

**United States Department of Agriculture
Food Safety and Inspection Service, Office of Public Health Science**

CLG-TM3.01	Page 1 of 14	
Title: Determination of Cadmium and Lead by ICP-MS		
Revision: 01	Replaces: CLG-TM3.00	Effective: 06/12/2006

Contents

A.	INTRODUCTION	2
B.	EQUIPMENT	2
C.	REAGENTS AND SOLUTIONS	3
D.	STANDARDS	3
E.	SAMPLE PREPARATION	5
F.	ANALYTICAL PROCEDURE.....	6
G.	CALCULATIONS.....	9
H.	SAFETY INFORMATION AND PRECAUTIONS.....	10
I.	QUALITY ASSURANCE PLAN	11
J.	WORKSHEET	13
K.	APPENDIX	13
L.	APPROVALS AND AUTHORITIES.....	14

**United States Department of Agriculture
Food Safety and Inspection Service, Office of Public Health Science**

CLG-TM3.01	Page 2 of 14	
Title: Determination of Cadmium and Lead by ICP-MS		
Revision: 01	Replaces: CLG-TM3.00	Effective: 06/12/2006

A. INTRODUCTION

1. Theory

Sample is digested with concentrated nitric acid in a microwave digestion apparatus. The sample digest is diluted, fortified with internal standards, and analyzed using inductively coupled plasma mass spectrometry (ICP-MS).

2. Applicability

This method is applicable to the analysis of cadmium (Cd) and lead (Pb) at ppb levels in beef, pork and poultry muscle, liver, and kidney.

B. EQUIPMENT

Note: Equivalent equipment may be substituted.

1. Apparatus

- a. Analytical balance - sensitive to 0.1 mg.
- b. Microwave digestion system - Mars5 System, CEM.
- c. Microwave digestion vessels - 100 mL capacity. Model XP-1500 vessels with TFM liners, standard or autoventing caps. CEM.
- d. Vacuum Concentration/Drying apparatus - Microvap accessory set for Mars5 system, CEM.
- e. Stirring rods (optional) - Teflon or polypropylene.
- f. Volumetric flasks - polypropylene or polymethylpentane, 50, 100, and 1000 mL.
- g. Volumetric flasks - glass, 10 - 1000 mL, as needed for preparation of standards, reagents.
- h. Micropipettors - fixed or variable, covering ranges 10 - 5000 μ L.
- i. Bottles - polypropylene, 100 and 250 mL.
- j. Centrifuge tubes - polypropylene, 50 mL.
- k. Argon gas, high purity grade (99.99%).
- l. Syringe filter (optional) - Acrodisc CR 13 mm, with 0.2 μ m PTFE Membrane, Gelman Laboratory.
- m. Milestone Trace Clean (optional).

2. Instrumentation

Inductively Coupled Plasma Mass Spectrometer - Agilent model 7500 a or c.

**United States Department of Agriculture
Food Safety and Inspection Service, Office of Public Health Science**

CLG-TM3.01	Page 3 of 14	
Title: Determination of Cadmium and Lead by ICP-MS		
Revision: 01	Replaces: CLG-TM3.00	Effective: 06/12/2006

C. REAGENTS AND SOLUTIONS

Note: Equivalent reagents/solutions may be substituted.

1. Reagents

- a. Deionized water (DI water) - for cleaning only.
- b. Millipore water - Deionized water polished to ASTM CAP/NCCLS Type 1 specifications or better (resistance \geq 18 megaohms).
- c. Nitric acid (HNO₃) - concentrated, Pb and Cd concentrations \leq 0.1 μ g/L. Ultra-pure grade (Optima by Fisher or Double Distilled by GFS) recommended.
- d. Sodium Hydroxide (NaOH) - reagent grade.

2. Solutions

- a. 25% NaOH solution (for evaporation scrubber):
Weigh 250 grams of NaOH into a 1 L volumetric flask and bring up to volume with water.
- b. 2% HNO₃ solution:
Dilute concentrated HNO₃ 1:50 with Millipore water. Prepare and store in polypropylene bottles.

D. STANDARDS

All elemental standard and internal standard solutions are prepared from commercial reference standards, which are available at concentrations of 1,000 or 10,000 mg/L (μ g/mL). Reference standards must be ICP-MS grade.

