
Photo credit: Getty Images

Lead In Spices, Alternative Medicines And Ceremonial Powders

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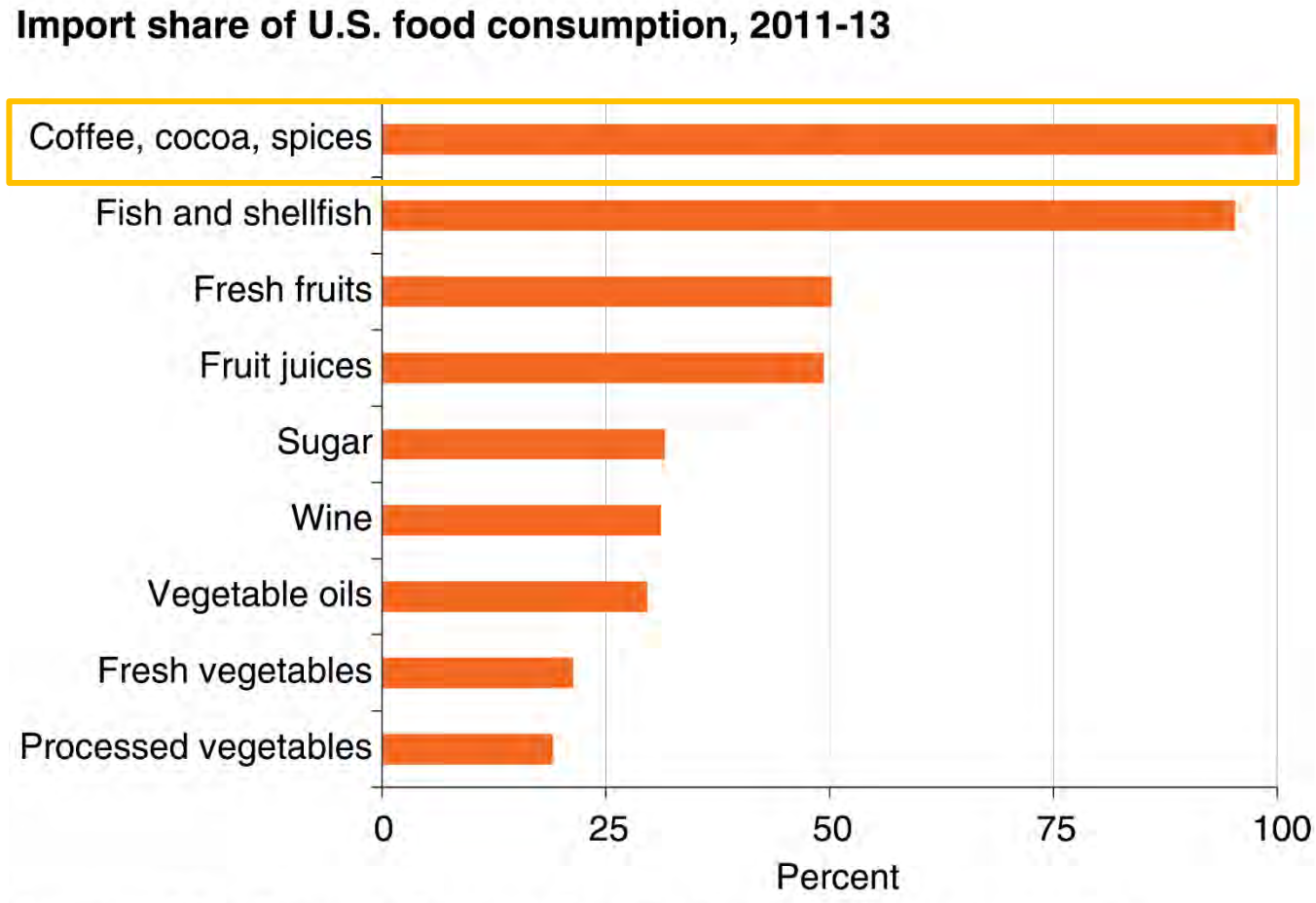
North Carolina Public Health

Updated 8/1/19

Benefits of Spices

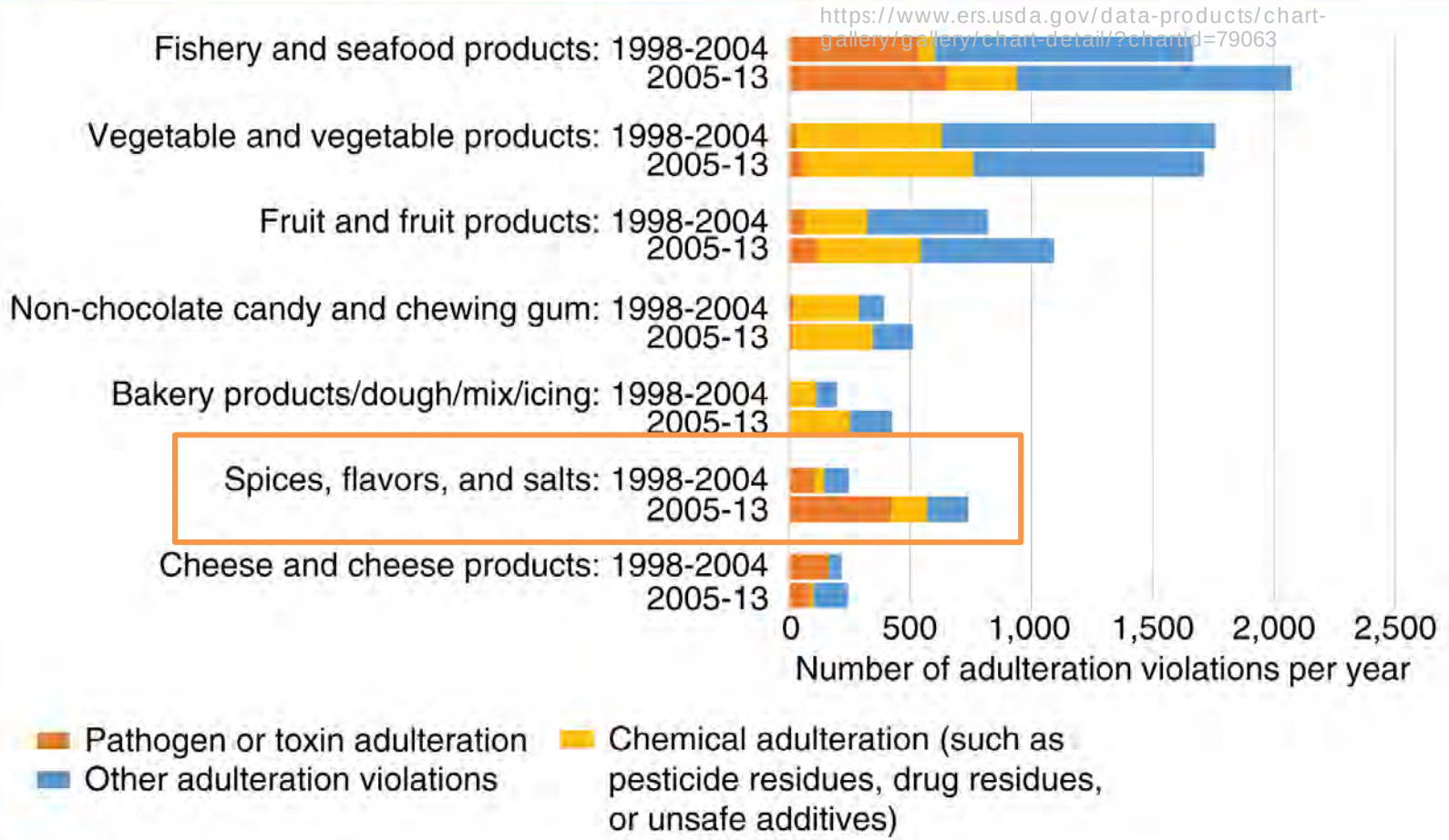
- Useful
  - Medicinal
  - Aromatic
  - Flavorful
- Historical and cultural significance
  - Using spices for thousands of years
  - Binds the culture together

