Supplement of

Oxidative potential of ambient water-soluble PM_{2.5} measured by Dithiothreitol (DTT) and Ascorbic Acid (AA) assays in the southeastern United States: contrasts in sources and health associations

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PM_{2.5} mass

PM_{2.5} mass concentration was measured by a Tapered Element Oscillating Microbalance (TEOM) by Atmospheric Research Analysis (ARA, Inc.) at SEARCH sites (JST, YRK, BHM, and CTR) and ESL. For the RS and GT sites, the PM mass concentrations were estimated from the sum of chemical components analyzed on the same Hi-Vol filters,, including elemental carbon (EC; Sunset Laboratory OCEC analyzer), organic mass (OC*1.6¹; water-soluble metals, and ammonium sulfate (assuming sulfate and ammonium are all (NH₄)₂SO₄², where sulfate was calculated from sulfur from XRF analysis (section 2.3.2).

Codes for health outcomes used in the epidemiological models

The health outcomes in the epidemiological models are asthma or wheeze with a primary International Classification of Disease, 9th Revision, (ICD-9) code of 493 and 786.07, congestive heart failure (428), chronic obstructive pulmonary disease (491, 492, 496), cardiovascular disease (410-414, 427, 428, 433-437, 440, 443-445, 451-453), ischemic heart disease (410-414), and pneumonia (480-486) for a patient with a home ZIP code within the Atlanta 5-county metro area (Fulton, DeKalb, Gwinnett, Cobb, Clayton) recorded in an Atlanta hospital from 8/1/1998 through 12/31/2009.

Table S1. Sampling schedule of Hi-Vol filters collected from June 2012 to September 2013.

Month Year	Season	Anchor site	Trailer site
June-July 2012	Summer	JST	YRK
July-August 2012	Summer	JST	GT
September-October 2012	Fall	JST	RS
November 2012	-	JST	JST
December 2012	Winter	JST	YRK
January-February 2013	Winter	JST	RS
March 2013	Winter	JST	GT
June-July 2013	Summer	CTR	BHM
August 2013	Summer	ESL	-
September-October 2013	Fall	GT	RS

JST - Southeastern Aerosol Research and Characterization Study (SEARCH) Jefferson Street, GA; YRK - SEARCH Yorkville, GA; GT - Georgia Tech, GA; RS - Roadside (on Georgia Tech Campus); BHM - SEARCH Birmingham, AL; CTR - SEARCH Centerville, AL; ESL - East St. Louis, IL.

Table S2. Water-soluble AA and DTT activity correlations (Pearson's r) with water-soluble species in PM_{2.5}