1. Source

- a. Elemental standard solutions are available from:
 - i. SPEX CertiPrep, Metuchen, NJ.
 - ii. Inorganic Ventures, Inc. Lakewood, NJ.
 - iii. Mass spectrometer tuning solution - 10 μ g/L Lithium, Yttrium, Cerium, Thallium, and Cobalt in 2% HNO₃, Cat No. 5184-3566, Agilent Technologies.

2. Preparation of Standard Solutions

Important: Metals may be leached from glass by nitric acid. Store all standard solutions in polypropylene or other inert containers. If glassware is used, it should be cleaned with nitric acid and dedicated for trace metals analyses. Standards prepared in glassware should be used immediately or transferred to suitable containers for storage.

**United States Department of Agriculture
Food Safety and Inspection Service, Office of Public Health Science**

CLG-TM3.01	Page 4 of 14	
Title: Determination of Cadmium and Lead by ICP-MS		
Revision: 01	Replaces: CLG-TM3.00	Effective: 06/12/2006

a. Internal standard (ISTD), Indium and Terbium (5000 µg/L):

Add volumes of Indium and Terbium reference standard solutions equivalent to 500 µg (e.g., 500 µL of a 1000 mg/L solution) to a 100 mL volumetric flask and dilute to 100 mL with 2% HNO₃. Mix.

Note: Other internal standards can be used as long as the element is not contained in the sample, the mass number is similar to that of the analyte, and the ionization potential is similar to that of the analyte.

b. Calibration Standards

Calibration standards are required for constructing a multipoint standard curve covering the range of analyte concentrations anticipated in samples.

Prepare intermediate standards by making dilutions of commercially available standard solutions into 2% HNO₃. Suggested concentrations, based on use of 1000 mg/L standards, are:

i. 10,000 µg/L:

Pipet 100 µL of 1000 mg/L standard to a 10 mL volumetric flask and dilute to volume.

ii. 1000 µg/L:

Pipet 10.0 mL of 10,000 µg/L solution (i) to a 100 mL volumetric flask and dilute to volume.

iii. 100 µg/L:

Pipet 1.00 mL of 10,000 µg/L solution (i) to a 100 mL volumetric flask and dilute to volume.

Prepare calibration standards by making appropriate dilutions of intermediate standards with 2% HNO₃ and adding sufficient 5000 µg/L ISTD to result in a final ISTD concentration of 5 µg/L. Prepare these standards using polymeric volumetric flasks.

The Table below lists some suggested concentrations for calibration standards and recommended volumes and concentrations of solutions required for preparation of 100 mL volumes of each.

Calibration STD Conc. [Sample Conc* in ()]	Amount used x Intermediate Standard concentration	Amount ISTD
Calibration Blank (0 ppb)	(2% HNO ₃ Only)	100 µL
0.05 µg/L (5 ppb)	50 µL x 100 µg/L	100 µL
0.10 µg/L (10 ppb)	100 µL x 100 µg/L	100 µL
0.20 µg/L (20 ppb)	200 µL x 100 µg/L	100 µL
0.50 µg/L (50 ppb)	500 µL x 100 µg/L	100 µL

**United States Department of Agriculture
Food Safety and Inspection Service, Office of Public Health Science**

CLG-TM3.01	Page 5 of 14	
Title: Determination of Cadmium and Lead by ICP-MS		
Revision: 01	Replaces: CLG-TM3.00	Effective: 06/12/2006

1.00 µg/L (100 ppb)	100 µL x 1000 µg/L	100 µL
2.00 µg/L (200 ppb)	200 µL x 1000 µg/L	100 µL
5.00 µg/L (500 ppb)	500 µL x 1000 µg/L	100 µL
10.00 µg/L (1000 ppb)	1000 µL x 1000 µg/L	100 µL

* Equivalent Analyte concentration in a sample in ppb, assuming a sample concentration of 0.01 g/mL (0.5 g/50 mL) in final extract.

c. Quality Control Standards

Prepare Quality Control standards from commercially available 1000 mg/L standard solutions obtained from a *different source* than that used to prepare Calibration Standards. Two types of quality control standard must be prepared:

i. QC Standard:

Prepare a combined Pb/Cd standard having concentrations near the midpoint of the calibration curve, but different from those used in any calibration standard. Prepare in same manner calibration standards are prepared, diluting with 2% HNO₃ and adding sufficient 5000 µg/L ISTD to result in a final ISTD concentration of 5 µg/L.

ii. Fortification Standard of Pb and Cd (500 µg/L):

Add 500 µL of 10,000 µg/L Pb and Cd standard solutions (D.2.b.i) to a 100 mL polymeric volumetric flask and dilute to volume with 2% HNO₃. Each µL added to control tissue is equivalent to approximately 1 ppb (25 µL=25 ppb) based on a 0.5 g sample weight.