Photo credit: UNC-G Environmental Health Students



Source: USDA, Economic Research Service calculations based on data from U.S. Department of Commerce, U.S. Census Bureau, Foreign Trade Database; and USDA, National Agricultural Statistics Service, various reports.

Adulteration violations in FDA import refusals, by violation type and product category



FDA = U.S. Food and Drug Administration.
Note: FDA uses risk-based criteria to determine which imported food shipments are inspected, rather than a random sample.
Source: USDA, Economic Research Service using data from U.S. Food and Drug Administration, Operational and Administrative System for Import Support database.

Why are some herbs and spices contaminated?

Photo credit: Getty Images

- Lead contaminated soils
  - Airborne emissions from leaded gas
  - Pollution, smelters, battery manufacturing plants
- Contamination during processing
- Exterior lead paint
- Intentional adulteration

STATE OF THE PROBLEM IN NC

Photo credit: Getty Images

Lead in Edible Products: Guidelines for NC Lead Investigators

Product	Reference Limits	Agency	Reference	NC CLPPP Reportable Limits*
Spices	1 mg/kg	New York State Department of Agriculture (Class II Recall)	https://www.astaspice.org/government-relations-advocacy/public-policy-2/state-regulations/	1 mg/kg
Salts	2 mg/kg	World Health Organization (WHO)	(CODEX STAN 193-1995) http://www.fao.org/fileadmin/user_upload/livestockgov/documents/1_CXS_193e.pdf	1 mg/kg
Maximum daily intake for children from all foods	3 µg/ day	US FDA	https://www.fda.gov/Food/FoodborneIllnessContaminants/Metals/ucm2006791.htm	1 mg/kg for any other edible substance
Baby Formula	0.02 mg/kg	World Health Organization (WHO)	(CODEX STAN 193-1995) http://www.fao.org/fileadmin/user_upload/livestockgov/documents/1_CXS_193e.pdf	0.02 mg/kg
Candies	0.1 mg/kg	US FDA	https://www.fda.gov/Food/GuidanceRegulation/GuidanceDocumentsRegulatoryInformation/ucm077904.htm	0.1 mg/kg
Food coloring	10 mg/kg	US FDA	https://www.fda.gov/ForIndustry/ColorAdditives/ColorCertification/ucm423846.htm	1 mg/kg
Alternative Medicines	None found			1 mg/kg
Cosmetics	10 mg/kg for lip products	US FDA	https://www.fda.gov/cosmetics/productsingredients/potentialcontaminants/ucm388820.htm	10 mg/kg

*At or above the NC CLPPP reportable limit, NC CLPPP will report the sample results to US Food and Drug Administration (FDA). In NCLEAD, mark this as a Non-property Hazard Definite (Based on sample results from investigation) and attach photos, spice surveys, and spice lab results to the Child Event.

1. Last Name			First Name						M I	
2. Medicaid No. or SSN										
3. Date of Birth				4. Hispanic Origin? ☐ Yes ☐ No						
5. Race ☐ White ☐ Asian			☐ Black ☐ Pacific Island.			☐ American Indian ☐ Other				
6. Sex ☐ Male			☐ Female							
7. County of Residence:										
8. Refugee status? ☐ Yes ☐ No										

NC Department of Health and Human Services
Division of Public Health

EXPOSURE HISTORY OF CHILD WITH ELEVATED BLOOD LEAD LEVEL

Current Address of Child: _____ Phone: (____) _____

Length of Residence at Child's Current Address: _____ years _____ months

Parent/Guardian Name: _____

Laboratory Findings: Date:_____ Blood Lead:_____

Date:_____ Blood Lead:_____

Date:_____ Blood Lead:_____

Dietary History:

Yes	No	
☐	☐	Does the family store food in open cans?
☐	☐	Does the family prepare, store, or serve food in homemade or imported ceramic dishes?
☐	☐	Does the family use traditional medicines such as greta, azarcon or pay-loo-ah?
☐	☐	Does the family cook with imported spices?

Photo credit: Getty Images

Triggers for lead investigation

- Doctor or nurse referral for a child under 6 or pregnant woman
- NC General Statutes §130A-131.5-131.9H
  - **Elevated blood lead** 5-9 µg/dL
  - **Confirmed lead poisoning** ≥ 10 µg/dL