	Site-Month. Year	BrC	WSOC	PM	S	K	Ca	Ti	Mn	Fe	Cu	Zn	As	Se	Br	Sr	Ba	Pb	DTT
AA	JST-June 2012	0.58	0.59	0.59	0.47	0.23	0.35	0.58	0.41	0.64	0.91	0.52	0.74	0.49	0.36	0.37	0.52	0.42	0.57
	JST-Aug. 2012	0.43	0.36	0.08	0.32	0.32	0.04	0.59	0.65	0.60	0.74	0.23	0.37	0.30	0.56	0.30	0.61	0.43	0.52
	JST-Sept. 2012	0.69	0.60	0.34	0.19	0.26	-0.20	0.48	0.26	0.58	0.82	0.54	0.71	0.23	0.21	0.16	0.34	0.47	0.45
	JST- Dec. 2012	0.42	0.65	0.56	-0.12	0.70	0.24	0.36	0.28	0.66	0.81	0.66	0.64	0.27	0.28	0.35	0.60	0.49	0.70
	JST-Feb. 2013	0.38	0.30	0.36	0.16	0.18	-0.21	-0.15	-0.06	0.14	0.29	-0.09	0.02	0.25	0.34	-0.15	-0.18	0.32	0.49
	JST-March 2013	-0.03	-0.03	-0.17	0.01	0.19	-0.08	-0.15	0.02	0.30	0.78	0.23	0.24	0.14	-0.30	-0.13	0.08	0.26	0.10
	GT-Aug. 2012	0.57	0.10	0.58	0.55	0.41	0.12	0.44	0.10	0.77	0.75	0.13	0.61	0.51	0.49	0.03	0.38	0.16	0.62
	GT-March 2013	0.43	0.47	0.40	0.05	0.37	0.06	0.05	0.37	0.36	0.63	0.36	0.03	0.40	0.31	-0.01	0.38	0.16	0.54
	GT-Sept 2013	0.18	0.08	0.27	0.10	0.32	0.27	0.38	0.37	0.35	0.52	0.18	0.17	0.07	0.33	0.10	0.45	0.07	0.39
	RS-Sept.2012	0.42	0.25	0.52	0.10	0.72	0.55	0.27	0.82	0.28	0.15	0.25	-0.29	0.17	0.28	0.71	0.49	-0.16	0.51
	RS-Feb.2013	0.22	0.13	-0.15	0.01	0.15	-0.07	0.17	-0.08	-0.05	0.94	0.14	-0.03	0.01	-0.04	0.12	0.14	-0.14	0.25
	RS-Sept 2013	0.26	0.18	0.08	0.37	0.58	0.43	0.52	0.54	0.56	0.74	0.50	0.33	0.21	0.67	0.06	0.62	0.40	0.13
	YRK-June.2012	0.18	0.06	0.05	-0.02	0.24	-0.22	-0.23	-0.31	0.00	0.70	0.11	0.02	0.06	0.27	-0.25	-0.24	0.17	0.14
	YRK-Dec.2012	0.38	0.12	0.58	0.60	0.07	-0.35	0.04	-0.10	0.29	0.84	0.09	0.27	0.39	0.10	-0.28	-0.04	0.54	0.49
	BHM-June 2013	0.32	0.47	0.32	0.11	0.46	0.42	0.15	0.43	0.16	0.80	0.24	-0.01	-0.04	0.09	0.19	0.08	-0.04	0.52
DTT	CTR-June 2013	0.18	0.22	-0.12	0.09	0.12	-0.07	0.03	-0.29	0.14	0.75	0.47	0.27	0.15	0.19	-0.41	-0.24	0.38	0.10
	ESL-Aug 2013	0.32	0.27	0.15	0.08	0.17	-0.16	0.09	0.32	0.23	0.32	0.44	0.18	0.31	0.17	-0.14	0.00	0.20	0.43
	JST-June 2012	0.77	0.91	0.85	0.74	0.71	0.59	0.66	0.63	0.62	0.53	0.58	0.36	0.69	0.72	0.50	0.49	0.61	1
	JST-Aug. 2012	0.66	0.62	0.80	0.77	0.48	0.06	0.68	0.77	0.90	0.79	0.59	0.42	0.74	0.79	0.36	0.65	0.71	1
	JST-Sept. 2012	0.73	0.65	0.80	0.14	0.30	-0.23	0.53	0.52	0.74	0.13	0.82	0.13	0.20	0.28	0.10	0.55	0.27	1
	JST- Dec. 2012	0.81	0.78	0.75	0.07	0.73	0.51	0.55	0.54	0.79	0.63	0.82	0.67	0.43	0.38	0.39	0.73	0.59	1
	JST-Feb. 2013	0.70	0.65	0.84	0.70	0.71	0.25	-0.02	0.33	0.70	0.37	0.30	0.19	0.66	0.77	0.16	0.13	0.75	1
	JST-March 2013	0.88	0.63	0.77	0.05	0.67	0.26	0.63	0.51	0.57	0.36	0.58	0.78	0.69	0.44	0.44	0.58	0.52	1
	GT-Aug. 2012	0.37	0.38	0.63	0.59	0.53	0.00	0.26	0.60	0.77	0.67	0.62	0.54	0.52	0.45	0.35	0.53	0.09	1
	GT-March 2013	0.83	0.49	0.88	0.34	0.78	0.11	0.23	0.71	0.84	0.83	0.70	0.61	0.74	0.61	0.33	0.63	0.36	1
	GT-Sept 2013	0.75	0.47	0.61	0.30	0.65	0.29	0.34	0.58	0.66	0.46	0.36	0.22	0.20	0.50	0.15	0.38	0.23	1
	RS-Sept.2012	0.59	0.51	0.86	0.50	0.52	0.12	0.51	0.27	0.44	0.61	0.55	-0.06	0.39	0.61	0.36	0.56	0.35	1
	RS-Feb.2013	0.86	0.71	0.79	-0.03	0.69	0.23	0.32	0.49	0.57	-0.11	0.60	0.63	0.33	0.57	0.20	0.34	0.34	1
	RS-Sept 2013	0.48	0.20	0.49	0.66	0.53	0.77	0.09	0.75	0.53	0.21	0.32	-0.13	0.41	0.64	0.16	0.29	-0.51	1
	YRK-June.2012	0.53	0.74	0.59	0.74	0.60	0.67	0.23	0.61	0.47	0.32	0.61	0.36	0.67	0.59	0.73	0.19	0.56	1
	YRK-Dec.2012	0.88	0.84	0.77	0.38	0.74	0.36	0.31	0.71	0.69	0.50	0.76	0.39	0.83	0.73	0.32	0.49	0.74	1
	BHM-June 2013	0.74	0.59	0.74	0.66	0.42	0.58	0.29	0.65	0.68	0.25	0.54	0.45	0.60	0.69	0.27	0.21	0.49	1
	CTR-June 2013	0.87	0.77	0.66	0.64	0.66	0.41	0.36	0.34	0.43	-0.25	0.60	0.47	0.62	0.62	0.03	0.12	0.61	1
	ESL-Aug 2013	0.16	0.38	0.57	0.47	0.48	0.27	0.17	0.44	0.40	0.68	0.35	0.52	0.41	0.51	0.25	0.44	0.36	1

r>0.65 in red and bold; Data below LOD was replaced by half of LOD values.