Note: Standards containing other concentration ratios of Pb and Cd may be used if desired.

3. Storage and Stability.

- a. All standards may be stored at room temperature.
- b. Commercially available standard solutions may be used until their expiration date.
- c. Solutions made from these may be used up to the earliest expiration date of any standard used to prepare them.

E. SAMPLE PREPARATION

Note: Since trace amounts of lead and cadmium are ubiquitous in the environment and may be present in dust particles, efforts should be made to avoid external contamination. All areas/materials involved in sample preparation and analysis should be kept as dust-free as possible to minimize the chance of contamination.

Samples must be thoroughly blended to assure uniformity prior to removal of a test portion.

**United States Department of Agriculture
Food Safety and Inspection Service, Office of Public Health Science**

CLG-TM3.01	Page 6 of 14	
Title: Determination of Cadmium and Lead by ICP-MS		
Revision: 01	Replaces: CLG-TM3.00	Effective: 06/12/2006

F. ANALYTICAL PROCEDURE

1. Microwave Digestion

- a. Weigh homogenized sample (approximately 0.5 g for muscle tissues, 0.5 - 1 g for liver and kidney¹) to the nearest 0.01 g into a clean² microwave vessel liner. Teflon or polypropylene stirring rods may be used to manipulate samples.

Note: Prepare negative and positive controls at this time (See section I.5, "Sample Set"). Prepare positive control(s) by adding 25 - 250 µL of Fortification Standard to blank tissue.

¹*Caution!* Mixing sample types or sample weights may produce unacceptably large variations in pressures developed during digestion, possibly resulting in damage to vessels if *unvented* caps are used. In order to maintain relatively constant digestion conditions in all unvented vessels, analyst should digest like quantities of similar sample matrices in each batch.

²Vessel liners must be cleaned after each use to reduce the possibility of cross-contamination. Refer to Section K.2 for recommended cleaning procedure.

- b. Add 5 mL of concentrated HNO₃.
- c. Assemble the vessel according to the manufacturer's instructions.
- d. Place assembled vessels into the microwave according to the manufacturer's instructions.
- e. Program oven with parameters demonstrated to safely and effectively digest samples (producing a clear digest when diluted). Recommended parameters are listed in the table below. It may be necessary to adjust these parameters to accommodate variations between individual instruments.

Power:	1200 Watts*
Ramp time:	10 minutes
Final temperature:	180 °C
Temperature hold time:	10 minutes
Cool down time:	10 minutes

*If there are less than eight vessels in the microwave the wattage can be lowered to 600.

- f. Initiate oven program and digest samples.
- g. Allow vessels to cool, then transfer to a fume hood and allow vessels to equilibrate to room temperature.
- h. Slowly open the vent fittings and vent to atmospheric pressure, then disassemble vessels.

**United States Department of Agriculture
Food Safety and Inspection Service, Office of Public Health Science**

CLG-TM3.01	Page 7 of 14	
Title: Determination of Cadmium and Lead by ICP-MS		
Revision: 01	Replaces: CLG-TM3.00	Effective: 06/12/2006

2. Microwave Evaporation

- a. Place vessel liners into the evaporation carousel and assemble according to the manufacturer's instructions. Note: Manufacturer recommends use of PTFE syringe filters with the evaporation manifold for trace metal analysis (optional).
- b. Place the evaporation assembly into the microwave.
- c. Program oven to reduce solution volumes to approximately 1 mL. Typical program parameters are listed below.

Power:	600 Watts
Ramp time:	5 minutes
Final temperature:	120 °C
Temperature hold time:	3.5 minutes*
Cool down time:	10 minutes

*Typical value required when 8 vessels are used. Hold times required to achieve a final volume of 1 mL for any given number of vessels must be determined experimentally.

Note: If the microwave is capable of determining an evaporation plateau temperature, a temperature drop of $\Delta T \approx 7$ °C may be used to control the final volume. This approach is more variable, but does not require adjustment for tissue type, tissue weight, or number of samples.

- d. Initiate oven program and evaporate samples.
- e. Once vessels have cooled to room temperature, remove the evaporation assembly from the oven and dismantle. Flush the evaporation manifold with DI water.

