

Analytical and Bioanalytical Chemistry

Electronic Supplementary Material

Effects of an iron-based fuel-borne catalyst and a diesel particle filter on exhaust toxicity in lung cells *in vitro*

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Table S1: Exhaust characterization. Particle concentrations and concentrations of gaseous exhaust components in the ten-fold diluted exhaust, listed as average \pm standard deviation.

		REF		SATACEN		SATACEN+DPF	
		Average	\pm SD	Average	\pm SD	Average	\pm SD
Total particle concentration	1/cm ³	4.8 x 10 ⁸	\pm 6.3 x 10 ⁷	1.8 x 10 ⁹	\pm 2.4 x 10 ⁷	2.1 x 10 ³	\pm 2.0 x 10 ³
Particles 10 - 40 nm	1/cm ³	2.1 x 10 ⁸	\pm 2.6 x 10 ⁶	1.6 x 10 ⁹	\pm 2.4 x 10 ⁷	1.3 x 10 ³	\pm 0.1 x 10 ³
Particles 41-100 nm	1/cm ³	2.4 x 10 ⁸	\pm 2.1 x 10 ⁶	1.9 x 10 ⁹	\pm 2.3 x 10 ⁶	0.4 x 10 ³	\pm 10
Particles > 100 nm	1/cm ³	2.9 x 10 ⁷	\pm 1.1 x 10 ⁷	2.1 x 10 ⁷	\pm 8.0 x 10 ⁵	0.4 x 10 ³	\pm 7
Carbon monoxide (CO)	ppm	33	\pm 2	35	\pm 1.0	38	\pm 0.1
Volatile hydrocarbons (HC)	ppm	11	\pm 3	10	\pm 0.7	14	\pm 1.8
Nitrogen oxides (NO _x)	ppm	11	\pm 1	11	\pm 0.6	10	\pm 0.5
Nitrogen dioxide (NO ₂)	ppm	4.3	\pm 0.9	4.4	\pm 0.1	3.3	\pm 0.1
Nitric oxide (NO)	ppm	6.3	\pm 0.9	6.9	\pm 0.5	6.4	\pm 0.4

Table S2: Biological responses measured upon filtered air exposure and upon exposure to ten-fold diluted exhausts, listed in non-normalized form and as normalized to the filtered air exposure (filtered air exposure = 1). REF: exhaust produced from reference diesel (low sulfur petrodiesel), REF-S: exhaust produced from reference diesel additized with 40 ppm Satacen[®] 3. REF-SF: exhaust produced from additized fuel, filtered by silicon carbide DPF

Treatment		Filtered air exposure	Exhaust exposure	Exhaust exposure, normalized to filtered air
		Average \pm SEM	Average \pm SEM	Average \pm SEM
Extracellular LDH activity	REF	1.1 \pm 0.1	1.0 \pm 0.0	1.0 \pm 0.0
	SATACEN	3.6 \pm 0.3	2.0 \pm 0.2	0.5 \pm 0.0
	SATACEN+DPF	0.9 \pm 0.1	0.9 \pm 0.0	0.9 \pm 0.0
	REF	1.2 \pm 0.1	1.2 \pm 0.0	1.0 \pm 0.0
	SATACEN	1.4 \pm 0.3	1.1 \pm 0.0	0.8 \pm 0.0
	SATACEN+DPF	0.9 \pm 0.1	1.5 \pm 0.2	1.7 \pm 0.2
Total reduced GSH	REF	0.9 \pm 0.1	0.09 \pm 0.04	0.11 \pm 0.04
	SATACEN	1.0 \pm 0.1	0.44 \pm 0.04	0.43 \pm 0.04
	SATACEN+DPF	1.1 \pm 0.1	0.65 \pm 0.04	0.59 \pm 0.03
	REF	0.8 \pm 0.1	0.09 \pm 0.03	0.10 \pm 0.04
	SATACEN	0.7 \pm 0.0	0.19 \pm 0.01	0.27 \pm 0.01
	SATACEN+DPF	1.0 \pm 0.0	0.57 \pm 0.03	0.59 \pm 0.03

Table S2, continued

Treatment		Filtered air exposure	Exhaust exposure	Exhaust exposure, normalized to filtered air
		Average \pm SEM	Average \pm SEM	Average \pm SEM
normalized amount of <i>HMOX1</i> mRNA	REF	1 \pm 0	25.7 \pm 4.7	25.7 \pm 4.7
	SATACEN	1 \pm 0	21.5 \pm 5.6	21.5 \pm 5.6
	SATACEN+DPF	1 \pm 0	22.2 \pm 3.9	22.2 \pm 3.9
	REF	1 \pm 0	34.0 \pm 7.0	34.0 \pm 7.0
	SATACEN	1 \pm 0	21.5 \pm 5.6	41.3 \pm 18.1
	SATACEN+DPF	1 \pm 0	4.6 \pm 1.5	4.6 \pm 1.5
normalized amount of <i>TNF</i> mRNA	REF	1 \pm 0	1.8 \pm 1.4	1.8 \pm 1.4
	SATACEN	1 \pm 0	0.9 \pm 0.4	0.9 \pm 0.4
	SATACEN+DPF	1 \pm 0	0.8 \pm 0.2	0.8 \pm 0.2
	REF	1 \pm 0	2.0 \pm 1.6	2.0 \pm 1.6
	SATACEN	1 \pm 0	13.7 \pm 11.0	13.7 \pm 11.0
	SATACEN+DPF	1 \pm 0	1.0 \pm 0.8	1.0 \pm 0.8