EBL / Confirmed Visits

- Interview
- Sketch residence
- XRF and environmental samples

Photo credit: Christy Klaus, REHS

Photo credit: Christy Klaus, REHS

Photo credit: Getty Images

Breaking down cultural barriers

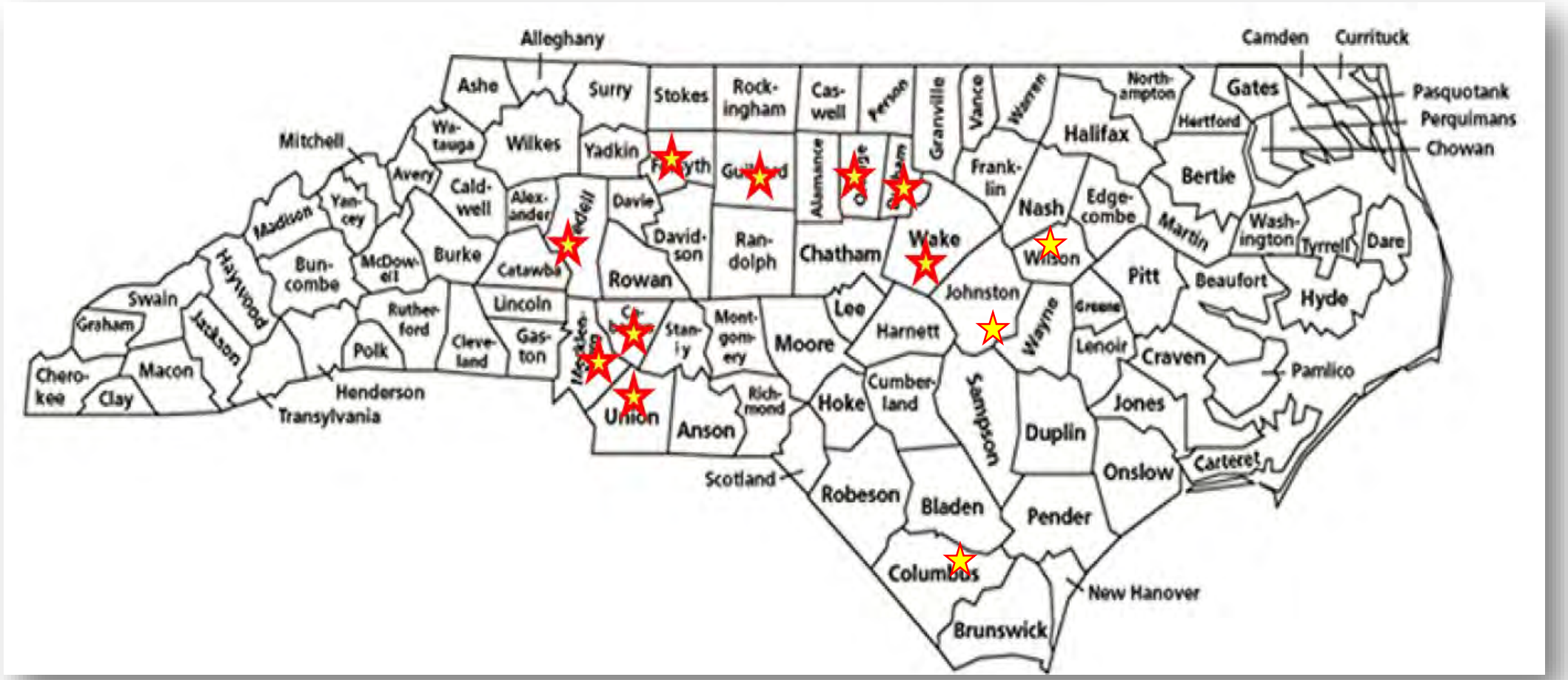
- Most important to find source of lead.
- Avoid judging religious or cultural beliefs.
- What does the parent think is the source of lead?
- Show empathy.
- Listen!

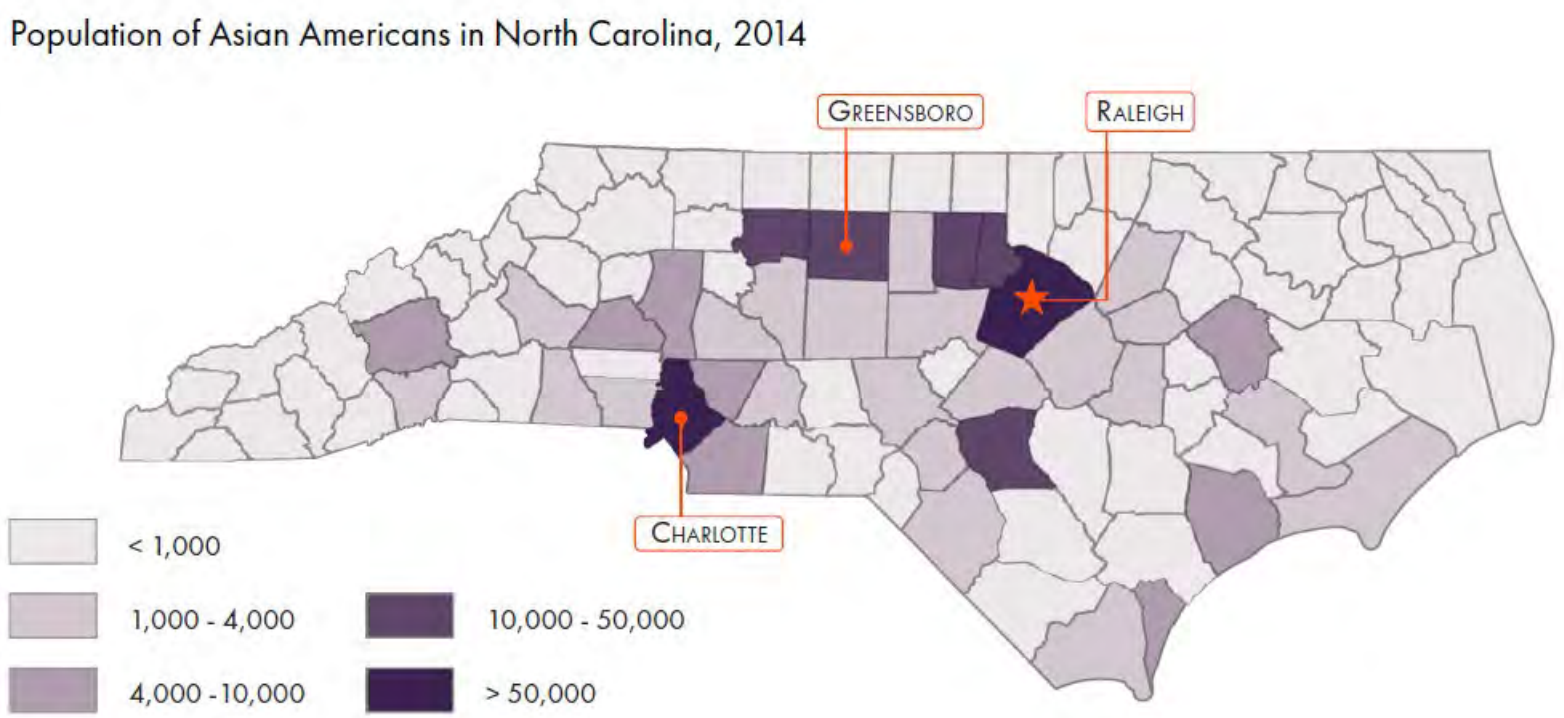
What did these sites have in common?

- **71% were homes/apartments built after 1978**
- Typically urban areas
- Children and mothers who consumed spices, supplements and foods later found to be positive for lead
- Families from many nationalities, but especially South Asian
- Spices and/or herbal remedies consumed daily

Photo credit: Getty Images

Lead Investigation Sites in NC with Product Sampling





From 2000-2010, our population of Asian Americans grew by 85%!