3. Extract Preparation

- a. If the solution volume remaining in the vessel liner is <1 mL, add concentrated HNO₃ to bring volume to approximately 1 mL. Note: residual acid volumes of up to 2.5 mL are acceptable, but should be avoided if possible. Pour extract solution into a 50 mL plastic tube containing approximately 10 mL Millipore water.
- b. Quantitatively transfer residual digest by rinsing the liner 3 - 4 times with Millipore water, adding each rinse to the extract in the tube. Keep total rinse volume < 35 mL.
- c. Add 50 µL of 5000 µg/L ISTD solution to the extract.
- d. Bring extract volume to 50 mL with Millipore water.
- e. Cap tube and invert several times to mix.

Note: The percentage of dissolved solids in the 50 mL extract, which is higher than that recommended by instrument manufacturer, can be reduced by

**United States Department of Agriculture
Food Safety and Inspection Service, Office of Public Health Science**

CLG-TM3.01	Page 8 of 14	
Title: Determination of Cadmium and Lead by ICP-MS		
Revision: 01	Replaces: CLG-TM3.00	Effective: 06/12/2006

increasing the dilution volume. Analyst must balance detrimental effects of high dissolved solids content (matrix effects, instrument contamination) against detrimental effects resulting from environmental contamination and lower analyte concentrations when considering this. If additional dilutions are made, care must be taken to maintain acid strength at ~2% and ISTD concentration at 5 µg/L, and adjust standard curve concentrations accordingly, if necessary.

4. ICP-MS Analysis

a. Tuning

- i. Prior to sample analysis check the instrument's tuning parameters by analyzing the Mass Spectrometer Tuning Solution as specified by the manufacturer. Check the sensitivity, % RSD, % oxide, % doubly charged, peak shape, and resolution.
- ii. If these parameters are outside the manufacturer's specifications, retune the instrument.

b. ICP-MS Parameters

Set up instrument to monitor isotopes of cadmium and lead, indium and terbium (or other selected internal standards), and molybdenum (MoO interferes with cadmium quantitation).

Table 1. ICP-MS Isotopes Monitored for Pb, Cd Analysis

Metal	Isotopes to Monitor
Cadmium	106, 108, 110, 111*, 112, 113, 114, 116
Lead	204, 206, 207, 208*
Molybdenum	92, 94, 95, 96, 97, 98, 100
Indium	113, 115
Terbium	159

* Isotope used for quantitation

c. Instrument calibration

- i. Analyze a calibration blank followed by at least 4 calibration standards (D.2.b) covering the range of interest. Using linear regression analysis, plot relative response (response relative to ISTD response) vs. concentration in µg/L and determine slope (m), intercept (b), and correlation coefficient (r) of the calibration curve. This can be automatically performed by the ICP-MS software. Correlation coefficient r must be ≥0.995, or calibration must be repeated.

Analyze the calibration blank and a QC standard (D.2.c.i.) immediately after the calibration curve. The response of the blank should be similar to

**United States Department of Agriculture
Food Safety and Inspection Service, Office of Public Health Science**

CLG-TM3.01	Page 9 of 14	
Title: Determination of Cadmium and Lead by ICP-MS		
Revision: 01	Replaces: CLG-TM3.00	Effective: 06/12/2006

that observed when initially analyzed. The calculated Pb and Cd concentrations in the QC standard must be within $\pm 10\%$ of their accepted value. If these conditions are not met, the calibration sequence must be repeated until results are acceptable.

d. Sample Analysis

Once instrument meets calibration requirements, analyze all controls and test samples, taking care to meet conditions listed below.

- i. Calibration blanks and QC standards must be included in the sample analysis sequence after at least every 12 consecutive samples analyzed, and also at the end of the sample sequence to verify instrument performance over the course of the run.
- ii. If response of any sample exceeds highest standard in the calibration curve, make an appropriate dilution in 2% HNO₃ and add ISTD to maintain a 5 µg/L concentration, then re-analyze.

G. CALCULATIONS

Note: Instrument software can be programmed to perform all necessary calculations.

1. Using values for m, b determined for the calibration curve (F.4.c), determine analyte concentration (C_E, in µg/L) in any extract having a relative response R using:

$$C_E (\mu\text{g/L}) = C_E, \mu\text{g/L} = (R-b)/m$$

Note: If sample is found to contain molybdenum, instrument software must be set to compensate for contribution of molybdenum oxide to the 111 isotope used for quantitation of cadmium in the sample.