Table S3. Water-soluble DTT and AA regressions with all CMB-E sources, with only significant (positive) sources, and with only significant (positive) sources without AMSULF

	Regressions		Intercept	LDGV	HDDV	SDUST	BURN	AMSULF	AMBSLF	AMNITR	OTHER_OC	*r	
DTT	All sources	Coefficient	0.050 ± 0.025	0.11 ± 0.021	0.038 ± 0.028	0.012 ± 0.012	0.065 ± 0.012	0.023 ± 0.009	0.015 ± 0.016	-0.001 ± 0.017	0.004 ± 0.010	0.69	
		p-value	0.048	<0.01	0.17	0.32	<0.01	0.011	0.35	0.94	0.68		
	Significant sources	Coefficient	0.067 ± 0.02	0.11 ± 0.02	0.045 ± 0.024		0.063 ± 0.01	0.022 ± 0.01				0.68	
		p-value	<0.01	<0.01	0.07		<0.01	0.01					
	Significant sources without AMSULF	Coefficient	0.095 ± 0.018	0.11 ± 0.020	0.052 ± 0.024		0.069 ± 0.010					0.67	
		p-value	<0.01	<0.01	0.04		<0.01						
	AA	All sources	Coefficient	0.19 ± 0.059	0.31 ± 0.046	0.28 ± 0.062	-0.020 ± 0.029	-0.098 ± 0.029	0.078 ± 0.020	0.018 ± 0.032	-0.088 ± 0.039	0.060 ± 0.020	0.71
			p-value	<0.01	<0.01	<0.01	0.50	<0.01	<0.01	0.59	0.03	<0.01	
Significant sources		Coefficient	0.17 ± 0.055	0.32 ± 0.044	0.32 ± 0.060		-0.14 ± 0.023	0.076 ± 0.019		-0.077 ± 0.035	0.072 ± 0.019	0.69	
		p-value	<0.01	<0.01	<0.01		<0.01	<0.01		0.03	<0.01		
Significant positive sources		Coefficient	0.079 ± 0.058	0.19 ± 0.043	0.23 ± 0.064			0.063 ± 0.021			0.075 ± 0.075	0.60	
		p-value	0.18	<0.01	<0.01			<0.01			<0.01		
Significant positive sources without AMSULF		Coefficient	0.18 ± 0.047	0.19 ± 0.044	0.24 ± 0.066						0.083 ± 0.022	0.57	
		p-value	<0.01	<0.01	<0.01						<0.01		

*- r value represents the correlations between measured and predicted data.

The sources are light-duty gasoline vehicles (LDGV), heavy-duty diesel vehicles (HDDV), soil dust (SDUST), biomass burning (BURN), ammonium sulfate (AMSULF), ammonium bisulfate (AMBSLF), ammonium nitrate (AMNITR), and other organic carbon (OTHER_OC) which mostly contains biogenic carbon.

Table S4. Risk ratios (95% confidence interval for interquartile range) for backcast-estimated DTT and AA activities (1998-2009) for asthma/wheeze and congestive heart failure

	Regressions	Asthma/wheeze		Congestive heart failure	
		Lag 0-2		Lag 0-2	
DTT	All sources	1.009 (1.000-1.018)	0.04	1.014 (1.000-1.028)	0.05
	Significant positive sources	1.009 (1.001-1.018)	0.04	1.015 (1.000-1.029)	0.04
	Significant positive sources without AMSULF	1.014 (1.004-1.023)	0.01	1.019 (1.004-1.035)	0.01
AA	All sources	0.999 (0.997-1.002)	0.64	0.998 (0.994-1.002)	0.29
	Significant positive sources	1.005 (0.994-1.015)	0.38	1.003 (0.986-1.020)	0.74
	Significant positive sources without AMSULF	1.008 (0.999-1.017)	0.07	1.005 (0.990-1.020)	0.50

The DTT and AA activities were estimated from three different linear regressions including all sources from CMB-E, statistically significant (p of F-statistic of coefficient<0.05) sources with positive coefficients, and significant positive sources without AMSULF (ammonium sulfate).

Figure S1. Map of sampling sites including three urban site: Jefferson Street, GA (JST); Birmingham, AL (BHM); East St. Louis, IL, two rural sites: Yorkville, GA (YRK); Centerville, AL (CTR), a near-road site - GT, and a road-side site – RS.

Figure S2. Protocol schematics for conducting Ascorbic Acid assay

Figure S3. Semi-automated system setup for Ascorbic Acid activities determination

Figure S4. Automated system that utilized an auto-sampler (AS40, DIONEX Corporation, Sunnyvale, CA, USA), a SelectPro two-position fluid processor valve (Alltech, Deerfield, IL, USA), and a peristaltic pump (Ismatec, Cole-Parmer Instrument Company, Vernon Hills, IL, USA) for measuring water-soluble organic carbon (WSOC) and brown carbon (BrC) from aqueous extracts.

Figure S5. Collocated measurements using two Hi-Vol samplers deployed at JST during November 2012 (Analysis was done by orthogonal regression.)

Figure S6. Loading of various water-soluble species and AA activity into various factors resolved by PMF analyses for all Atlanta urban sites (JST, GT, and RS) (a) and factors' time series (b) from the JST site.

