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https://nacrw.org/metals-subgroup

METALS SUBGROUP

Housekeeping

- **Presentation will be recorded**
  - Link to be sent out through Metals Subgroup email list and posted on subgroup website
- **Type questions using the chat feature**
- **Please keep your phones muted**

Reference to any commercial materials, equipment, or process does not, in any way, constitute approval, endorsement, or recommendation by the US Food and Drug Administration.

All views and opinions expressed throughout the presentation are those of the presenter and do not necessarily represent views or official position of US Food and Drug Administration.

Topics

- Trace Metal Subgroup Session-2020
- Education and Social Media
- Cannabis Analytical Science Program (CASP) Activities
- Metals Expert Review Panel (ERP) Activities
- Heavy Metals in Colors Working Group
- FDA Method Updates
- Reference Material Update

Trace Metals Subgroup Session

Dr Andrea Raab:
Senior research fellow, University of Aberdeen.

Is elemental speciation important for analysis of foodstuff?

Kevin Smith:
Laboratory Director, Napro Research

Trace metal analysis in Cannabis using ICP-MS & the impact of varying matrices on spike recovery.

Dr Aaron Hineman
Inorganic Product Line Leader, PerkinElmer Inc.

Single Particle-ICP-MS as a Metrology Tool for Engineered Nanoparticles in Environmental Matrices

Dr Sean Conklin
Research Chemist, FDA

Analysis of 17 elements in the top 10 most consumed seafoods in the US

Sub-Saharan Africa: Salt and Na in Food

Dr Eve Kroukamp:
Associate Product Leader ICP-MS, PerkinElmer Inc.

- Sampling and sample preparation
- Analysis with ICP-MS

Dr Aaron Hineman
Inorganic Product Line Leader, PerkinElmer Inc.

- FAAS
- ICP-OES

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Education and Social Media

- **Working with CASP Education working group**
  - Instrumentation fundamentals
  - Method validation and verification
  - QA and QC during analysis
  - Speciation fundamentals
- **Social media**
  - LinkedIn Discussion forum

CASP Activities

- **SMPR 2020.001**
  - Determination of Heavy Metals in a Variety of Cannabis and Cannabis-Derived Products
- **Call for methods ongoing (currently no set close date)**
  - https://www.aoac.org/news/call-for-methods-determination-of-heavy-metals-in-a-variety-of-cannabis-and-cannabis-derived-products/

Metals ERP Activities

- **SMPR 2012.007**
  - Heavy Metals in a Variety of Foods and Beverages
    - AOAC First Action method 2015.01 unable to be promoted to Final Action
    - A second candidate for First Action received, reviewed, and pending authors response
- **SMPR 2015.006**
  - Quantitation of Arsenic Species in Selected Foods and Beverages
    - AOAC Final Action 2016.04 (Arsenic speciation in juice), awaiting publication via AOAC

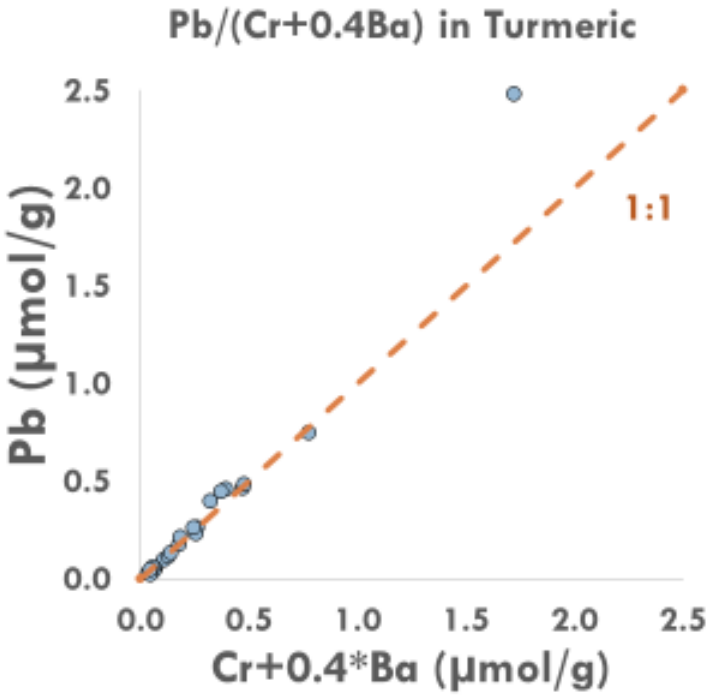
Heavy Metals in Colors Working Group

Adulteration of Natural Colors/Spices with Toxic Salts

Bangladeshi turmeric samples found to be **high in Pb** (Gleason et al. 2014)

Reanalysis of samples showed **close correlation of Pb, Cr, and Ba**

Indicates adulteration with **$PbCrO_4$ (yellow paint)** and **$BaSO_4$ (barite, white powder,** used in lead batteries)



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Heavy Metals in Colors Working Group

Adulteration of Natural Colors/Spices with Toxic Salts

Prompted us to ask: can we produce a global database of adulterants in natural colors/spices?