2. Calculate analyte concentrations in digested controls and samples (C_S) using:

$$C_S (\text{ppb}) = \frac{C_E \times V_E \times D}{W}$$

Where

C_E = Analyte concentration in final extract, in µg/L

V_E = Final sample extract volume in milliliters

D = Dilution factor (Diluted volume/aliquot volume), if secondary dilution was made.

W = Sample Weight in grams.

3. Calculate Relative % Difference (RPD) for duplicate results using:

$$\text{RPD} = \frac{|C_1 - C_2| \times 200}{(C_1 + C_2)}$$

Where:

C₁ = first duplicate's concentration.

**United States Department of Agriculture
Food Safety and Inspection Service, Office of Public Health Science**

CLG-TM3.01	Page 10 of 14	
Title: Determination of Cadmium and Lead by ICP-MS		
Revision: 01	Replaces: CLG-TM3.00	Effective: 06/12/2006

C2 = second duplicate's concentration.

4. Calculate recoveries of fortified controls and check samples using

$$\%Rec = \frac{(C_F - C_B) \times W \times 100}{V_{FS} \times C_{FS}}$$

Where

C_F, C_B = Analyte concentrations determined for the fortified sample and the blank tissue from which it was prepared, in ppb (ng/g).

W = Weight of fortified control, in grams.

V_{FS} = Volume of fortification standard added, in mL.

C_{FS} = Concentration of fortification standard, in µg/L.

H. SAFETY INFORMATION AND PRECAUTIONS

- Required Protective Equipment - Safety glasses, lab coat, protective gloves.
- Hazards

Item/Procedure	Hazard	Recommended Safe Procedures
Nitric Acid	Strong oxidizer. May be fatal if swallowed or inhaled. Extremely corrosive. Contact with skin or eyes may cause severe burns and permanent damage.	Perform operations using concentrated acid in fume hood. Use protective eyewear, gloves and clothing. Store in approved acid safety cabinet away from basic or other reactive materials.
Microwave Digester	Possible explosion hazard	Follow manufacturer recommendations
Pb, Cd, In, Tb Standards	Poisonous if ingested.	Do not pipet by mouth

- Disposal Procedures

Item/Procedure	Hazard	Recommended Safe Procedures
Nitric Acid	See above	Store in cabinet away from bases or other reactive materials. Follow applicable state and local regulations when disposing of acid solutions.
Pb, Cd, In, Tb Standards	See above	Follow applicable state and local regulations when disposing of

**United States Department of Agriculture
Food Safety and Inspection Service, Office of Public Health Science**

CLG-TM3.01	Page 11 of 14	
Title: Determination of Cadmium and Lead by ICP-MS		
Revision: 01	Replaces: CLG-TM3.00	Effective: 06/12/2006

solutions or their residues.

I. QUALITY ASSURANCE PLAN

1. Performance Standard

<i>Analyte</i>	<i>Analytical Range</i>	<i>Acceptable Recovery</i>
Pb, Cd	≥ 25 ppb (Pb) ≥ 10 ppb (Cd)	< 25 ppb: 70 - 110% (Cd) ≥ 25 ppb: 80 - 110% (Cd, Pb)

For each sample set:

- a. The instrument calibration meets specifications in section F.4.c.
- b. The recovery calculated for the positive control meets specifications in the above table.
- c. If a positive control duplicate is run, the calculated RPD is ≤ 20%.
- d. All calibration blanks injected show consistent responses, and all QC standards are within ± 10% of the accepted value.
- e. For each sample within the set, the internal standard response is within ± 50% of the average instrument calibration internal standard response.

2. Readiness To Perform (FSIS Training Plan)

a. Familiarization

- i. Phase I: Standards - Analyze a ≥ 6 level standard curve in duplicate for Pb and Cd over range 0 – 5 µg/L (or higher) on 3 different days. Suggested concentrations are:
 - (a) 0 µg/L (calibration blank)
 - (b) 0.2 µg/L
 - (c) 0.5 µg/L
 - (d) 1.0 µg/L
 - (e) 2.0 µg/L
 - (f) 5.0 µg/L
- ii. Phase II: Fortified samples - For muscle, liver, and kidney tissues: Fortify blank tissue in duplicate with Cd and Pb at 4 levels (including 0) representing low, medium, and high values in the range of interest for that tissue. Recommended ranges are muscle: up to 100 ppb; liver and kidney: up to 250 ppb. Analyses must be conducted over a minimum of three separate days.

