Technical Briefing on Trace Elements Analysis for the Food Adulteration (Metallic Contamination) (Amendment) Regulation 2025 Cap. 132V

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Key Amendments to Cap. 132V

- Total number of maximum levels (MLs) increased from 144 to 171
  - 27 new MLs of specified metals (cadmium, lead and methylmercury) in specified food; and
  - 9 updated MLs of lead in existing specified food.
- With reference to Codex / latest standards of major importing areas

- Grace period from 5 Sep 2025 to 5 Mar 2027

Methylmercury		
Food	Existing ML (mg/kg)	Amended ML (mg/kg)
Tuna	0.5 (fish)	1.2
Alfonsino	0.5 (fish)	1.5
Marlin	0.5 (fish)	1.7
Shark	0.5 (fish)	1.6
Orange roughy	0.5 (fish)	0.8
Pink cusk-eel	0.5 (fish)	1.0
fish balls and fish cakes	--	0.5

No changes has been made to total mercury

Lead		
Food	Existing ML (mg/kg)	Amended ML (mg/kg)
Salt, food grade, other than salt from marshes, food grade	2	1
Sugar-based candies and honey	--	0.1
Soft brown, raw, and non- centrifugal sugars	--	0.5
White sugar, refined sugar, corn syrups and maple syru	--	0.5
Mango chutney	1	0.4
Edible offal of cattle	0.5	0.2
Edible offal of pig	0.5	0.15
Edible offal of poultry	0.5	0.1
Edible fats and oils	0.1	0.08
Fat spreads and blended spreads	0.1	0.08
Lime preserved eggs	0.5	0.2
Edible fungi (other than those edible fungi specified in this item)	1	0.5
Fresh farmed mushrooms (common mushrooms (Agaricus bisporus), shiitake mushrooms (Lentinula edodes) and oyster mushrooms (Pleurotus ostreatus))	1 (edible fungi)	0.3
Honey mushrooms (Armillaria mellea)	1 (edible fungi)	0.3
Grape juice	0.05	0.04
Cereal-based foods intended to be consumed principally by persons under the age of 36 months.	--	0.02
Ready-to-eat complementary foods intended to be consumed principally by persons under the age of 36 months. (Other than cereal-based foods intended to be consumed principally by persons under the age of 36 months.)	--	0.02

Cadmium		
Food	Existing ML (mg/kg)	Amended ML (mg/kg)
Cocoa powder (100% total cocoa solids on a dry matter basis) ready for consumption	--	2.0
Chocolates containing or declaring ≥ 70% total cocoa solids on a dry matter basis	--	0.9
Chocolates containing or declaring ≥ 50% total cocoa solids on a dry matter basis	--	0.8
Chocolates containing or declaring ≥ 30% total cocoa solids on a dry matter basis	--	0.7
Chocolates containing or declaring < 30% total cocoa solids on a dry matter basis	--	0.3
Edible fungi (other than those edible fungi specified in this item)	0.1 (Vegetables unless otherwise specified)	0.2
Shiitake mushrooms (Lentinula edodes)	0.1 (Vegetables unless otherwise specified)	0.5
Morels (Morchella importuna), shingled hedgehogs (Sarcodon imbricatus), green-cracking russulas (Russula virescens), chanterelles (Cantharellus spp.) and honey mushrooms (Armillaria mellea)	0.1 (Vegetables unless otherwise specified)	0.6
Bolete mushrooms (Boletus bainiugan, Lanmaoa asiatica, Sutorius brunneissimus, Rugiboletus extremiorientalis), matsutake mushrooms (Tricholoma matsutake), termite mushrooms (Termitomyces spp.) and tawny milkcaps (Lactarius volemus)	0.1 (Vegetables unless otherwise specified)	1
Truffles (Tuber spp.) and himematsutake mushrooms (Agaricus blazei)	0.1 (Vegetables unless otherwise specified)	2
Wood ears (Auricularia cornea, Auricularia heimuer) and white jelly mushrooms (Tremella fuciformis)	0.1 (Vegetables unless otherwise specified)	0.5

Grinding and Homogenizing Food Samples

- Size reduction of sample - as fine as possible
- Do not use homogenizer with stainless steel blade for determining chromium in food! Use blade with titanium coating.

  for example:

International Standard Methods for Cadmium and Lead

- GB 5009.15-2023 (Cd only, GFAAS, ICP-MS)
- GB 5009.12-2023 (Pb only, GFAAS, FAAS, ICP-MS)
- GB 5009.268-2025 (various elements, ICP-MS)
- AOAC Official Method 2015.01 (various elements, ICP-MS)
- BS EN 17851:2023 (various elements, ICP-MS)
- US FDA EAM 4.7 (various elements, ICP-MS)

Method Comparison for Cd and Pb Determination

	GB 5009.268-2025	US FDA EAM 4.7	BS EN 17851:2023
Scope	Food	Food	Food
Sample weight	0.2 to 1 g depending on food matrix	0.5 to 5 g depending on food matrix	0.2 to 3 g depending on food matrix
Reagent	3 to 5 mL HNO3	8 mL HNO3 1 mL 30% H2O2	3 mL HNO3 0.5 to 1 mL 30% H2O2
Digestion technique	Closed vessel microwave digestion	Closed vessel microwave digestion	Closed vessel microwave digestion
Digestion condition	Temperature : 190 ˚C Ramp Time : 15 min Hold Time : 30 min	Temperature : 200 ˚C Ramp Time : 25 min Hold Time : 15 min	Temperature : 200 ˚C Ramp Time : 5 min Hold Time : 20 min
Calibration	Internal calibration	Internal calibration	Internal calibration

Examples on Method Parameters

Element	Monitored isotopes	Recommended ISTD	Recommended reporting isotope	Minimum integration time (sec)	Analysis Mode
Chromium	$^{52, 53}$Cr	^{103}Rh	^{52}Cr	0.3	Helium
Manganese	^{55}Mn	^{103}Rh	^{55}Mn	0.1	Helium
Nickel	$^{60, 62}$Ni	^{103}Rh	^{60}Ni	0.3	Helium
Copper	$^{63, 65}$Cu	^{103}Rh	^{65}Cu	0.1	Helium
Zinc	$^{66, 68}$Zn	^{103}Rh	^{66}Zn	0.1	Helium
Arsenic	^{75}As	^{74}Ge	^{75}As	0.5	Helium
Selenium	$^{78, 82}$Se	^{103}Rh	^{78}Se	0.3	Helium
Molybdenum	$^{95, 98}$Mo	^{103}Rh	^{95}Mo	0.1	Helium
Cadmium	$^{111, 114}$Cd	^{103}Rh	^{111}Cd	0.3	Helium
Thallium	$^{203, 205}$Tl	^{209}Bi	^{205}Tl	0.1	Helium
Lead	$^{206, 207, 208}$Pb	^{209}Bi	Sum isotopes	0.1	Helium
Mercury	$^{201, 202}$Hg	^{193}Ir	^{201}Hg	0.5	Helium