Table S2, continued

Treatment		Filtered air exposure	Exhaust exposure	Exhaust exposure, normalized to filtered air
		Average \pm SEM	Average \pm SEM	Average \pm SEM
normalized amount of <i>IL-8</i> mRNA	REF	1 \pm 0	2.7 \pm 2.9	2.7 \pm 2.9
	SATACEN	1 \pm 0	1.5 \pm 0.8	1.5 \pm 0.8
	SATACEN+DPF	1 \pm 0	1.4 \pm 0.4	1.4 \pm 0.4
	REF	1 \pm 0	3.1 \pm 1.8	3.1 \pm 1.8
	SATACEN	1 \pm 0	7.2 \pm 8.0	7.2 \pm 8.0
	SATACEN+DPF	1 \pm 0	2.7 \pm 0.2	2.7 \pm 0.2
Extracellular TNF- α concentration	REF	3.1 \pm 0.7 ng/ml	4.0 \pm 1.1 ng/ml	1.3 \pm 0.3
	SATACEN	1.5 \pm 0.3 ng/ml	1.5 \pm 0.1 ng/ml	1.0 \pm 0.1
	SATACEN+DPF	1.4 \pm 0.2 ng/ml	1.8 \pm 0.2 ng/ml	1.2 \pm 0.1
	REF	5.7 \pm 1.0 ng/ml	7.1 \pm 1.6 ng/ml	1.3 \pm 0.3
	SATACEN	4.3 \pm 0.3 ng/ml	2.5 \pm 0.1 ng/ml	0.6 \pm 0.0
	SATACEN+DPF	2.3 \pm 0.1 ng/ml	4.5 \pm 0.3 ng/ml	2.0 \pm 0.1

Table S2, continued

Treatment		Filtered air exposure	Exhaust exposure	Exhaust exposure, normalized to filtered air
		Average \pm SEM	Average \pm SEM	Average \pm SEM
Extracellular IL-8 concentration	REF	1.4 \pm 0.1	1.7 \pm 0.3	1.2 \pm 0.2
	SATACEN	1.3 \pm 0.1	1.3 \pm 0.1	1.0 \pm 0.1
	SATACEN+DPF	1.0 \pm 0.1	0.9 \pm 0.1	0.9 \pm 0.1
	REF	1.4 \pm 0.1	1.6 \pm 0.3	1.2 \pm 0.2
	SATACEN	1.5 \pm 0.1	1.2 \pm 0.1	0.8 \pm 0.0
	SATACEN+DPF	1.0 \pm 0.0	1.2 \pm 0.0	1.3 \pm 0.0

Table S3: Absolute number of revertants fomed upon exhaust exposure in Salmonella typhimurium strin TA100 and TA98 and fold induction of revertant formation over baseline (number upon exhaust exposure divided by number in negative control). A fold induction of 3 or higher indicates mutagenicity.

		REF	DPF	SATACEN	SATACEN+DPF
TA100		average ± SD	average ± SD	average ± SD	average ± SD
number of revertants	negative control	4.4 ± 2.3	1.9 ± 3.1	5.3 ± 2.1	8.0 ± 4.8
	2 h	5.9 ± 2.0	7.0 ± 5.2	7.1 ± 2.2	5.9 ± 3.4
	4 h	8.5 ± 3.4	26.1 ± 13.3	11.3 ± 4.8	9.9 ± 6.8
	6 h	13.1 ± 5.1	37.3 ± 12.6	15.3 ± 12.2	8.9 ± 4.7
fold induction over negative control	2 h	1.3	3.7	1.3	1.0
	4 h	1.9	13.6	2.1	1.2
	6 h	3.0	19.4	2.9	1.1
TA98					
number of revertants	negative control	1.6 ± 3.1	0.6 ± 1.4	1.9 ± 3.6	0.3 ± 0.6
	2 h	1.1 ± 1.0	0 ± 0	0.9 ± 0.8	0.9 ± 1.0
	4 h	0.8 ± 1.0	0 ± 0	1.4 ± 2.1	0.8 ± 0.5
	6 h	2.0 ± 2.4	0 ± 0	1.0 ± 2.1	2.0 ± 1.1
fold induction over negative control	2 h	0.7	0	0.5	3.5
	4 h	0.5	0	0.7	3.0
	6 h	1.3	0	0.5	8.0