

Supplementary Information (SI)

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Underground Salt and Potash Workers exposed to Nitrogen Oxides and Diesel Exhaust – Assessment of specific Effect Biomarkers

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Table S1 Duration of employment and age of non-participants

Parameter	Duration of employment of non-participants [Years]	Age of non-participants [Years]
N	1456	1456
Median (IQR)	14.6 (24.2)	43.7 (21.4)

Table S2 Number N, median (IQR) and mean (SD) pre- and post-shift measurements of FEV₁% and FVC%, by smoking status and exposure group

Group of biomarkers	Biomarkers	Above-ground facility			Underground					
		Reference			Maintenance			Mining		
		N	Median (IQR)	Mean (SD)	N	Median (IQR)	Mean (SD)	N	Median (IQR)	Mean (SD)
Respiratory biomarkers	FEV₁% [%] (pre shift)									
	Non-smoker	106	94.0 (17.0)	94.9 (12.2)	96	99.5 (17.5)	97.2 (12.8)	316	96.0 (14.5)	95.0 (11.3)
	Former smoker	62	99.0 (18.0)	98.0 (14.4)	41	93.0 (16.0)	90.8 (11.7)	161	93.0 (15.0)	93.3 (11.0)
	Current smoker	68	91.0 (11.0)	90.8 (11.9)	46	94.0 (11.0)	93.1 (10.7)	239	92.0 (13.0)	92.3 (10.6)
	FEV₁% [%] (post shift)									
	Non-smoker	106	92.0 (19.0)	94.3 (12.1)	96	99.0 (15.5)	97.4 (13.1)	316	95.5 (15.0)	94.9 (11.7)
	Former smoker	62	98.4 (18.0)	98.1 (14.3)	41	91.0 (16.0)	90.7 (11.1)	161	94.0 (16.0)	94.1 (11.0)
	Current smoker	68	90.0 (13.0)	90.1 (11.0)	46	94.5 (12.0)	94.4 (10.0)	239	93.0 (14.0)	92.3 (10.4)
	FVC% [%] (pre shift)									
	Non-smoker	106	96.0 (17.0)	96.7 (11.9)	96	100.0 (14.0)	99.3 (10.7)	316	98.0 (14.0)	98.1 (10.3)
	Former smoker	62	98.5 (14.0)	99.9 (11.8)	41	96.0 (13.0)	94.4 (10.0)	161	98.0 (13.0)	97.5 (10.3)
	Current smoker	68	96.0 (9.5)	95.9 (9.1)	46	96.0 (17.0)	99.2 (11.4)	239	98.0 (13.0)	97.2 (9.6)
	FVC% [%] (post shift)									
	Non-smoker	106	95.5 (17.0)	96.4 (11.9)	96	100.0 (14.0)	99.0 (11.1)	316	98.0 (14.0)	97.9 (10.4)
	Former smoker	62	99.0 (14.0)	99.4 (11.4)	41	95.0 (10.0)	94.4 (10.0)	161	97.0 (15.0)	97.9 (9.9)
	Current smoker	68	95.0 (9.0)	94.9 (9.1)	46	100.5 (18.0)	99.9 (11.3)	239	97.0 (14.0)	97.0 (9.5)

Table S3 Number N and mean (SD), pre shift, post shift and post- vs. pre-shift differences in cardiovascular biomarkers and biomarkers of inflammation and immune response, by exposure group; and number N and mean (SD), pre shift, post shift and post- vs. pre-shift differences of FeNO as well as pre- and post-shift measurements of FEV₁%/FVC%, by smoking status and exposure group