Source: US FDA EAM 4.7

4.7 Table 6. Possible interferences

m/z	Element	Polyatomic Interferences	Elemental Interferences
Analyte Isotopes			
52	Cr	$^{35}Cl^{16}OH$, $^{40}Ar^{12}C$, $^{36}Ar^{16}O$, $^{37}Cl^{15}N$ $^{34}S^{18}O$	$^{104}Pd^{++}$, $^{104}Ru^{++}$
53		$^{37}Cl^{16}O$, $^{38}Ar^{15}N$, $^{38}Ar^{14}NH$, $^{36}Ar^{16}OH$, $^{40}Ar^{13}C$	$^{106}Pd^{++}$, $^{106}Cd^{++}$
55	Mn	$^{40}Ar^{15}N$, $^{40}Ar^{14}NH$, $^{39}K^{16}O$, $^{38}Ar^{16}OH$	$^{110}Cd^{++}$
60	Ni	$^{44}Ca^{16}O$, $^{23}Na^{37}Cl$, $^{43}Ca^{16}OH$	$^{120}Sn^{++}$, $^{120}Te^{++}$
62		$^{46}Ti^{16}O$, $^{23}Na^{39}K$, $^{46}Ca^{16}O$	$^{124}Te^{++}$, $^{124}Sn^{++}$, $^{124}Xe^{++}$
63	Cu	$^{31}P^{16}O_2$, $^{40}Ar^{23}Na$, $^{47}Ti^{16}O$, $^{23}Na^{40}Ca$, $^{46}Ca^{16}OH$	$^{126}Te^{++}$, $^{126}Xe^{++}$
65		$^{49}Ti^{16}O$, $^{32}S^{16}O_2H$, $^{40}Ar^{25}Mg$, $^{40}Ca^{16}OH$, $^{36}Ar^{14}N_2H$	$^{130}Te^{++}$, $^{130}Xe^{++}$, $^{130}Ba^{++}$
66	Zn	$^{50}Ti^{16}O$, $^{34}S^{16}O_2$, $^{33}S^{16}O_2{}^1H$, $^{32}S^{16}O^{18}O$, $^{32}S^{17}O_2$	$^{132}Xe^{++}$, $^{132}Ba^{++}$
68		$^{36}S^{16}O_2{}^+$, $^{34}S^{16}O^{18}O^+$, $^{40}Ar^{14}N_2{}^+$, $^{35}Cl^{16}O^{17}O^+$, $^{34}S_2$	$^{136}Ba^{++}$, $^{136}Xe^{++}$, $^{136}Ce^{++}$
75	As	$^{40}Ar^{35}Cl$, $^{59}Co^{16}O$, $^{36}Ar^{38}ArH$, $^{38}Ar^{37}Cl$, $^{36}Ar^{39}K$	$^{150}Sm^{++}$, $^{150}Nd^{++}$
78	Se	$^{38}Ar^{40}Ar$, $^{62}Ni^{16}O$	^{78}Kr, $^{156}Gd^{++}$, $^{156}Dy^{++}$
82		$^{40}Ar_2H_2$, $^{66}Zn^{16}O$	^{82}Kr, $^{164}Dy^{++}$, $^{164}Er^{++}$
95	Mo	$^{79}Br^{16}O$	
98		$^{82}Kr^{16}O$, $^{82}Se^{16}O$	^{98}Ru
111	Cd	$^{95}Mo^{16}O$, $^{94}Zr^{16}OH$, $^{39}K_2{}^{16}O_2H$	
114		$^{98}Mo^{16}O$, $^{98}Ru^{16}O$	^{114}Sn
201	Hg		
202		$^{186}W^{16}O$	
203	Tl	$^{187}Re^{16}O$, $^{186}W^{16}OH$	
205			
206	Pb	$^{190}Pt^{16}O$	
207		$^{191}Ir^{16}O$	
208		$^{192}Pt^{16}O$	

Source: US FDA EAM 4.7

International / National Standard Methods for Methylmercury

- GB 5009.17-2021
- BS EN 16801:2016
- US FDA EAM 4.8

GB

中华人民共和国国家标准

GB 5009.17—2021

食品安全国家标准

食品中总汞及有机汞的测定

BS EN 16801:2016

BSI Standards Publication

Foodstuffs — Determination of elements and their chemical species — Determination of methylmercury in foodstuffs of marine origin by isotope dilution GC-ICP-MS

U.S. Department of Health & Human Services

FDA U.S. Food and Drug Administration

Elemental Analysis Manual
for Food and Related Products

4.8 High Performance Liquid Chromatographic-Inductively Coupled Plasma-Mass Spectrometric Determination of Methylmercury and Total Mercury in Seafood

政府化驗所
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Version 1.1 (June 2008)
Authors: John Cheng
Susan C. Hight

Method Comparison for Methylmercury

	GB 5009.17-2021	BS EN 16801-2016	US FDA EAM 4.8
Scope	Food	Aquatic product	Aquatic product
Extraction solution	5M HCl	25% TMAH solution	1% L-cysteine solution
Extraction condition	1. Ultrasonicate for 60 min at room temp. 2. Neutralize with ammonia 3. Add L-cysteine solution	1. Rotating until completely dissolved 2. Add pH 5 sodium acetate/acetic acid buffer and HNO3 3. Sodium tetraethyl borate derivatization 4. Extract in hexane layer	60 °C water bath for 120 min
Measurement technique	LC-AFS / LC-ICP-MS	GC-ICP-MS	LC-ICP-MS
Calibration	External calibration of MeHg	Isotope dilution using ^{201}Hg enriched MeHg	External calibration of MeHg