Figure S7. Associations between backcast-estimated DTT and AA activities based on estimated sources for the previous 10 years (1998-2009) and emergency department (ED) visits for asthma/wheeze and congestive heart failure (CHF) in the greater metropolitan Atlanta, GA. The backcast estimated DTT and AA were based on models that included; (a) all sources and (b) only significant and positive sources without AMSULF (ammonium sulfate). Risk ratios and associated 95% confidence intervals are presented for an increase of one interquartile range (IQR) increment of the exposure metric. A risk ratio with 95% confidence intervals (CI) for interquartile range above 1 indicates a statistically significant positive association. Risk ratio data can be found in Table S4.

Sensitivity test using backcast DTT/AA from different regression models

For a sensitivity test, separate regressions were performed with all sources included and with significant positive sources without including the AMSULF. The latter was done because sulfate has substantially decreased over the last decade due to emission reductions in the southeastern US^{3, 4}, which may have unknown effects on predicted activities. All the regressions are presented in Table S3 and the risk ratios with 95% CI for interquartile range were presented in Figure S7.

As discussed in the main text, there is a positive association between DTT and the ED visits of asthma/wheeze and CHF. Similar, but slightly weaker associations, were found for DTT generated from models with all sources included [Fig. S7(a)], and slightly stronger associations were found for that with significant positive sources without AMSULF [Fig. S7(b)]. None of the AA estimates for Lag 0-2 exposure were associated with any health outcomes.

Hardware and software details of the Kloehn Control syringe pumps (Kloehn, Inc., Las Vegas, Nevada, USA):

Pump A:

VersaPump 6, 48k resolution drive pump (P/N 55022);

12-way distribution rotary valve (P/N 24105);

5 mL syringe (P/N 17599);

Pump B:

VersaPump 3, 12k resolution drive pump (P/N 23254);

6-way distribution valve (P/N 23327);

250 µL syringe (P/N 23166);

Software: Kloehn Control version 1.04.

Kloehn Control program code for conducting the AA method (Address 2 - pump A; Address 1 - pump B):

Line	Line Label	Address	Command	Command Data
1		2	CONSTANT <varName> = <float>	dILarge,12
2		2	CONSTANT <varName> = <float>	AirLarge,5
3		2	CONSTANT <varName> = <float>	WasteLarge,6
4		2	CONSTANT <varName> = <float>	Kbuffer,2
5		2	CONSTANT <varName> = <float>	LWCC,9
6		2	CONSTANT <varName> = <float>	Sample,7
7		2	CONSTANT <varName> = <float>	IVLarge,4
8		2	CONSTANT <varName> = <float>	RVLarge,3
9		2	CONSTANT <varName> = <float>	BVLarge, 1
10		1	CONSTANT <varName> = <float>	dISmall,6
11		1	CONSTANT <varName> = <float>	AirSmall,4
12		1	CONSTANT <varName> = <float>	WasteSmall,5
13		1	CONSTANT <varName> = <float>	AA,3
14		1	CONSTANT <varName> = <float>	IVSmall,2
15		1	CONSTANT <varName> = <float>	RVSmall,1
16				
17				
18	HomePosition	2	SET out2 = <bit>	1
19		2	SET out2 = <bit>	0
20		2	SET out2 = <bit>	1
21		2	SET out1 = <bit>	1

22				
23	PreloadKbuffer	2	VALVE_PORT = <int> [CCW]	Kbuffer
24		2	SET speed = <float>	400
25		2	POSITION <float> [IMM or SYNC]	1000
26		2	VALVE_PORT = <int> [CCW]	WasteLarge
27		2	POSITION <float> [IMM or SYNC]	0
28				
29	PreloadAA	1	VALVE_PORT = <int> [CCW]	AA
30		1	SET speed = <float>	30
31		1	POSITION <float> [IMM or SYNC]	250
32		1	VALVE_PORT = <int> [CCW]	WasteSmall
33		1	POSITION <float> [IMM or SYNC]	0
34				
35				
36	CleanLarge+Small		DO	
37		2	VALVE_PORT = <int> [CCW]	dILarge
38		2	SET speed = <float>	400
39		2	POSITION <float> [IMM or SYNC]	5000
40		2	VALVE_PORT = <int> [CCW]	WasteLarge
41		2	POSITION <float> [IMM or SYNC]	0
42		1	VALVE_PORT = <int> [CCW]	dISmall
43		1	POSITION <float> [IMM or SYNC]	250
44		1	VALVE_PORT = <int> [CCW]	WasteSmall
45		1	POSITION <float> [IMM or SYNC]	0
46			LOOP <int>	2
47				
48			DO	
49	ChangeSample	2	SET out1 = <bit>	0
50		2	SET out1 = <bit>	1
51				
52	MixSample	2	VALVE_PORT = <int> [CCW]	Sample
53		2	SET speed = <float>	300
54		2	POSITION <float> [IMM or SYNC]	5000
55		2	DELAY <float>	1
56		2	VALVE_PORT = <int> [CCW]	Sample
57		2	POSITION <float> [IMM or SYNC]	0
58			DO	
59		2	VALVE_PORT = <int> [CCW]	AirLarge
60		2	SET speed = <float>	400
61		2	POSITION <float> [IMM or SYNC]	5000
62		2	VALVE_PORT = <int> [CCW]	Sample
63		2	SET speed = <float>	800
64		2	POSITION <float> [IMM or SYNC]	0
65			LOOP <int>	3

