

Heavy Metals in Cassava Baby Puffs

GOALS

To gauge the levels of lead in baby puffs made from cassava or sorghum and inform the public about health concerns and safer options, CR decided to test four products (from two brands) of puffs made from cassava, and two products (from one brand) of puffs made from sorghum. Because these types of products have shown measurable levels of arsenic, cadmium, and mercury in the past, we also tested for those metals.

TEST APPROACH AND METHODS

At least three samples from one to three different lots (defined by best-buy or expiration date) for six products were sent to a certified lab for total lead, arsenic, cadmium, and mercury testing using Inductively Coupled Plasma – Triple Quadrupole Mass Spectrometry (ICP-QQQ MS) according to method AOAC 2015.01. Table 1, below, describes the models that were tested, along with the serving size of each in grams.

We reviewed all the test results and quality control data provided by the contract lab for accuracy and clarity and checked for errors.

DATA ANALYSIS

To estimate the average concentration of a heavy metal in a tested baby puff product, we applied a method used by many risk assessors,¹ including the Environmental Protection Agency.² In cases where only one or two of the samples of a given product were above the method detection limit (MDL), the sample or samples with results below the MDL were assumed to have a concentration of half the MDL for that heavy metal. If the heavy metal was not detected in any of the samples tested of the product, we assumed a concentration of zero for all the samples of that product for the heavy metal. This approach to risk assessment appropriately considered important uncertainties about potential levels of undetected risk in samples with test results below the MDL.

continued

Table 1. Baby Puffs Tested (With Serving Sizes)

Brand Name	Model Name	# Lots Tested	Serving Size		
			grams	cups	# of puffs
LesserEvil	Lil' Puffs Sweet Potato Apple Asteroid	3	7	NA	24**
LesserEvil	Lil' Puffs Intergalactic Voyager Veggie Blend	2	7	NA	29*/35**
Once Upon a Farm	Organic Fruit & Veggie Puffs, Apple, Sweet Potato & Coconut	1	7	1/3	48*
Once Upon a Farm	Organic Fruit & Veggie Puffs, Mango, Carrot and Coconut	1	7	1/3	NA
Serenity Kids	Grain Free Puffs, Carrot & Beet	3	7	1/3	NA
Serenity Kids	Grain Free Puffs, Tomato & Herbs, Bone Broth	2	7	1/3	35*

NA = Not available. *CR measured an average of three trials for the number of puffs in 7 grams.

**Provided on product label information.

¹ Xue J., Zartarian V., Wang S., et al. (2010). "Probabilistic Modeling of Dietary Arsenic Exposure and Dose and Evaluation with 2003-2004 NHANES Data," *Environmental Health Perspectives*, 118(3): 345-35.

² "Regional Guidance on Handling Chemical Concentration Data Near the Detection Limit in Risk Assessments," Environmental Protection Agency, <https://www.epa.gov/risk/regional-guidance-handling-chemical-concentration-data-near-detection-limit-risk-assessments>.

TESTING

The baby puff models were prepared and analyzed in accordance with the following method:

AOAC Official Method 2015.01, Mod. Determination of Heavy Metals in Food by ICP-MS

RISK ASSESSMENT

We estimated how much of the tested heavy metal an average 2-year-old child would consume from a serving of each product, and, where appropriate and applicable, we compared the intake estimates to the exposure limits in Table 2, below.

Chemical	EPA RfD ug/kg bw/d	OEHHA MADL ug/day
Arsenic	0.1 ³	NA
Cadmium	NA	4.1 ⁴
Lead	NA	0.5 ⁵
Mercury	0.1 ⁶	NA

OEHHA = California Office of Environmental Health Hazard Assessment. MADL = maximum allowable dose level.

Noncancer exposure risks were calculated by the Hazard Quotient Method⁷ and the following equation:

HQ = Exposure Dose/Reference Dose (see Table 2, above)

We also expressed the estimated intake of each metal per serving as a percentage of the MADL. An HQ >1 or %MADL >100 would indicate that consumption of one serving per day would be of health concern. However, %MADLs less than 100 can also be a health concern when considering the cumulative exposure from total daily food consumption.

³ https://iris.epa.gov/static/pdfs/0278_summary.pdf.

⁴ <https://oehha.ca.gov/chemicals/cadmium>.

⁵ <https://oehha.ca.gov/proposition-65/chemicals/lead-and-lead-compounds>.

⁶ EPA has not established an oral reference dose (RfD) for total mercury, therefore, the RfD for methylmercury is used to estimate risk, https://cfpub.epa.gov/ncea/iris2/chemicallanding.cfm?substance_nmbr=73.

⁷ "Risk Assessment for Other Effects," EPA, <https://www.epa.gov/fera/risk-assessment-other-effects>.