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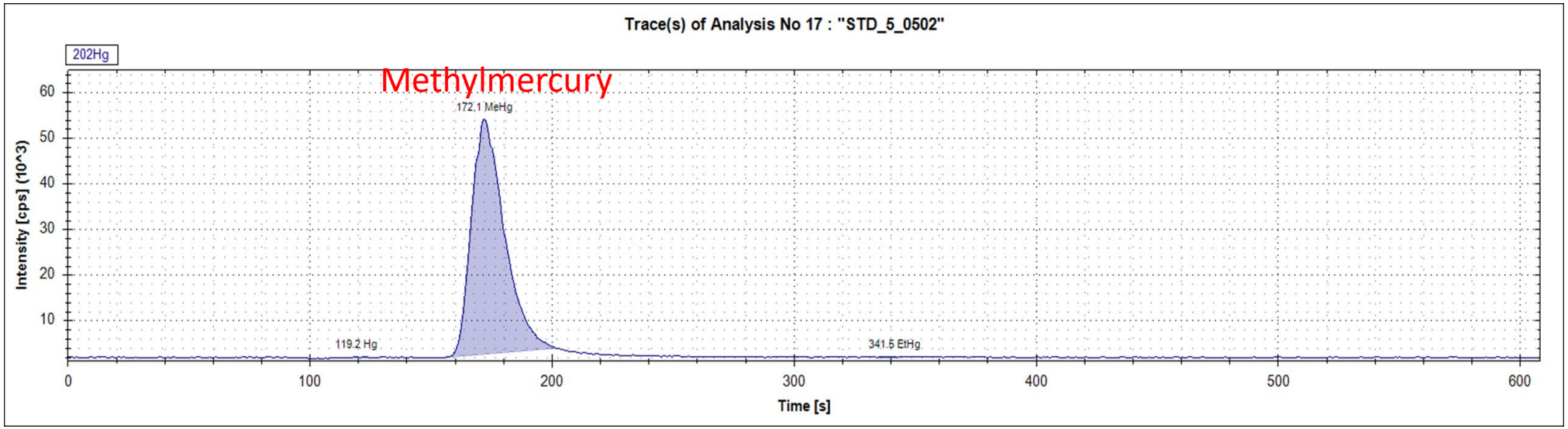
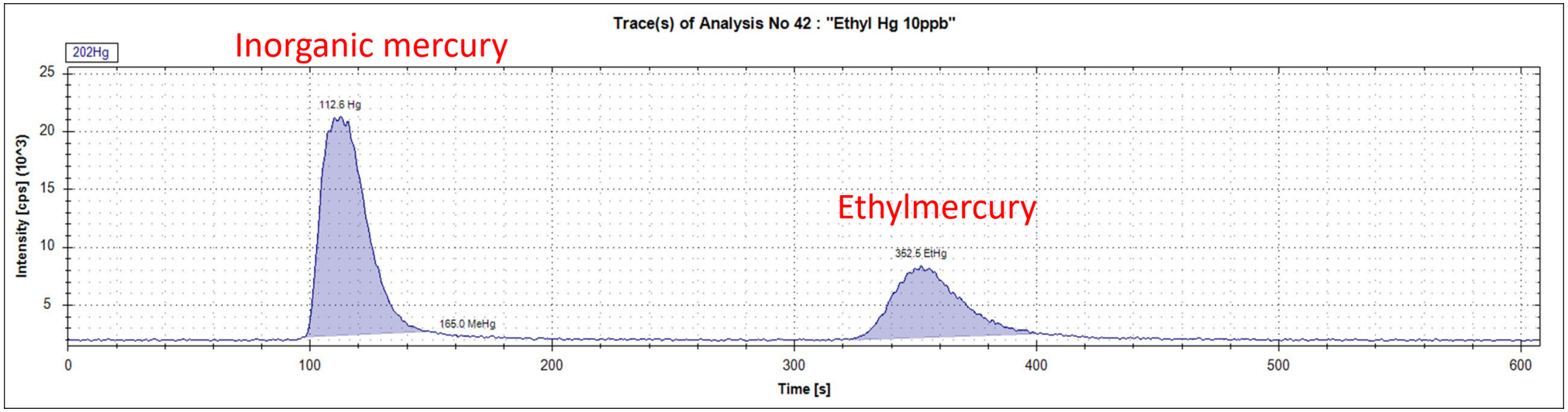
Note: Methylmercury in extraction solution decomposes over time. analyze the extract within 8 hr of preparation.