Begin with **turmeric**, but extending to **annatto** and **paprika**

In cooperation with AOAC, formed a "**Heavy Metals in Colors**" working group

Participation is voluntary!

Contact Dr. Pete Morton (Ph.D. Chemical Oceanography) at **pmorton@fsu.edu**

Current activities include:

Sample exchange (turmeric)

Intercalibration of wet lab and instrumental techniques

Extend analytical suite of elements

FDA Method Updates

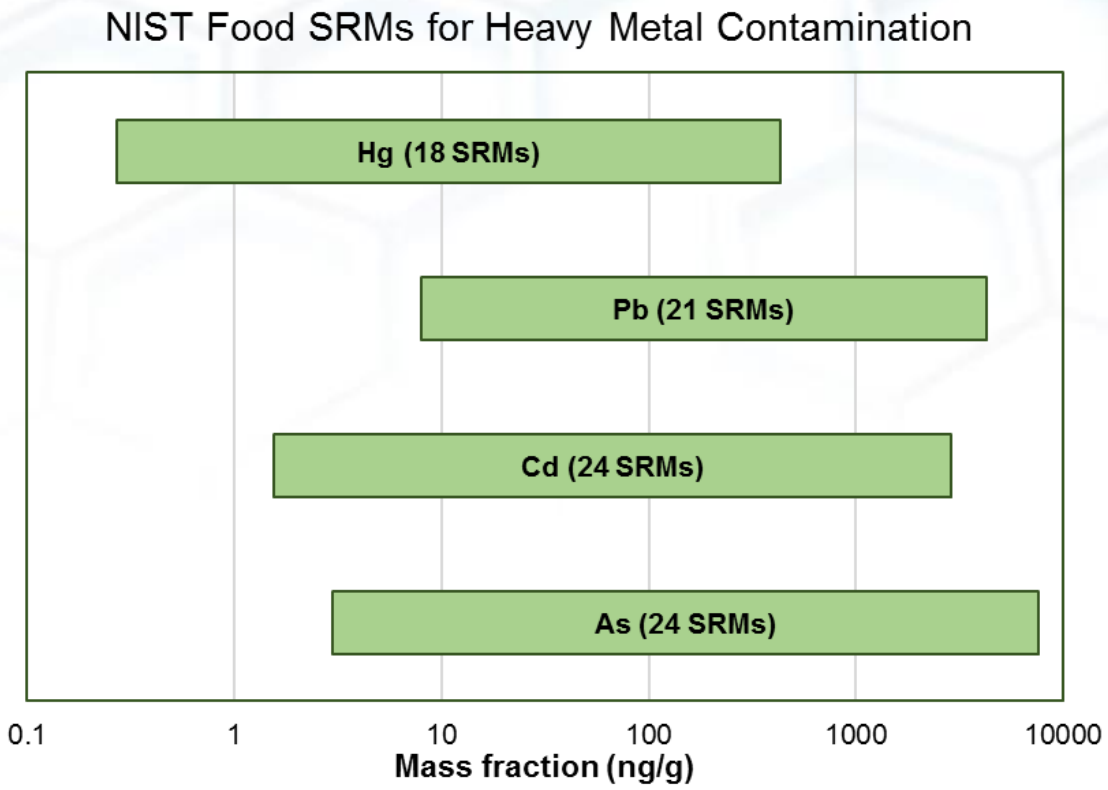
- **EAM 4.7** (Inductively Coupled Plasma-Mass Spectrometric Determination of Arsenic, Cadmium, Chromium, Lead, Mercury, and Other Elements in Food Using Microwave Assisted Digestion)
  - v1.2 released – Thallium added and other minor changes
- **EAM 4.10 (High Performance Liquid Chromatography Inductively Coupled Plasma-Mass Spectrometric Determination of Arsenic Species in Fruit Juice)**
  - v1.1 released – Method modifications for juices with hard to extract arsenic and wine and other minor changes
- **FDA Elemental Analysis Manual:**
  - https://www.fda.gov/food/laboratory-methods-food/elemental-analysis-manual-eam-food-and-related-products