Yee, A. "Asian Americans in North Carolina." March 2016. *Institute for Southern Studies.*

Methods

- Time period: 2011 to 2018
  - NC State Laboratory of Public Health (SLPH) purchased ICP-MS

- Collected:

  - Childhood blood lead levels from NCLEAD surveillance system
  - Lead hazard information from investigation reports
  - Laboratory sample results from NC SLPH

Lead in Spices, Herbal Remedies, and Ceremonial Powders Sampled from Home Investigations for Children with Elevated Blood Lead Levels — North Carolina, 2011–2018

Weekly / November 23, 2018 / 67(46);1290–1294

MMWR Morb Mortal Wkly Rep. 2018 Nov 23;67(46):1290-1294. doi: 10.15585/mmwr.mm6746a2.

Lead in Spices, Herbal Remedies, and Ceremonial Powders Sampled from Home Investigations for Children with Elevated Blood Lead Levels - North Carolina, 2011-2018.

Angelon-Gaetz KA, Klaus C, Chaudhry EA, Bean DK.

Abstract

The number of pediatric cases of elevated blood lead levels (BLLs) are decreasing in North Carolina. However, one county reported an increase in the number of children with confirmed BLLs ≥5 µg/dL (CDC reference value, https://www.cdc.gov/nceh/lead/acclpp/blood_lead_levels.htm), from 27 in 2013 to 44 in 2017. Many children with elevated BLLs in this county lived in new housing, but samples of spices, herbal remedies, and ceremonial powders from their homes contained high levels of lead. Children with chronic lead exposure might suffer developmental delays and behavioral problems (https://www.cdc.gov/nceh/lead/). In 1978, lead was banned from house paint in the United States (1); however, children might consume spices and herbal remedies daily. To describe the problem of lead in spices, herbal remedies, and ceremonial powders, the North Carolina Childhood Lead Poisoning Prevention Program (NCCLPPP) retrospectively examined properties where spices, herbal remedies, and ceremonial powders were sampled that were investigated during January 2011-January 2018, in response to confirmed elevated BLLs among children. NCCLPPP identified 59 properties (6.0% of all 983 properties where home lead investigations had been conducted) that were investigated in response to elevated BLLs in 61 children. More than one fourth (28.8%) of the spices, herbal remedies, and ceremonial powders sampled from these homes contained ≥1 mg/kg lead. NCCLPPP developed a survey to measure child-specific consumption of these products and record product details for reporting to the Food and Drug Administration (FDA). Lead contamination of spices, herbal remedies, and ceremonial powders might represent an important route of childhood lead exposure, highlighting the need to increase product safety. Setting a national maximum allowable limit for lead in spices and herbal remedies might further reduce the risk for lead exposure from these substances.

PMID: 30462630 DOI: 10.15585/mmwr.mm6746a2

[Indexed for MEDLINE] Free full text

https://www.cdc.gov/mmwr/volumes/67/wr/mm6746a2.htm?s_cid=mm6746a2_e

Highest average lead levels

- **Nonfood items (ceremonial powders and topical remedies)**
  - Kumkum (average = 12,185 mg/kg; range = 0.4–140,000)
  - Sindoor (average = 41,401 mg/kg; range = 0.1–130,000)
  - Surma (68,000 mg/kg; only one sample collected)
- **Edible items**
  - Saffron supplement (2,764 mg/kg; only one sample collected)
  - Balguti Kesaria (an Ayurvedic medicine) (220 mg/kg; only one sample collected)
  - Turmeric (average = 110.9 mg/kg; range = 0.05–890) had the highest average lead levels.

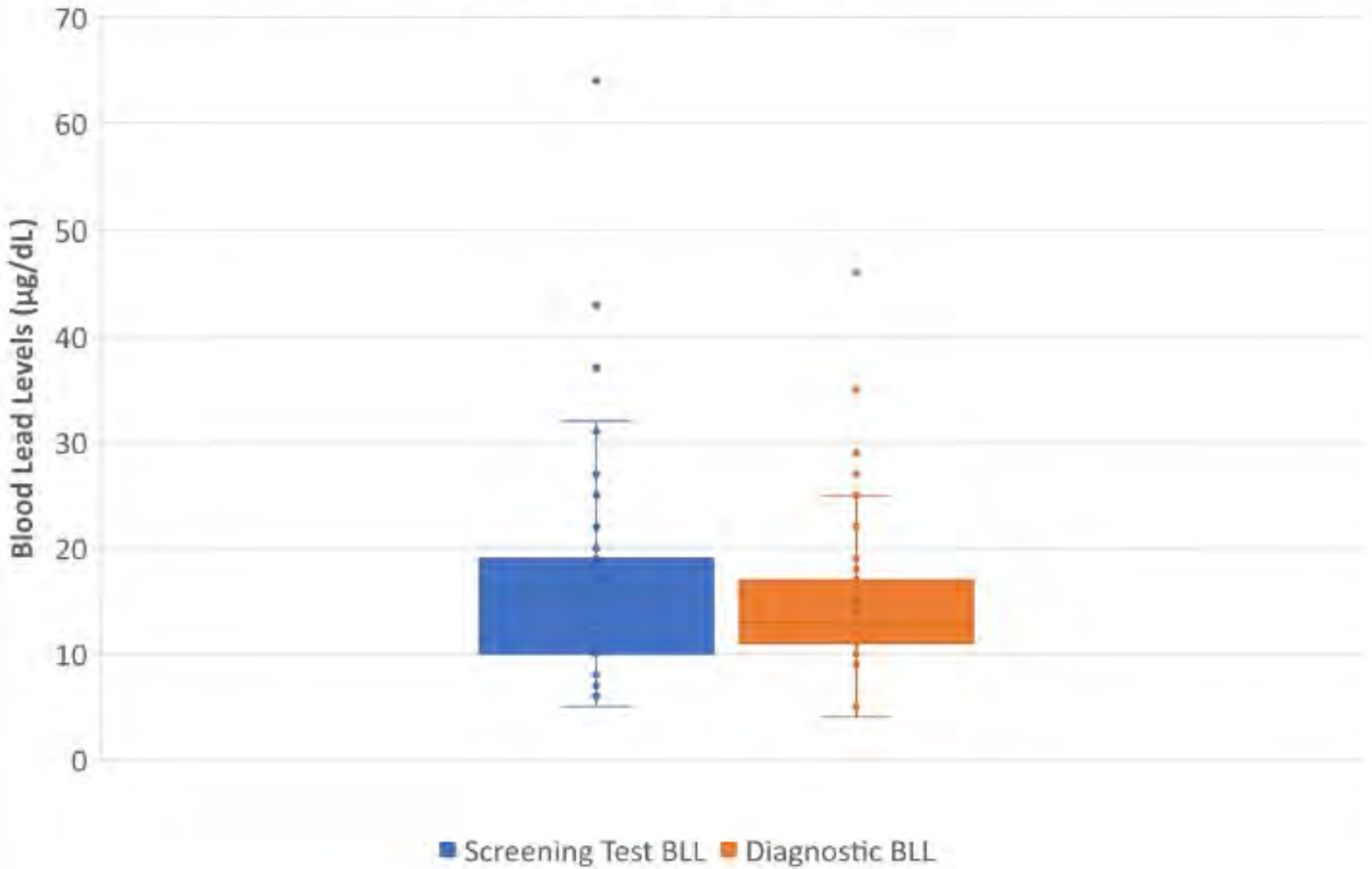
Photo credit: UNC-G Environmental Health Students