66				
67	PreLoad Sample	2	VALVE_PORT = <int> [CCW]	Sample
68		2	SET speed = <float>	200
69		2	POSITION <float> [IMM or SYNC]	1000
70		2	DELAY <float>	1
71		2	VALVE_PORT = <int> [CCW]	WasteLarge
72		2	POSITION <float> [IMM or SYNC]	0
73				
74				
75	LoadReactionVial	2	VALVE_PORT = <int> [CCW]	Kbuffer
76		2	POSITION <float> [IMM or SYNC]	300
77		2	VALVE_PORT = <int> [CCW]	RVLarge
78		2	POSITION <float> [IMM or SYNC]	0
79		2	VALVE_PORT = <int> [CCW]	Sample
80		2	SET speed = <float>	200
81		2	POSITION <float> [IMM or SYNC]	2400
82		2	DELAY <float>	1
83		2	VALVE_PORT = <int> [CCW]	RVLarge
84		2	SET speed = <float>	400
85		2	POSITION <float> [IMM or SYNC]	0
86		2	VALVE_PORT = <int> [CCW]	RVLarge
87		2	SET speed = <float>	800
88		2	POSITION <float> [IMM or SYNC]	3000
89		2	VALVE_PORT = <int> [CCW]	RVLarge
90		2	POSITION <float> [IMM or SYNC]	0
91		2	VALVE_PORT = <int> [CCW]	AirLarge
92		2	POSITION <float> [IMM or SYNC]	1000
93		2	VALVE_PORT = <int> [CCW]	RVLarge
94		2	POSITION <float> [IMM or SYNC]	0
95				
96	Draw1	1	VALVE_PORT = <int> [CCW]	RVSmall
97		1	POSITION <float> [IMM or SYNC]	250
98		1	VALVE_PORT = <int> [CCW]	WasteSmall
99		1	POSITION <float> [IMM or SYNC]	0
100		1	VALVE_PORT = <int> [CCW]	RVSmall
101		1	POSITION <float> [IMM or SYNC]	250
102		1	VALVE_PORT = <int> [CCW]	RVSmall
103		1	POSITION <float> [IMM or SYNC]	200
104		1	VALVE_PORT = <int> [CCW]	IVSmall
105		1	POSITION <float> [IMM or SYNC]	110
106		1	VALVE_PORT = <int> [CCW]	RVSmall
107		1	POSITION <float> [IMM or SYNC]	0
108		1	VALVE_PORT = <int> [CCW]	AirSmall
109		1	POSITION <float> [IMM or SYNC]	250

110		1	VALVE_PORT = <int> [CCW]	RVSmall
111		1	POSITION <float> [IMM or SYNC]	0
112		1	VALVE_PORT = <int> [CCW]	dISmall
113		1	POSITION <float> [IMM or SYNC]	250
114		1	VALVE_PORT = <int> [CCW]	WasteSmall
115		1	POSITION <float> [IMM or SYNC]	0
116		1	VALVE_PORT = <int> [CCW]	dISmall
117		1	POSITION <float> [IMM or SYNC]	250
118		1	VALVE_PORT = <int> [CCW]	IVSmall
119		1	POSITION <float> [IMM or SYNC]	0
120		1	VALVE_PORT = <int> [CCW]	dISmall
121		1	POSITION <float> [IMM or SYNC]	250
122		1	VALVE_PORT = <int> [CCW]	IVSmall
123		1	POSITION <float> [IMM or SYNC]	0
124				
125	DiluteTo3mL1	2	VALVE_PORT = <int> [CCW]	dILarge
126		2	SET speed = <float>	400
127		2	POSITION <float> [IMM or SYNC]	3500
128		2	VALVE_PORT = <int> [CCW]	WasteLarge
129		2	POSITION <float> [IMM or SYNC]	0
130		2	VALVE_PORT = <int> [CCW]	dILarge
131		2	POSITION <float> [IMM or SYNC]	3500
132		2	VALVE_PORT = <int> [CCW]	WasteLarge
133		2	POSITION <float> [IMM or SYNC]	0
134		2	VALVE_PORT = <int> [CCW]	dILarge
135		2	POSITION <float> [IMM or SYNC]	2410
136		2	VALVE_PORT = <int> [CCW]	IVLarge
137		2	POSITION <float> [IMM or SYNC]	0
138		2	VALVE_PORT = <int> [CCW]	IVLarge
139		2	POSITION <float> [IMM or SYNC]	3000
140		2	VALVE_PORT = <int> [CCW]	IVLarge
141		2	POSITION <float> [IMM or SYNC]	0
142		2	VALVE_PORT = <int> [CCW]	AirLarge
143		2	SET speed = <float>	800
144		2	POSITION <float> [IMM or SYNC]	1000
145		2	VALVE_PORT = <int> [CCW]	IVLarge
146		2	POSITION <float> [IMM or SYNC]	0
147		2	VALVE_PORT = <int> [CCW]	IVLarge
148		2	POSITION <float> [IMM or SYNC]	3000
149		2	VALVE_PORT = <int> [CCW]	IVLarge
150		2	POSITION <float> [IMM or SYNC]	0
151		2	VALVE_PORT = <int> [CCW]	AirLarge
152		2	POSITION <float> [IMM or SYNC]	1000
153		2	VALVE_PORT = <int> [CCW]	IVLarge