Group of biomarkers	Biomarkers	Above-ground facility				Underground							
		Reference				Maintenance				Mining			
		N*	Mean (SD)			N*	Mean (SD)			N*	Mean (SD)		
			Pre shift	Post shift	post-vs. pre-shift		Pre shift	Post shift	post-vs. pre-shift		Pre shift	Post shift	post-vs. pre-shift
Cardiovascular biomarkers	PTT [s]	229	33.3 (5.7)	32.6 (4.2)	-0.8 (5.5)	193	32.6 (4.7)	32.8 (4.1)	0.1 (3.9)	765	32.7 (4.2)	32.6 (4.2)	-0.1 (2.9)
	Thrombocytes [1/ni]	231	236.2 (49.8)	242.0 (52.1)	7.0 (19.9)	187	235.8 (54.6)	244.0 (52.0)	7.3 (22.7)	770	236.7 (48.2)	241.8 (48.2)	5.2 (20.8)
	SBP [mmHg]	243	125.8 (12.8)	127.4 (12.1)	1.6 (12.0)	202	126.3 (12.0)	127.8 (13.0)	1.4 (12.2)	799	128.3 (12.8)	129.1 (11.6)	0.8 (13.1)
	DBP [mmHg]	243	81.5 (7.8)	81.2 (7.6)	-0.4 (8.5)	202	80.6 (7.3)	81.3 (7.8)	0.7 (8.3)	799	82.0 (7.8)	81.6 (7.7)	-0.3 (8.6)
Biomarkers of inflammation and immune response	Neutrophils [%]	228	52.9 (9.4)	53.9 (8.0)	1.0 (9.5)	187	52.1 (8.6)	54.1 (7.4)	2.0 (8.9)	762	53.5 (9.1)	54.7 (7.8)	1.1 (9.4)
	IL-6 [pg/ml]	236	2.1 (4.5)	2.0 (1.9)	-0.1 (4.2)	196	1.8 (1.8)	1.8 (1.6)	0.0 (1.6)	785	1.8 (2.1)	2.0 (2.3)	0.2 (1.8)
	IL-8 [pg/ml]	236	6.1 (3.8)	6.2 (3.6)	0.2 (3.7)	196	6.2 (2.9)	6.1 (3.2)	-0.2 (3.0)	784	6.5 (3.5)	6.1 (3.3)	-0.4 (3.0)
	TNF-α [pg/ml]	236	6.0 (4.7)	5.4 (3.3)	-0.7 (3.9)	196	7.3 (18.2)	5.6 (2.1)	-1.8 (18.2)	785	6.6 (17.9)	6.2 (15.3)	-0.4 (2.9)
	MPO [ng/ml]	234	266.6 (170.8)	297.4 (261.9)	29.3 (184.8)	196	267.0 (125.4)	307.4 (147.6)	38.4 (107.2)	785	279.4 (167.6)	300.0 (164.2)	23.8 (113.7)
	CC16 [ng/ml]	239	14.7 (19.3)	18.0 (29.9)	2.1 (20.0)	195	45.1 (80.1)	55.0 (105.7)	7.6 (80.9)	787	42.3 (86.9)	38.7 (80.0)	-3.5 (92.0)
	CRP [mg/ml]	241	2.6 (3.6)	2.5 (3.5)	-0.1 (1.2)	198	2.2 (3.2)	2.2 (3.3)	0.0 (0.8)	789	2.2 (3.7)	2.2 (3.5)	0.0 (1.1)
	IgE [IU/ml]	241	134.7 (319.7)	131.0 (314.1)	-4.3 (19.2)	198	101.9 (172.2)	99.9 (165.4)	-3.0 (12.0)	789	163.4 (471.8)	158.3 (465.2)	-4.2 (25.0)
Respiratory biomarkers	FeNO [ppb]												
	Non-smoker	109	17.7 (11.9)	16.4 (11.2)	-1.3 (4.0)	99	18.9 (10.6)	17.8 (10.9)	-1.6 (4.2)	337	17.8 (12.0)	17.1 (11.7)	-0.8 (4.7)
	Former smoker	62	17.1 (14.3)	15.2 (10.9)	-2.0 (7.1)	45	20.5 (15.7)	20.8 (18.2)	0.3 (6.1)	176	17.4 (14.5)	16.1 (13.7)	-1.2 (5.4)
	Current smoker	70	11.5 (9.3)	10.8 (9.5)	-0.8 (4.7)	54	13.2 (9.2)	11.9 (7.9)	-1.0 (3.4)	274	11.9 (10.5)	10.9 (10.3)	-1.1 (6.0)
	FEV ₁ %/FVC% [%] (pre and post shift)												
	Non-smoker	106	95.6 (7.5)	95.7 (7.1)	/	96	96.2 (7.1)	96.5 (7.3)	/	316	95.2 (7.5)	95.1 (7.9)	/
	Former smoker	62	96.6 (7.9)	96.9 (7.8)	/	41	94.8 (7.4)	94.7 (7.4)	/	161	94.0 (6.6)	94.6 (7.1)	/
Current smoker	68	93.3 (8.8)	93.3 (7.5)	/	46	92.8 (6.3)	93.5 (6.6)	/	239	93.7 (7.5)	93.7 (7.1)	/	

* Data for number (N) are related to post- vs. pre-shift differences (except for FEV₁%/FVC%). However, number (N) related to pre- and post-shift are comparable to those for post- vs. pre-shift differences.