Photo credit: Doris Hogan, REHS

Take away messages

- More than **one fourth (28.8%)** of the spices, herbal remedies, and ceremonial powders sampled **contained ≥1 mg/kg lead**.
- Among the 61 children included in this report, the average screening (initial) BLL was 17.0 (±9.6) μg/dL, and the **average diagnostic BLL was 15.2 (±7.0) μg/dL**.
- In 7 of the 59 properties, spices, herbal remedies, and ceremonial powders were the **only identified lead hazards**.
- Spices, herbal remedies, and ceremonial powders may be an important source of chronic lead exposure for children

Figure 1. Blood Lead Levels of North Carolina Children (n=59) Consuming Contaminated Spices or Herbal Remedies



Spices/ food items with mean ≥1 mg/kg of lead (n=373)

Spice	Number of samples	Average lead content (mg/kg)	Range (mg/kg)
Baby cereal	2	17.6	1.2-34.0
Candy	5	10.6	0.03-25.9
Chili powder/ red pepper	22	8.1	0.05-110
Cinnamon	1	2.5	N/A
Coriander	9	4.8	0.05-39
Cumin	15	1.6	0.05-9.8
Turmeric	33	110.9	0.05- 890
Salt	4	6.62	0.05-26.0
Spice mix (All purpose)	6	10.9	0.15-23

Turmeric (India)

890 mg/kg

Photo credit: Christy Klaus, REHS

- Grown near Nepal
- Root crushed in metal container with a hammer
- Dried in the sun for 3-4 days
- Mailed to family and consumed for > 1 year
- Used on dried beans, vegetables and lentils

Ground Cloves

- 23 mg/kg from Indian Store locally
- Grown in India, Pakistan, Sri Lanka
- Consumed for digestive problems
- Used to treat morning sickness with ginseng.

Photo credit: UNC-G Environmental Health Students

Cinnamon (US)

Photo credit: UNC-G Environmental Health Students

2.5 mg/kg

- Infant consumed ¼ tsp to ½ tsp on mashed sweet potato, oatmeal, mashed bananas for 6 months

- Ate oatmeal 1 X a day, mashed bananas, sweet potato 3 X per week

Chilies

1.4 mg/kg

Photo credit: Christy Klaus

Photo credit: UNC-G Environmental Health Students

21 mg/kg chilito en polvo

3.99 mg/kg chili garlic sauce

Kabsa spice

- 19 mg/kg
- black pepper, cloves, saffron, cinnamon, nutmeg, bay leaves

Photo credit: Christy Klaus, REHS

Stone Flower

- Lichen used to flavor and thicken meals
- Also known as dagad phool, poota, kalpasi, Rathipachi, Kallupachi, Celeyam
- Result= 37.5 mg/kg lead

Photo credit: Donna Gilbird, REHS

Non-food substances with mean ≥ 1 mg/kg of lead (n=373)

Substance	Number of samples	Average lead content (mg/kg)	Range (mg/kg)
Ash powder	1	19	N/A
Balguti kesaria	1	220	N/A
Incense	2	5.2	1.9-8.4
Kum kum	12	12,185	0.41-140,000
Pooja Powder	2	34	3.0-65
Rangoli (chalk)	2	2.9	1.60- 4.15
Saffron Supplement	1	2,764	N/A
Sindoor	7	47,315	0.11- 130,000
Vibuti	3	80.3	2.9-140

Photo credit: Christy Klaus, REHS

Photo credit: Christy Klaus, REHS

Alternative Medicines

Mojhat ceremonial herbal drink (Egypt)

- Mom drank during pregnancy and breastfeeding
- Aids digestion
- 31 mg/kg

Photo credit: Getty Images

FDA warns consumers not to use Balguti Kesaria Ayurvedic Medicine due to high levels of lead

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FDA lab finds lead, arsenic and mercury in "Balguti Kesaria"

[Update: 11/1/2017] An FDA laboratory analyzed a sample of "Balguti Kesaria" and confirmed it contained lead in addition to arsenic, and mercury. FDA continues to warn parents and caregivers to not use this product. Exposure to these heavy metals could lead to serious adverse health effects. Anyone who is using "Balguti Kesaria" or giving it to a child should stop immediately and see a health care provider to be evaluated for potential heavy metal poisoning.

[8/4/2017] The U.S. Food and Drug Administration is warning parents and caregivers not to use "Balguti Kesaria (or Kesaria Balguti) Ayurvedic Medicine" due to the risk of lead poisoning.

https://www.fda.gov/Drugs/DrugSafety/ucm570237.htm

NC Case Details

- Infant consumed Balguti kesaria
  - 2 pills per day over a period of 3 months for cough and to aid with digestion
  - Child did not reach milestones
  - 220 mg/kg of lead

Asafoetida powder

- Aids digestion, relieves colic, and other medicinal uses
- Ground giant fennel
- 1 mg/kg

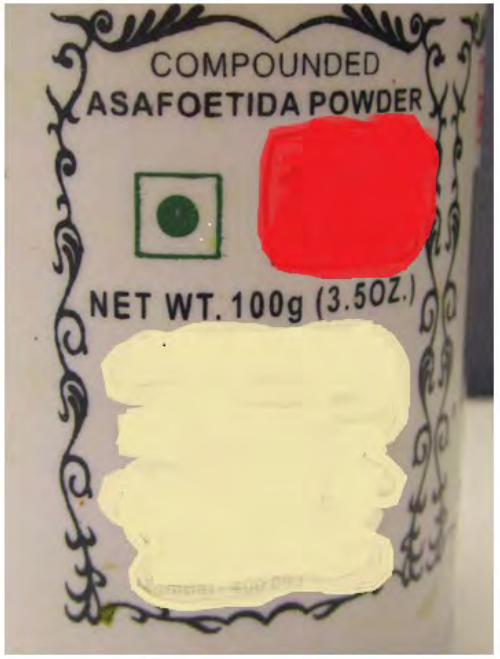


Photo credit: UNC-G Environmental Health Students

Photo credit: UNC-G Environmental Health Students

DILEMMA 1: Modeling vs. Real Life

Amounts and frequency of consumption

Photo credit: Christy Klaus, REHS

Photo credit: Christy Klaus, REHS

Spice and Home Remedy Survey

EHS Interviewer Name: Child NCLEAD ID: Date:

Spice and Home Remedy Survey

Instructions to Interviewers: Please administer this survey to the child's primary caregiver during your lead investigation if you suspect spices, herbal remedies, or imported drinks may be the child's source of lead exposure. If possible, you may want to take pictures of the food labels for any samples you collect. ***If parent cannot tell you exactly how much of a substance they use or eat, please have them show you how they measure it and then you can estimate the amount.***

1. Does your child currently drink any **formula**?
   - ○ Yes
   - ○ No
2. Is your child currently **breastfeeding**?
   - ○ Yes
   - ○ No
3. Does your child currently drink any **tea**?
   - ○ Yes
   - ○ No
4. Does your child currently drink any **coffee**?
   - ○ Yes
   - ○ No

DILEMMA 2: Potential Co-exposures Ceremonial Powders And Cultural Objects

Kumkum - 140,000 mg/kg lead

Metal altar

Rangoli -110 µg/ft^2 lead on sidewalk; 54 µg/ft^2 front entry

Sindoor- 130,000 mg/kg lead

DILEMMA 3: Exposure Prevention

Photo credit: Kim Gaetz

A Spoonful of Lead: A 10-Year Look at Spices as a Potential Source of Lead Exposure

Paromita Hore, PhD, MPH; Kolapo Alex-Oni, MPH; Slavenka Sedlar, MA; Deborah Nagin, MPH

ABSTRACT

Context: While lead-based paint and occupational lead hazards remain the primary sources of lead exposures among New York City's lead-poisoned children and men, respectively, these are not the only possible lead sources. Certain consumer products are often implicated. Between 2008 and 2017, the New York City Department of Health and Mental Hygiene tested more than 3000 samples of consumer products during lead poisoning case investigations and surveys of local stores, and of these, spices were the most frequently tested (almost 40% of the samples).

Objectives: To describe spice samples—types, origin, lead concentrations, and the implication of findings for public health programs and global food safety regulations.

Design: Descriptive study of lead contamination in spices systematically collected as part of lead poisoning investigations.

Setting and Participants: A total of 1496 samples of more than 50 spices from 41 countries were collected during investigations of lead poisoning cases among New York City children and adults and local store surveys.

Results: More than 50% of the spice samples had detectable lead, and more than 30% had lead concentrations greater than 2 ppm. Average lead content in the spices was significantly higher for spices purchased abroad than in the United States. The highest concentrations of lead were found in spices purchased in the countries Georgia, Bangladesh, Pakistan, Nepal, and Morocco.

Conclusions: Certain commonly used spices, particularly those purchased abroad in Georgia, Bangladesh, Pakistan, Nepal, and Morocco, can have very high lead levels, which can contribute to lead body burden. This underscores the need to develop comprehensive interventions that educate consumers and initiate intergovernmental efforts for stricter global food regulations.

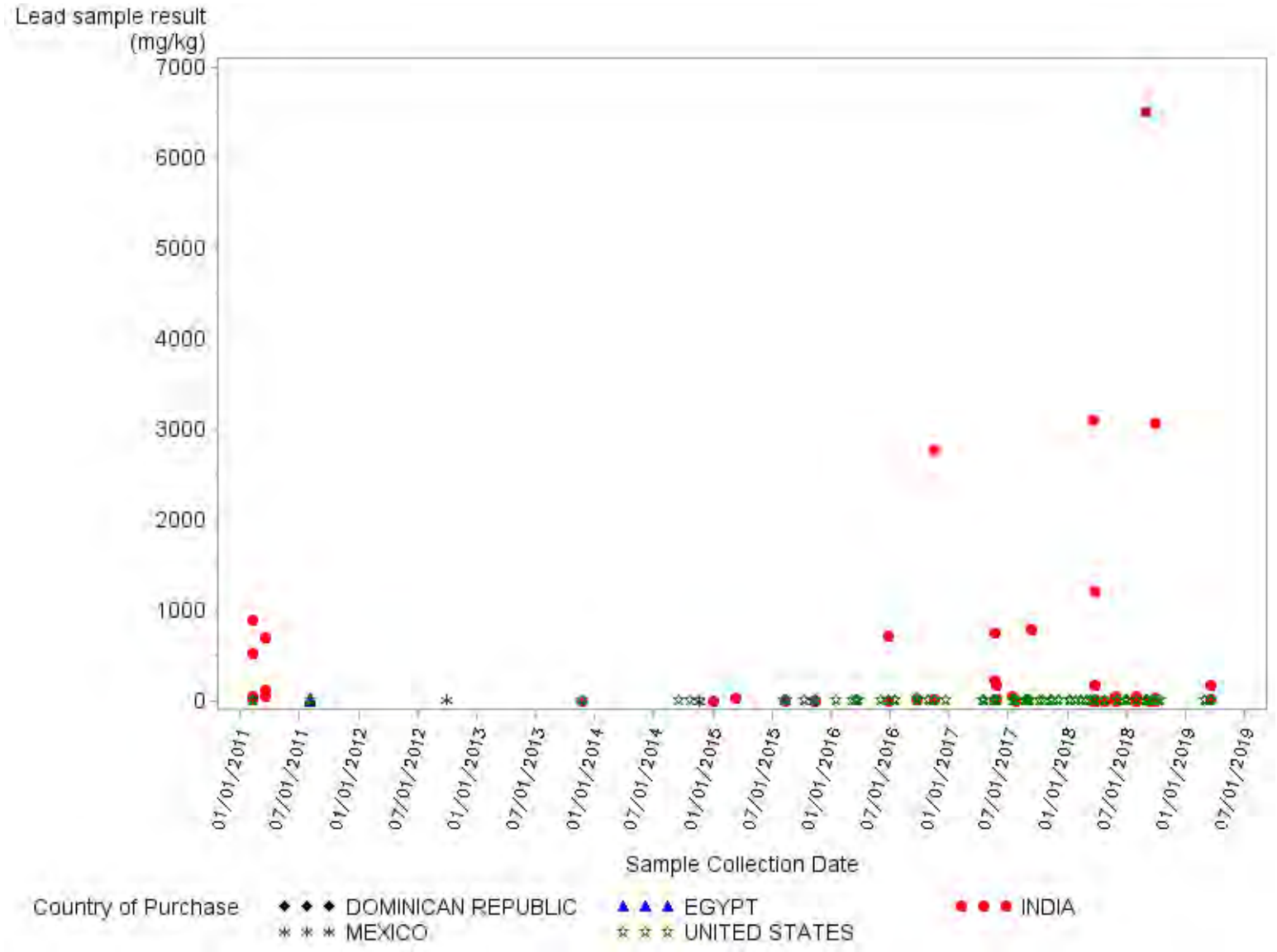
KEY WORDS: Georgia, lead-contaminated spice, South Asia, turmeric, yellow flower

2019. *Journal of Public Health Management and Practice*, 25 (1 Supp): S63-S70.