Reference Material Updates

- **Cannabis materials (Emerald Scientific):**
  - Heavy Metals on Ground Hemp (Emerald Scientific: 54990)
    - As, Cd, Pb, Hg
  - Heavy Metals in Cannabis (Emerald Scientific: FM-740)
    - As, Cd, Cr, Cu, Pb, Ni, Hg
- **NIST**
- **NRC**

Food Safety Efforts

Heavy Metal Contamination



Available materials include grains, meats, processed foods, and dietary supplements

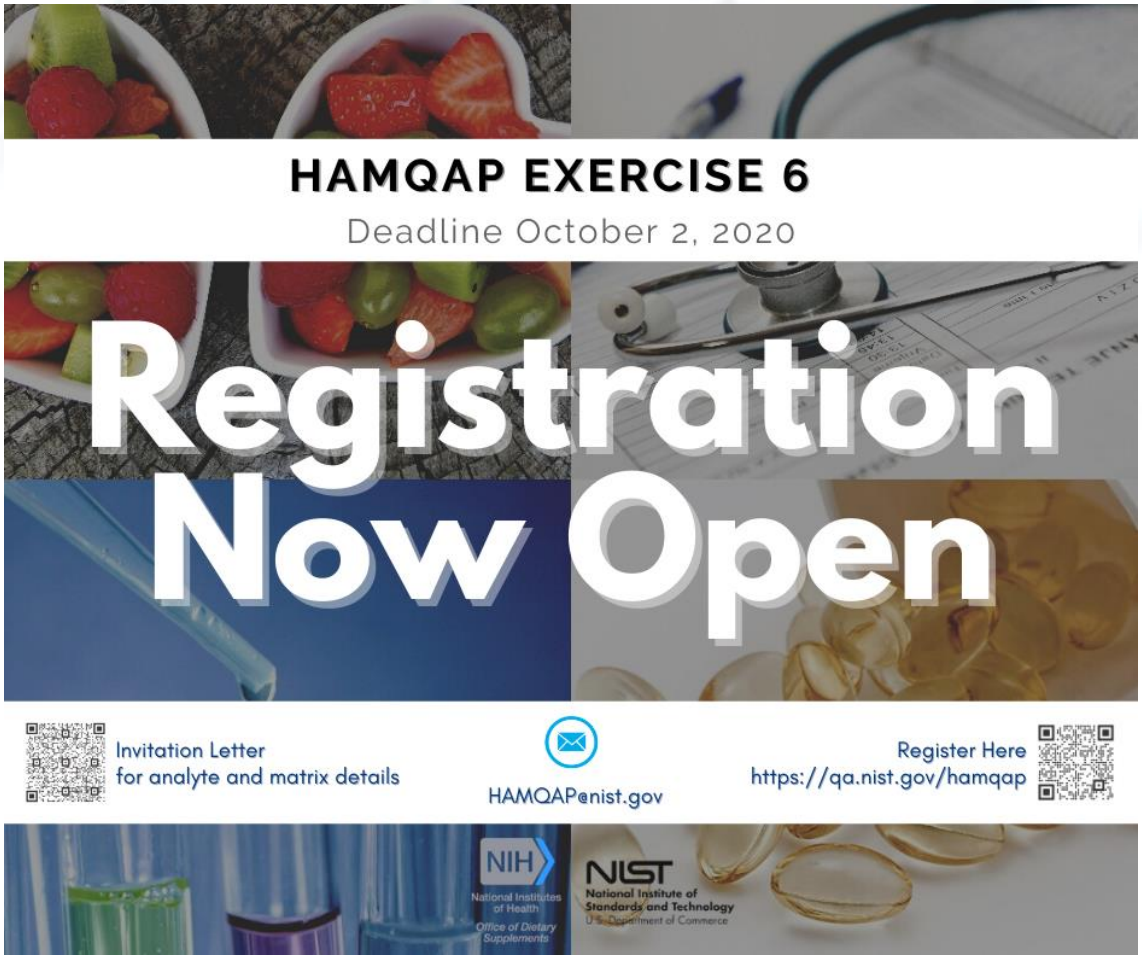
New SRMs

	SRM 3299 Ground Turmeric Rhizome	SRM 1548b Typical Diet	3384 Asian Ginseng Rhizome	SRM 3398 Ginger Rhizome	RM 8650 Kudzu Rhizome	RM 8666 Ginger Extract
As	x	x	x	x[a]	x	x[a]
Cd	x	x	x		x	x
Hg				x		x
Pb	x	x	x	x	x	

X[a] has arsenic species

SRM 3299 is now available. The remaining 5 have all documentation under review and are expected to be available within 6 months.