154		2	POSITION <float> [IMM or SYNC]	0
155				
156	IVtoLWCC1	2	VALVE_PORT = <int> [CCW]	IVLarge
157		2	SET speed = <float>	400
158		2	POSITION <float> [IMM or SYNC]	3000
159		2	VALVE_PORT = <int> [CCW]	WasteLarge
160		2	POSITION <float> [IMM or SYNC]	2000
161		2	SET speed = <float>	100
162		2	VALVE_PORT = <int> [CCW]	LWCC
163		2	POSITION <float> [IMM or SYNC]	500
164		2	VALVE_PORT = <int> [CCW]	WasteLarge
165		2	SET speed = <float>	400
166		2	POSITION <float> [IMM or SYNC]	0
167				
168	RinseIV1	2	VALVE_PORT = <int> [CCW]	IVLarge
169		2	SET speed = <float>	700
170		2	POSITION <float> [IMM or SYNC]	1000
171		2	VALVE_PORT = <int> [CCW]	WasteLarge
172		2	POSITION <float> [IMM or SYNC]	0
173			DO	
174		1	VALVE_PORT = <int> [CCW]	dISmall
175		1	SET speed = <float>	50
176		1	POSITION <float> [IMM or SYNC]	250
177		1	VALVE_PORT = <int> [CCW]	IVSmall
178		1	POSITION <float> [IMM or SYNC]	0
179		1	VALVE_PORT = <int> [CCW]	AirSmall
180		1	POSITION <float> [IMM or SYNC]	250
181		1	VALVE_PORT = <int> [CCW]	IVSmall
182		1	POSITION <float> [IMM or SYNC]	0
183		2	VALVE_PORT = <int> [CCW]	dILarge
184		2	POSITION <float> [IMM or SYNC]	4000
185		2	VALVE_PORT = <int> [CCW]	IVLarge
186		2	POSITION <float> [IMM or SYNC]	0
187		2	VALVE_PORT = <int> [CCW]	IVLarge
188		2	POSITION <float> [IMM or SYNC]	4500
189		2	VALVE_PORT = <int> [CCW]	WasteLarge
190		2	POSITION <float> [IMM or SYNC]	0
191			LOOP <int>	3
192				
193	ReloadRV	2	VALVE_PORT = <int> [CCW]	RVLarge
194		2	SET speed = <float>	400
195		2	POSITION <float> [IMM or SYNC]	3000
196		2	VALVE_PORT = <int> [CCW]	WasteLarge
197		2	POSITION <float> [IMM or SYNC]	2000

198		2	VALVE_PORT = <int> [CCW]	RVLarge
199		2	POSITION <float> [IMM or SYNC]	200
200		2	VALVE_PORT = <int> [CCW]	WasteLarge
201		2	POSITION <float> [IMM or SYNC]	0
202		2	VALVE_PORT = <int> [CCW]	AirLarge
203		2	POSITION <float> [IMM or SYNC]	1500
204		2	VALVE_PORT = <int> [CCW]	RVLarge
205		2	POSITION <float> [IMM or SYNC]	0
206				
207	AddAA	1	VALVE_PORT = <int> [CCW]	AA
208		1	POSITION <float> [IMM or SYNC]	250
209		1	VALVE_PORT = <int> [CCW]	RVSmall
210		1	SET speed = <float>	40
211		1	POSITION <float> [IMM or SYNC]	50
212		1	VALVE_PORT = <int> [CCW]	WasteSmall
213		1	POSITION <float> [IMM or SYNC]	0
214		1	VALVE_PORT = <int> [CCW]	AirSmall
215		1	POSITION <float> [IMM or SYNC]	250
216		1	VALVE_PORT = <int> [CCW]	RVSmall
217		1	POSITION <float> [IMM or SYNC]	0
218		2	VALVE_PORT = <int> [CCW]	RVLarge
219		2	SET speed = <float>	800
220		2	POSITION <float> [IMM or SYNC]	2500
221		2	VALVE_PORT = <int> [CCW]	RVLarge
222		2	POSITION <float> [IMM or SYNC]	0
223		2	VALVE_PORT = <int> [CCW]	AirLarge
224		2	POSITION <float> [IMM or SYNC]	1000
225		2	VALVE_PORT = <int> [CCW]	RVLarge
226		2	POSITION <float> [IMM or SYNC]	0
227		2	POSITION <float> [IMM or SYNC]	2500
228		2	VALVE_PORT = <int> [CCW]	RVLarge
229		2	POSITION <float> [IMM or SYNC]	0
230		2	VALVE_PORT = <int> [CCW]	AirLarge
231		2	POSITION <float> [IMM or SYNC]	1000
232		2	VALVE_PORT = <int> [CCW]	RVLarge
233		2	POSITION <float> [IMM or SYNC]	0
234			DO	
235		1	VALVE_PORT = <int> [CCW]	dISmall
236		1	SET speed = <float>	30
237		1	POSITION <float> [IMM or SYNC]	250
238		1	VALVE_PORT = <int> [CCW]	WasteSmall
239		1	POSITION <float> [IMM or SYNC]	0
240			LOOP <int>	2
241				