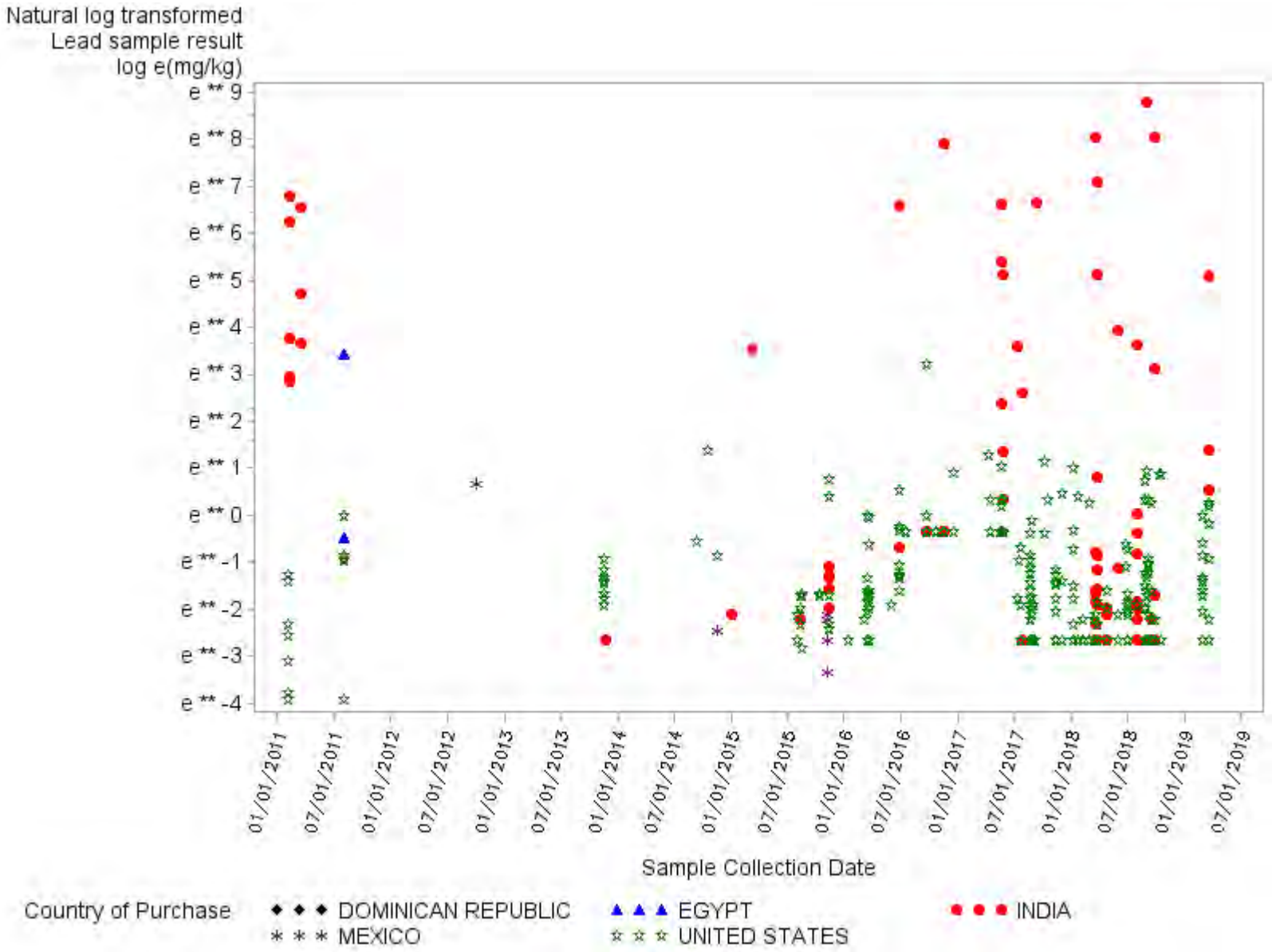
Photo credit: Getty Images

Study 2: Preliminary Data for NC

Lead Contamination (mg/kg) of Edible Products (N=382), by Country of Purchase



Log Transformed Lead Contamination (Log_e mg/kg) of Edible Products (N=382), by Country of Purchase

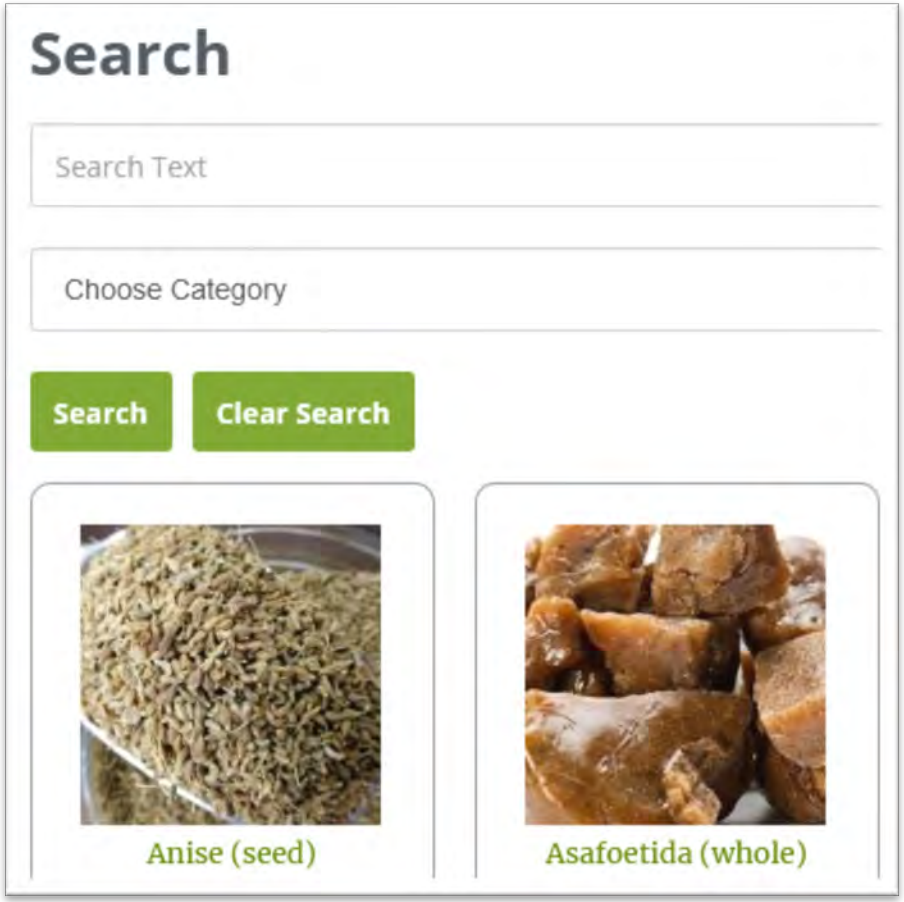


Take away message

- Spices and teas purchased in India are more likely than those purchased from the United States to have lead levels in the range of ≥100 mg/kg lead.
- Based on preliminary analysis

