ELECTRONIC SUPPLEMENTARY INFORMATION

Lewisite exposure biomarkers in urine by liquid chromatography – inductively coupled plasma tandem mass spectrometry: with an accelerated matrix-matched stability study

Jason D. Palcic,*[a] Janet S. Jones,[a] E. Lindsay Flagg,[a] and Stephen F. Donovan[b]

[a] Florida Department of Health, Bureau of Public Health Laboratories, 1217 N. Pearl St, Jacksonville, FL 32202

[b] NMS Labs, 3701 Welsh Rd, Willow Grove, PA 19090

* Corresponding author

Overview of the results provided in the supporting information:

- **Table S1** LC-ICP-MS instrumentation parameters as performed on the Agilent 7500ce.
- **Table S2** Determination of CVAOA in urine by LC-ICP-MS (single quadrupole) accuracy using the consensus mean and standard deviation of NYS DOH PT materials (n = 17 labs).
- **Table S3** Determination of CVAOA in urine by LC-ICP-MS/MS (tandem) accuracy using the consensus mean and standard deviation of NYS DOH PT materials (n = 18 labs).
- **Table S4** ANOVA calculation of coefficients of variation (CV) from seven day/run, seven replicate CVAOA precision data (n = 49) on the single quadrupole instrument.
- **Figure S1** Chlorine measured at *m/z* $^{35}Cl^{+}$ was chromatographically resolved from CVAOA and the AsAc internal standard by LC-ICP-MS.
- **Figure S2** Comparison of least square linear regression models of the calibration curve from the single quadrupole ICP-MS (Agilent 7500ce).

Table S1 LC-ICP-MS instrumentation parameters as performed on the Agilent 7500ce.

HPLC	
System	Agilent 1200 Series
Column	Ascentis 5 µm RP-amide, 100 mm × 2.1 mm i.d.
Column temp. (°C)	30 ± 0.8
Autosampler temp. (°C)	4 ± 1
Mobile phase (isocratic)	11.5 mM TBAH, 5 mM succinic acid, 2% IPA, pH 5.5
Mobile phase flow rate (mL/min)	1.0
Injection volume (µL)	10
ICP-MS	
System	Agilent 7500ce
RF power (W)	1500
Plasma gas flow rate (L/min)	15.0
Auxiliary gas flow rate (L/min)	0.90
Nebulizer gas flow rate (L/min)	0.85
Makeup gas flow rate (L/min)	0.15
Nebulizer	Concentric Micromist (Glass Expansion, Pocasset, MA)
Spray Chamber temp. (°C)	2
Ion lens voltages	Optimized daily
Cell entrance (V)	–22
Cell exit (V)	–22
Octopole bias (V)	–6
Kinetic energy discrimination (V)	+3
Integration time (s)	0.3
Isotopes monitored (scan type)	$^{75}As^+$ (time-resolved analysis) $^{76}Ar_2^+$ (is necessary to list as an internal standard; however, the internal standard correction is deselected)
Acquisition time (min)	5
Repetition	1

Table S2 Determination of CVAOA in urine by LC-ICP-MS (single quadrupole) accuracy using the consensus mean and standard deviation of NYS DOH PT materials (n = 17 labs)

Sample ID	Reported Value (µg/L)	Z-Score	Consensus Mean (µg/L)	Consensus SD (µg/L)	Bias (%)
LW1401-01-12	ND	-	ND	-	-
LW1401-02-12	72.2	0.28	70	8.0	+3.1
LW1401-03-12	124	0.25	121	12.2	+2.5
LW1401-04-12	161	0.14	159	14.8	+1.3
LW1401-05-12	330	0.45	313	37.4	+5.4
LW1401-06-12	419	0.15	411	52.9	+1.9
LW1401-07-12	904	0.24	876	115	+3.2
LW1401-08-12	1260	0.17	1230	173	+2.4
LW1401-09-12	1670	0.12	1640	253	+1.8
LW1401-10-12	2770	–0.04	2790	478	–0.7

Table S3 Determination of CVAOA in urine by LC-ICP-MS/MS (tandem) accuracy using the consensus mean and standard deviation of NYS DOH PT materials (n = 18 labs)

Sample ID	Reported Value (µg/L)	Z-Score	Consensus Mean (µg/L)	Consensus SD (µg/L)	Bias (%)
LW1402-11-10	ND	-	ND	-	-
LW1402-12-10	36.5*	–0.01	36.6	9.30	–0.3
LW1402-13-10	93.9	0.08	92.5	16.5	+1.5
LW1402-14-10	162	0.00	162	10.1	0.0
LW1402-15-10	273	0.12	270	24.4	+1.1
LW1402-16-10	348	0.23	343	21.3	+1.5
LW1402-17-10	788	–0.04	790	52.9	–0.3
LW1402-18-10	1220	0.13	1200	149	+1.7
LW1402-19-10	1570	0.00	1570	116	0.0
LW1402-20-10	2860	0.17	2810	297	+1.8
LW1403-21-12	ND	-	ND	-	-
LW1403-22-12	47.1*	–0.32	50.7	11.1	–7.1
LW1403-23-12	65.8	0.13	64.8	7.54	+1.5
LW1403-24-12	145	0.07	144	14.0	+0.7
LW1403-25-12	235	–0.06	236	17.3	–0.4
LW1403-26-12	248	–0.21	252	19.0	–1.6
LW1403-27-12	678	0.36	661	47.4	+2.6
LW1403-28-12	1170	0.46	1122	105	+4.3
LW1403-29-12	1260	0.40	1225	87.8	+2.9
LW1403-30-12	2210	0.21	2178	151	+1.5