NOTE: Phase I and Phase II may be performed concurrently.

**United States Department of Agriculture
Food Safety and Inspection Service, Office of Public Health Science**

CLG-TM3.01	Page 12 of 14	
Title: Determination of Cadmium and Lead by ICP-MS		
Revision: 01	Replaces: CLG-TM3.00	Effective: 06/12/2006

- iii. Phase III: Check samples for analyst accreditation.
 - (a) A minimum of six check samples, having concentrations unknown to the analyst. Set must include one blank tissue, with the remainder containing Pb at levels between 25 - 250 ppb and Cd at any levels between 10 - 250 ppb.
 - (b) Approval from Quality Assurance Manager (QAM) is required to commence official analysis.
- b. Acceptability criteria.
Refer to section I.1 above.
- 3. Intralaboratory Check Samples
 - a. System, minimum contents.
 - i. Frequency: One per week per analyst, when samples are analyzed.
 - ii. Records are to be maintained by the analyst and reviewed by the supervisor and QAM.
 - b. Acceptability criteria.
If unacceptable values are obtained, then:
 - i. Stop all official analyses by that analyst.
 - ii. Take corrective action.
- 4. Sample Acceptability and Stability
 - a. Sample size: 450 g minimum.
 - b. Sample condition: Cold on receipt.
 - c. Sample storage:
 - i. Time: Indefinite.
 - ii. Condition: Frozen.
- 5. Sample Set
A sample set consists of:
 - a. One tissue blank (Negative control).
Note: Truly blank tissues are not available. Use previously analyzed tissues having low analyte levels for this purpose.
 - b. One or more fortified blanks (Positive controls), prepared using the same tissue used for the tissue blank.
Note: Use fortification levels greater than the amount naturally present in the blank to minimize the blank's contribution to the uncertainty of the calculated

**United States Department of Agriculture
Food Safety and Inspection Service, Office of Public Health Science**

CLG-TM3.01	Page 13 of 14	
Title: Determination of Cadmium and Lead by ICP-MS		
Revision: 01	Replaces: CLG-TM3.00	Effective: 06/12/2006

recovery.

- c. Up to the number of samples that can be digested simultaneously with the positive and negative controls in the microwave apparatus.

6. Method Sensitivity

Minimum proficiency level (MPL): Pb: 25 ppb; Cd: 10 ppb

J. WORKSHEET

Reserved.

K. APPENDIX

1. References

Agilent 7500 ICP-MS Hardware Manual, G1833-90004, January 2001.

CEM XP-1500 Plus Vessel Accessory Sets and Autovent Option Instruction for Use, 600493, Rev. 5, 8/01.

CEM Vacuum Concentration/Drying Accessory Set Instructions for Assembly and Use, 600484, Rev. 1, 6/99.

EPA Method 6020, Inductively Coupled Plasma-Mass Spectrometry, Revision 0, September 1994.

2. Cleaning Vessel Liners

The following procedures are suitable for removal of residual adsorbed Cd and Pb residues from Teflon liners used in this method. Other procedures are available and may be used if demonstrated to be effective.

Option 1

- a. Add approximately 20 mL of 2% HNO₃ to each digestion vessel liner.
- b. Assemble vessels as specified by manufacturer.
- c. Place in microwave.
- d. Digest at 600W, ramp to 125 °C over 10 minutes, then hold at temperature for 10 minutes.
- e. Cool vessels to room temperature, then disassemble.
- f. Rinse vessel liners and caps with Millipore water several times to remove all traces of acid.
- g. Place in a clean environment to dry.

**United States Department of Agriculture
Food Safety and Inspection Service, Office of Public Health Science**

CLG-TM3.01	Page 14 of 14	
Title: Determination of Cadmium and Lead by ICP-MS		
Revision: 01	Replaces: CLG-TM3.00	Effective: 06/12/2006

Option 2.

Using a Milestone Trace Clean apparatus:

- a. Place the microwave vessel liners and caps into the apparatus.
- b. Start the method program as per the manufacturer suggestion.
- c. After the apparatus has cooled, remove the liners and caps.
- d. Rinse with Millipore water.
- e. Place in a clean environment to dry.

L. APPROVALS AND AUTHORITIES

Approvals are on file.

Issuing Authority: Laboratory Quality Assurance Division (LQAD).