Example of Instrument Program for Methylmercury

LC	
Mobile phase	0.1% (w/v) L-cysteine + 0.1% (w/v) L-cysteine.HCl.H2O in water
Flow rate	1 mL/min (isocratic)
Injection volume	50 µL
Run time	10 min
Column	C18, 150 x 4.6 mm, 4 µm particle size or equivalent
Column temperature	Not controlled
ICP-MS	
RF power	1550 W
Plasma gas flow rate	15 L/min
Carrier gas flow rate	1 L/min
Acquisition mode	Time-resolved analysis
Acquired mass	202
Integration time (s)	0.2 for mass 202

Chromatograms of inorganic mercury, methylmercury and ethylmercury





Injection of other mercury species -- Make sure peaks for different mercury species are well separated!

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Screening Strategy of Methylmercury

Laboratory analysis

17. Will the Government provide recommended testing methods for all the metallic contaminants specified in Cap. 132V?

The Government has conducted meetings with the testing laboratories and other stakeholders to discuss the determination of metallic contaminants in food. Relevant information can be found at the websites of CFS and GL. Based on the actual requirements, equipment, resources available, laboratories may develop testing methods, making reference to international or national technical criteria and reference testing methods.

For MLs expressed as methyl-mercury, the trade may decide to use their own screening when applying the ML of methyl-mercury by analysing total mercury in the food sample concerned. In general, if the level of total mercury is below or equal to the ML expressed as methyl-mercury, no further testing is required and the sample is determined to be in compliance with the ML expressed as methyl-mercury. If the level of total mercury is above the ML expressed as methyl-mercury, further testing is necessary to determine if the level of methyl-mercury in the food sample concerned is above the ML. The aforesaid principle may also be applicable to inorganic arsenic.

New/Updated MLs in Pb

Food category	2019 Cap. 132V ML (mg/kg)	2025 Cap. 132V ML (mg/kg)
Edible fats and oils	0.1	0.08
Fat spreads and blended spreads	0.1	0.08
Cereal-based foods for infants and young children	--	0.02
Ready-to-eat complementary foods for infants and young children	--	0.02

Method Validation Work for New/Updated MLs in Pb by GL

Food type	Food examples suggested for method validation
edible fats and oils / fat spreads and blended spreads	Canola oil, butter, lard
cereal-based complementary foods for infants and young children	Baby cereal, puff, biscuit
ready-to-eat complementary foods for infants and young children	Fruit puree, ground chicken, apple juice

Method Validation Work for New/Updated MLs in Pb by GL

- Calibration curve: 0.025 – 5 ng/mL
- Sample size: 0.5 g
- RL of edible fats and oils / fat spreads and blended spreads: 0.08 mg/kg
- RL of cereal-based foods / ready-to-eat complementary foods for infants and young children: 0.02 mg/kg
- LOD: ≤ 1/5 of ML (HOKLAS SC-37)
- LOQ: ≤ 2/5 of ML (HOKLAS SC-37)

Method Validation Work for New/Updated MLs in Pb by GL

Calculate the concentration of analytes in sample as follows:

$$M = (A \times D \times V) / W$$

M = concentration of analyte in the sample, mg/kg
A = concentration of analyte in the sample solution, µg/L
D = dilution factor of the sample solution, if any
V = volume of sample solution made up after digestion, L
W = weight of the sample taken for analysis, g

Criteria for Selection of Methods

- Performance characteristics can include, but are not limited to:
  - Applicability
  - Minimum applicable range
  - Accuracy
  - Limit of detection (LOD)
  - Limit of quantification (LOQ)
  - Precision
  - Recovery
  - Trueness
- More in HOKLAS Supplementary Criteria No. 37…

Proficiency Testing (PT) and Quality Control Samples

- PT on relevant matrices and quality control samples are available from commercial PT providers, e.g. FAPAS®
  - metallic contaminants in vegetable oil, heavy metals in baby food (vegetable based), heavy metals in infant cereal (rice based)

- Matrix CRMs for methylmercury are available from various reference material producers, e.g. National Metrology Institutes
  - DOLT-5 Dogfish liver (NRC), IAEA-476 Fish homogenate (IAEA)

Thank you!