HAMQAP



Exercise 6 Studies

Nutritional Studies:
- Cl, Cr, I, Se, Mo in multivitamin & infant formula

Toxic Elements Studies:
- As, Cd, Pb, Hg, in Green Tea Tablets & Rice Flour

National Research Council Canada

Conseil national de recherches Canada

NRC food reference materials

Z. Mester

September 23, 2020

Ottawa

Our research

- Isotope ratio measurement
  - New isotope CRMs, matrix CRMs
  - Fundamental metrology on mass bias
- Nano
  - Ongoing R&D in sample prep + sizeable investment in new sampling and digestion technologies
- Purity/ traceability via GD MS and qNMR
  - Unique ultra trace GD MS capability (17025 certified)
- Speciation
  - Unique hyphenations available at CM
- Research in CRM production
  - Incurred, multi residue CRMs,
  - Novel approaches to value assignment in CRM

Reference standards, reference materials

Canadian CRM milestones

- 1981 CRM for trace elements in seawater (NASS-1)
- 1989 material for MeHg speciation (TORT/DOLT/DORM)
- 1989 second generation RM (LUTS-1)
- 1993 natural matrix for dioxins, furans and PCBs (CARP-1)
- 1994 marine toxins
- 1995 AsB speciation (DORM-2)
- 2005 SELM-1 selenomethionine in yeast
- 2010 Mercury isotope ratio / atomic weight CRM
- 2014 CNC and SWCNT CRMs
- 2018 Sugar carbon delta measurements
- 2019 Inorganic Arsenic in Baby food

Marine tissue

Five CRMs, for trace elements, arsenic, tin and mercury species (including two low contaminant level tissue CRMs

DORM is being currently replaced any interest in participating the certification?

DOLT, DORM and TORT is being considered for inorganic arsenic content.

Agricultural commodities (metals, majors, proximates)

Bovine Muscle
Whole Egg
Wheat Gluten
Corn Starch
Corn Bran
Durham Wheat
Hard Red Spring Wheat
Soft Winter Wheat
Potato Starch
Quinoa
Milk powder

NHP, Functional foods

Calcium carbonate

Selenium enriched yeast (Se-82 labelled SeMet)

2 multivitamin/mineral supplement (Se and Cr species

Spinach powder (metals and nitrate content)

Water

Drinking water for trace elements

Water nutrient content (nitrate/nitrite, phosphate, silicate)

Stable isotope CRMs

Three sugar reference materials certified for Carbon delta value

Stable isotope standards for contaminants of interest (Pb, Hg, In, Lu, Cu etc)

Vanillin

NRC future CRM interest

- Contaminants and actives in mushrooms
- New protein source CRMs (food safety) e.g. insects, plant proteins etc
- Brown seaweed CRM for organoarsenic species (food and feed streams)
- Nano materials in matrix
- Stable isotopes

www.nrc.ca/crm

Canadian Reference Materials

From Wikipedia, the free encyclopedia

Canadian Reference Materials (**CRM**) are certified reference materials of high-quality and reliability produced by the National Metrology Institute of Canada – the National Research Council Canada. The NRC Certified Reference Materials program is operated by the Measurement Science and Standards portfolio and provides CRMs for environmental, biotoxin, food, nutritional supplement, and stable isotope analysis. The program was established in 1976 to produce CRMs for inorganic and organic marine environmental analysis and remains internationally recognized producer of CRMs.[1]

Inorganic CRMs [edit]

NRC produces certified reference materials of biological tissues, isotopic standards, natural waters, sediments, supplements, and natural health products. With the exception of the ORMS, the river water CRM with elevated mercury, all materials contain natural levels of analytes in their native matrix.

Since 2011, the reference material for the isotopic composition of natural mercury, NIMS-1, is basis for the standard atomic weight of mercury[2]

- **Biological tissues**
  - DOLT, dogfish liver for trace metals
  - DORM, fish protein for trace metals
  - LUTS, non-defatted lobster hepatopancreas for trace metals
  - TORT, lobster hepatopancreas for trace metals
- **Isotopic materials**
  - NIMS, natural inorganic mercury standard
  - EMMS, isotopic methylmercury standard
- **Natural waters**
  - CASS, near-shore seawater for trace metals
  - MOOS, seawater for nutrients
  - NASS, seawater for trace metals
  - ORMS, river water for mercury
  - SLEW, estuarine water for trace metals

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