* Reported as present below the lowest calibrator (PLC).

Table S4 ANOVA calculation of coefficients of variation (CV) from seven day/run, seven replicate CVAOA precision data (n = 49) on the single quadrupole instrument

Level	Grand Mean (µg/L)	Grand SD (µg/L)	Grand CV (%)	Within day/run CV (%)	Between day/run CV (%)	Intermediate CV (%)
QL	105	4.16	3.9	1.6	3.9	4.2
QM	842	41.7	4.9	2.2	4.8	5.2
QM	3359	149	4.4	1.9	4.3	4.7

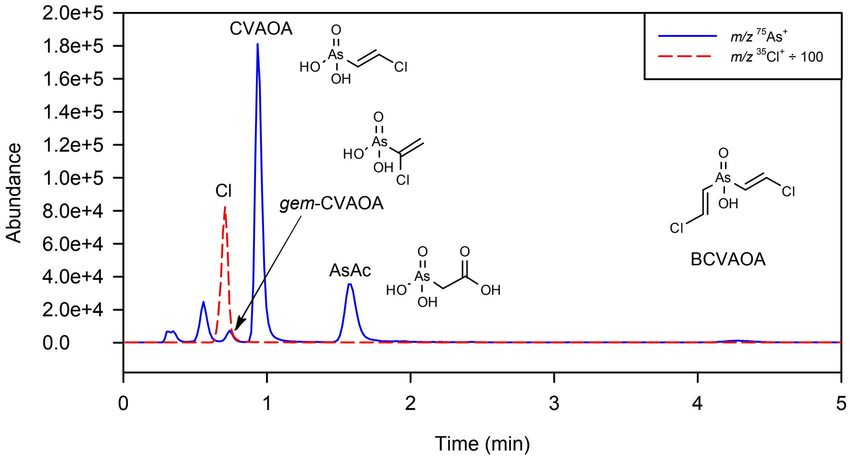

Figure S1 Chlorine measured at *m/z* ^{35}Cl^{+} was chromatographically resolved from CVAOA and the AsAc surrogate internal standard by LC-ICP-MS. The abundance of chlorine was divided by a hundred-fold to bring onto scale of *m/z* ^{75}As detection for the QH sample. Therefore analysis on single quadrupole instruments without a reaction/collision gas did not hinder quantitative analysis of CVAOA. However, chlorine was not chromatographically resolved from the tentatively assigned *gem*-CVAOA isomer and should not be integrated with single quadrupole ICP-MS (cell evacuated), because of the potential ^{40}Ar^{35}Cl^{+} polyatomic interference.

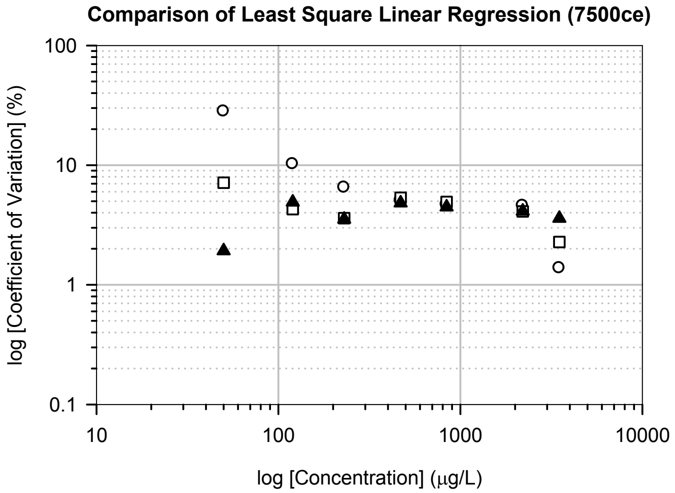

Figure S2 Comparison of least square linear regression models for the calibration range obtained using a single quadrupole ICP-MS (Agilent 7500ce). The coefficient of variation was plotted (logarithmic scale) for each standard reprocessed using three least squares linear regression models; ordinary least squares (○, OLS), inverse of concentration weighted least squares (□, WLS 1/x), and inverse of the square of concentration weighted least squares (▲, WLS 1/x2). The concentrations were calculated from the standards area response ratio (CVAOA/AsAc), slope, and intercept obtained from the daily calibration curve (n = 20).