase 2)											
A	DE	-1.65	1.50	5.42	3.55	0.24	0.25	0.71	0.30		
A	NO2	-1.77	1.53	8.55	3.58	-0.92	0.25	0.26	0.30		
A	FA	-1.83	1.63	4.34	3.83	-0.23	0.27	0.27	0.34		

*H = healthy subjects, A = asthmatic subjects. Analytical model tests main effect of atmosphere for phase 2, main and interactive effects of asthma status and atmosphere for phase 1. Model also adjusts exhaled concentration for concurrent ambient concentration. See text for explanation of significant variation.

Table B13. Pre-Exposure Measurements: Summary Statistics*

Variable	Units	Prelim. Healthy		Phase 1 Asthmatic		Phase 2 Asthmatic	
		mean	SD	mean	SD	mean	SD
Sputum total cells	cells/ml	1165	618	1593	976	1101	1041
Sputum macrophages	%	50.8	24.6	40.7	22.0	46.1	18.9
Sputum lymphocytes	%	8.2	5.6	5.8	19.4	2.0	1.2
Sputum PMNs	%	41.0	29.2	51.6	25.9	49.9	17.8
Sputum eosinophils	%	0.0	0.0	1.9	4.5	1.3	4.6
Serum IgA	ng/ml	128.5	6.2	116.7	5.9	127.0	1.4
Serum IgE	ng/ml	0.4	2.4	26.6	5.3	2.3	1.7
Serum IgG	ng/ml	41.6	1.9	975.1	61.1	103.7	2.7
Serum IgG4	ng/ml	54.1	3.7	133.0	3.8	114.3	7.1
Serum IgM	ng/ml	364.7	1.5	393.1	1.8	246.8	6.0
Serum IL-6	pg/ml	5.1	1.5	15.7	5.5	140.2	2.4
Serum ICAM	ng/ml	14.0	1.4	7.2	1.6	34.9	2.4
FVC	ml	4294	497	4293	1156	3794	864
FEV1	ml	3780	372	3179	877	2916	729
SRaw	l x (cmH ₂ O/(l/sec))	6.9	1.5	9.2	5.3	8.4	4.3
BP systolic	mm Hg	106.8	10.6	117.1	15.9	117.4	15.6
BP diastolic	mm Hg	67.8	8.5	73.5	8.9	76.7	10.6
SaO ₂	%	98.8	0.9	98.2	1.0	98.1	1.2
FeNO	ppb	13.6	7.3	45.2	49.0	45.3	28.1
FeCO	ppm	0.3	0.3	1.2	0.9	1.3	1.3
Total symptoms	(arbitrary score)	0.0	0.0	1.2	2.0	2.0	3.3
Respiratory symptoms	(arbitrary score)	0.0	0.0	1.0	1.8	1.0	1.7
Cardiac symptoms	(arbitrary score)	0.0	0.0	0.0	0.0	0.04	0.2
Miscellaneous symptoms	(arbitrary score)	0.0	0.0	0.3	0.6	0.9	2.3

*Tabulated data are geometric means and standard deviations for serum variables, arithmetic means and standard deviations for all other variables. Sputum data are taken from "baseline" measurements, separated from exposure studies by at least 2 weeks. (No pre-exposure sputum samples were collected.)