242			DO	
243	Clean Lsyringe	2	VALVE_PORT = <int> [CCW]	dILarge
244		2	SET speed = <float>	400
245		2	POSITION <float> [IMM or SYNC]	4500
246		2	VALVE_PORT = <int> [CCW]	WasteLarge
247		2	POSITION <float> [IMM or SYNC]	0
248			LOOP <int>	2
249				
250			DO	
251	CleanLWCC	2	VALVE_PORT = <int> [CCW]	dILarge
252		2	POSITION <float> [IMM or SYNC]	4000
253		2	VALVE_PORT = <int> [CCW]	WasteLarge
254		2	POSITION <float> [IMM or SYNC]	3500
255		2	VALVE_PORT = <int> [CCW]	LWCC
256		2	SET speed = <float>	100
257		2	POSITION <float> [IMM or SYNC]	500
258		2	VALVE_PORT = <int> [CCW]	WasteLarge
259		2	SET speed = <float>	400
260		2	POSITION <float> [IMM or SYNC]	0
261				
262	Draw	1	VALVE_PORT = <int> [CCW]	RVSmall
263		1	SET speed = <float>	30
264		1	POSITION <float> [IMM or SYNC]	250
265		1	VALVE_PORT = <int> [CCW]	RVSmall
266		1	POSITION <float> [IMM or SYNC]	0
267		1	VALVE_PORT = <int> [CCW]	AirSmall
268		1	POSITION <float> [IMM or SYNC]	250
269		1	VALVE_PORT = <int> [CCW]	RVSmall
270		1	POSITION <float> [IMM or SYNC]	0
271		1	VALVE_PORT = <int> [CCW]	RVSmall
272		1	POSITION <float> [IMM or SYNC]	250
273		1	VALVE_PORT = <int> [CCW]	WasteSmall
274		1	POSITION <float> [IMM or SYNC]	0
275		1	VALVE_PORT = <int> [CCW]	RVSmall
276		1	POSITION <float> [IMM or SYNC]	250
277		1	VALVE_PORT = <int> [CCW]	RVSmall
278		1	POSITION <float> [IMM or SYNC]	200
279		1	VALVE_PORT = <int> [CCW]	IVSmall
280		1	POSITION <float> [IMM or SYNC]	100
281		1	VALVE_PORT = <int> [CCW]	RVSmall
282		1	POSITION <float> [IMM or SYNC]	0
283		1	VALVE_PORT = <int> [CCW]	AirSmall
284		1	POSITION <float> [IMM or SYNC]	250
285		1	VALVE_PORT = <int> [CCW]	RVSmall

286		1	POSITION <float> [IMM or SYNC]	0
287		1	VALVE_PORT = <int> [CCW]	dISmall
288		1	POSITION <float> [IMM or SYNC]	250
289		1	VALVE_PORT = <int> [CCW]	WasteSmall
290		1	POSITION <float> [IMM or SYNC]	0
291		1	VALVE_PORT = <int> [CCW]	dISmall
292		1	POSITION <float> [IMM or SYNC]	250
293		1	VALVE_PORT = <int> [CCW]	IVSmall
294		1	POSITION <float> [IMM or SYNC]	0
295		1	VALVE_PORT = <int> [CCW]	dISmall
296		1	POSITION <float> [IMM or SYNC]	250
297		1	VALVE_PORT = <int> [CCW]	IVSmall
298		1	POSITION <float> [IMM or SYNC]	0
299				
300	Dilute to 3ml	2	VALVE_PORT = <int> [CCW]	dILarge
301		2	SET speed = <float>	400
302		2	POSITION <float> [IMM or SYNC]	2400
303		2	VALVE_PORT = <int> [CCW]	IVLarge
304		2	POSITION <float> [IMM or SYNC]	0
305		2	VALVE_PORT = <int> [CCW]	IVLarge
306		2	POSITION <float> [IMM or SYNC]	3000
307		2	VALVE_PORT = <int> [CCW]	IVLarge
308		2	POSITION <float> [IMM or SYNC]	0
309		2	VALVE_PORT = <int> [CCW]	AirLarge
310		2	SET speed = <float>	800
311		2	POSITION <float> [IMM or SYNC]	1000
312		2	VALVE_PORT = <int> [CCW]	IVLarge
313		2	POSITION <float> [IMM or SYNC]	0
314		2	VALVE_PORT = <int> [CCW]	IVLarge
315		2	POSITION <float> [IMM or SYNC]	3000
316		2	VALVE_PORT = <int> [CCW]	IVLarge
317		2	POSITION <float> [IMM or SYNC]	0
318		2	VALVE_PORT = <int> [CCW]	AirLarge
319		2	POSITION <float> [IMM or SYNC]	1000
320		2	VALVE_PORT = <int> [CCW]	IVLarge
321		2	POSITION <float> [IMM or SYNC]	0
322				
323	IVtoLWCC	2	VALVE_PORT = <int> [CCW]	IVLarge
324		2	POSITION <float> [IMM or SYNC]	3000
325		2	VALVE_PORT = <int> [CCW]	WasteLarge
326		2	POSITION <float> [IMM or SYNC]	2000
327		2	SET speed = <float>	100
328		2	VALVE_PORT = <int> [CCW]	LWCC
329		2	POSITION <float> [IMM or SYNC]	500