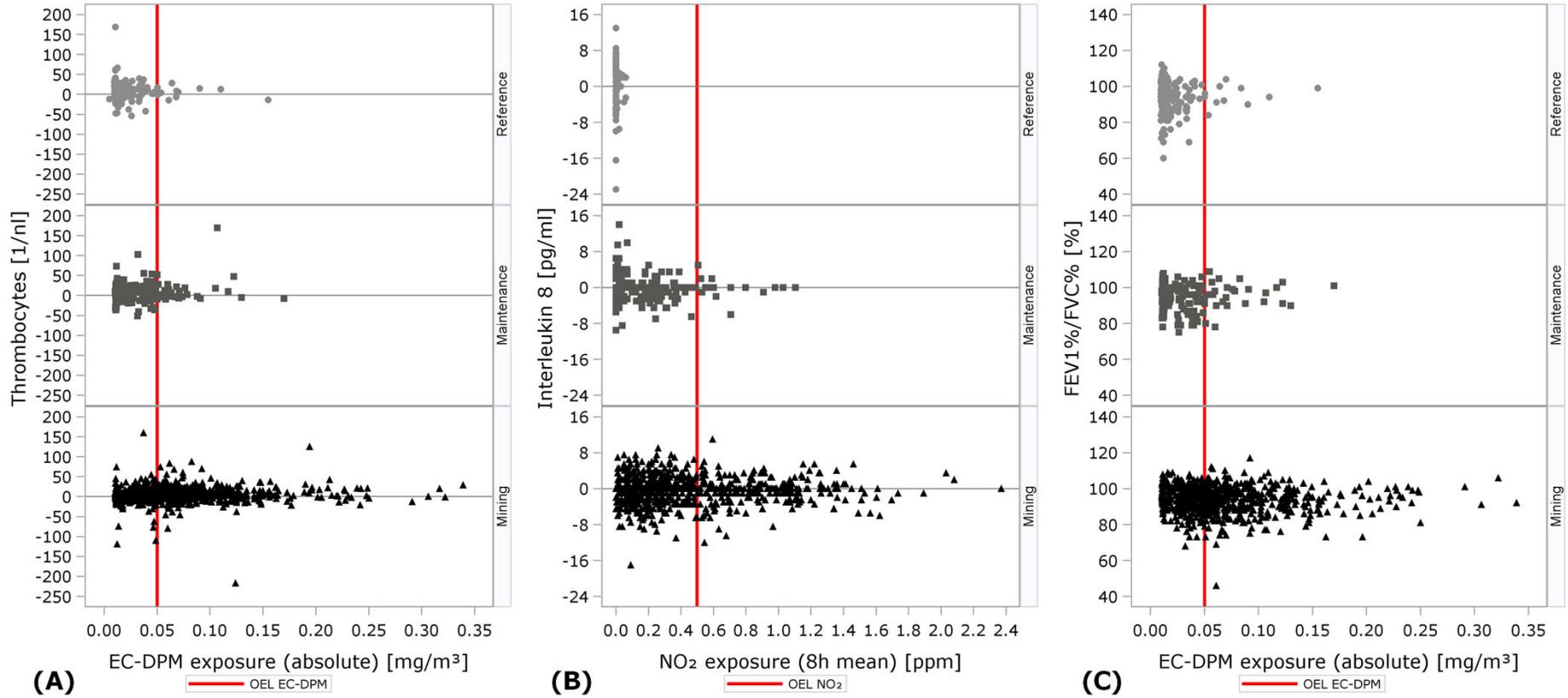


Fig. S1 Post- vs. pre-shift differences of thrombocyte levels by absolute EC-DPM exposure (A), of Interleukin 8 levels by 8-hour mean exposure of NO₂ (B) and pre-shift values of FEV₁%/FVC% by absolute EC-DPM exposure (C) for miners, maintenance workers, and reference group workers