NC CLPPP Actions Taken

- **Created**:
  - Spice and Herbal Remedy Survey
  - Brochures and other educational materials
  - Standard procedures for lead investigators in NC
  - System of alerts in NCLEAD surveillance system for edible sources
- Quarterly conference calls with other lead poisoning prevention programs to standardize procedures nationally



Lead Sources Library
(https://nchealthyhomes.com/lead-sources/)

Tips for Lead Investigators

Collect the following information <u>during</u> the lead investigation because the product may be gone when results are reported:

- **When** the product was purchased
- City and store **where** the product was purchased (or website)
- **Name** of the product and the **manufacturer**
- **Document everything** on the label or container, including product codes or identifying marks
- If possible, **take photos** of ALL parts of the labels and ALL sides of the container.

Sample Collection Procedures

1. Collect at least 5 – 10 grams to allow for retesting if necessary.
2. Fill out a separate NC State Laboratory of Public Health sample chain of custody form.
3. Put Sample type= O for “Other” for all sample types outside the wipes, paints and soil matrices.
4. Put the name of the spice or substance in the Sample description.
5. Contact Chris Goforth at chris.goforth@dhhs.nc.gov with any questions.

Sample Analysis at the NC SLPH

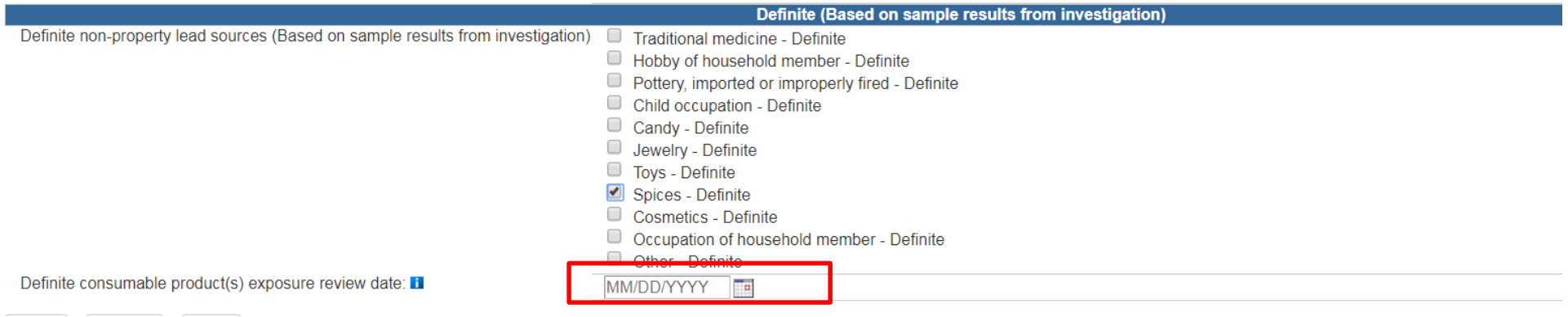
- **1st run:** Initial screening by Inductively coupled plasma - optical emission spectrometry (ICP-OES) detects lead down to 15 mg/kg.

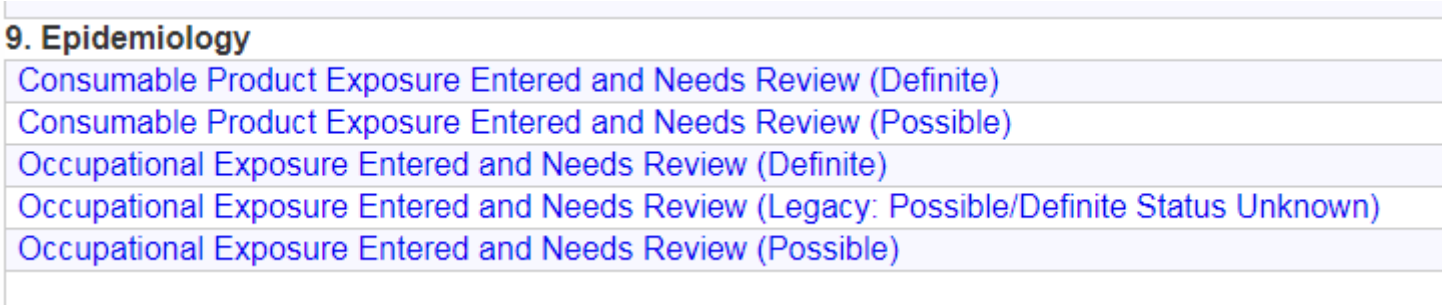
- **2nd run:** Inductively coupled plasma - mass spectrometry (ICP-MS) detects lead down to 1 mg/kg or less.

- **If you receive sample result back with "<15 mg/kg" and no notice of re-running the sample on the ICP-MS down to 1 mg/kg, please contact the lab.**

Recording Non-Property Hazards in NCLEAD

NCLEAD Non-Property Hazards Cont.





Next Steps

- ✓ Revise dietary survey based on feedback from lead investigators
- ✓ Monitor data on new sources found
- ✓ Report to FDA

Resources

- **NC Healthy Homes Website**
  - **Lead Sources Image Library**

https://nchealthyhomes.com/lead-sources/

  - **Spice and Home Remedy Survey**
    - English https://nchealthyhomes.com/files/2017/10/Spice_and_HomeRemedySurveyFINAL_English.pdf
    - Spanish
    - https://nchealthyhomes.com/files/2017/10/Spice_and_HomeRemedySurveyFINAL_Spanish.pdf
  - **Lead Poisoning Prevention Brochures**

http://nchealthyhomes.com/lead-poisoning/

http://www.orangecountync.gov/415/Lead-Poisoning

Federal Resources


Photo credit: Getty Images

Food and Drug Administration (FDA)

- **Import Alerts**

https://www.accessdata.fda.gov/cms_ia/importalert_1143.html

- **Recalls**

https://www.fda.gov/safety/recalls/default.htm

- **Guidance on Lead in Food, Foodwares, and Dietary Supplements**

https://www.fda.gov/food/foodborneillnesscontaminants/metals/ucm2006791.htm

- **Toxic Elements Working Group**

https://www.fda.gov/Food/FoodborneIllnessContaminants/Metals/ucm604173.htm

Consumer Product Safety Commission (CPSC)

https://www.cpsc.gov/

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NCPH
North Carolina
Public Health


CENTERS FOR DISEASE CONTROL AND PREVENTION
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NORTH CAROLINA
HEALTHY HOMES

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Photo credit: Getty Images