330		2	VALVE_PORT = <int> [CCW]	WasteLarge
331		2	POSITION <float> [IMM or SYNC]	0
332				
333	RinseIV	2	VALVE_PORT = <int> [CCW]	IVLarge
334		2	SET speed = <float>	700
335		2	POSITION <float> [IMM or SYNC]	1000
336		2	VALVE_PORT = <int> [CCW]	WasteLarge
337		2	POSITION <float> [IMM or SYNC]	0
338			DO	
339		1	VALVE_PORT = <int> [CCW]	dISmall
340		1	SET speed = <float>	50
341		1	POSITION <float> [IMM or SYNC]	250
342		1	VALVE_PORT = <int> [CCW]	IVSmall
343		1	POSITION <float> [IMM or SYNC]	0
344		1	VALVE_PORT = <int> [CCW]	AirSmall
345		1	POSITION <float> [IMM or SYNC]	250
346		1	VALVE_PORT = <int> [CCW]	IVSmall
347		1	POSITION <float> [IMM or SYNC]	0
348		2	VALVE_PORT = <int> [CCW]	dILarge
349		2	POSITION <float> [IMM or SYNC]	4000
350		2	VALVE_PORT = <int> [CCW]	IVLarge
351		2	POSITION <float> [IMM or SYNC]	0
352		2	VALVE_PORT = <int> [CCW]	IVLarge
353		2	POSITION <float> [IMM or SYNC]	4500
354		2	VALVE_PORT = <int> [CCW]	WasteLarge
355		2	POSITION <float> [IMM or SYNC]	0
356			LOOP <int>	3
357			LOOP <int>	5
358				
359	Rinse RV	1	VALVE_PORT = <int> [CCW]	dISmall
360		1	SET speed = <float>	50
361		1	POSITION <float> [IMM or SYNC]	250
362		1	VALVE_PORT = <int> [CCW]	RVSmall
363		1	POSITION <float> [IMM or SYNC]	0
364		1	VALVE_PORT = <int> [CCW]	dISmall
365		1	POSITION <float> [IMM or SYNC]	250
366		1	VALVE_PORT = <int> [CCW]	RVSmall
367		1	POSITION <float> [IMM or SYNC]	0
368		1	VALVE_PORT = <int> [CCW]	AirSmall
369		1	POSITION <float> [IMM or SYNC]	250
370		1	VALVE_PORT = <int> [CCW]	RVSmall
371		1	POSITION <float> [IMM or SYNC]	0
372		2	VALVE_PORT = <int> [CCW]	RVLarge
373		2	SET speed = <float>	400

374		2	POSITION <float> [IMM or SYNC]	2000
375		2	VALVE_PORT = <int> [CCW]	WasteLarge
376		2	POSITION <float> [IMM or SYNC]	0
377			DO	
378		2	VALVE_PORT = <int> [CCW]	dILarge
379		2	POSITION <float> [IMM or SYNC]	3000
380		2	VALVE_PORT = <int> [CCW]	RVLarge
381		2	POSITION <float> [IMM or SYNC]	0
382		2	VALVE_PORT = <int> [CCW]	RVLarge
383		2	POSITION <float> [IMM or SYNC]	3500
384		2	VALVE_PORT = <int> [CCW]	WasteLarge
385		2	POSITION <float> [IMM or SYNC]	0
386			LOOP <int>	3
387				
388	RecleanLWCC	2	VALVE_PORT = <int> [CCW]	dILarge
389		2	SET speed = <float>	400
390		2	POSITION <float> [IMM or SYNC]	5000
391		2	VALVE_PORT = <int> [CCW]	WasteLarge
392		2	POSITION <float> [IMM or SYNC]	4000
393		2	VALVE_PORT = <int> [CCW]	LWCC
394		2	SET speed = <float>	100
395		2	POSITION <float> [IMM or SYNC]	1000
396		2	VALVE_PORT = <int> [CCW]	WasteLarge
397		2	SET speed = <float>	400
398		2	POSITION <float> [IMM or SYNC]	0
399			LOOP <int>	14

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