Coffee

Karen Pendergrass · Heavy Metal Index, Institute of Contaminant Standards

HEAVY METAL INDEX · INGREDIENT PROFILE October 2026

DOI 10.83376/hmi.ingredient.coffee

CITE AS

Pendergrass, K. (2026). Coffee. Heavy Metal Index. https://doi.org/10.83376/hmi.ingredient.coffee

CORRESPONDENCE

Corrections are logged publicly on the article page, each with its date, the affected value, and the source that resolved it.

KEYWORDS

heavy metals, food safety, dietary exposure

PUBLICATION HISTORY

This revision 2026-10-22.

Abstract

Coffee in the HMI library has 852 reported results for lead, cadmium, total arsenic, inorganic arsenic, dimethylarsinic acid, total mercury, nickel, chromium, aluminum, tin, antimony, uranium, Co, Cu, Fe, Mn, Zn, V, Se, Ba, Mo, Sr, Ti and Tl from 33 sources. WHO gems/food submissions reported lead in coffee as sold from 738 results in 4 reporting regions, with subgroup medians from 3.5 to 148 µg/kg. In the US Total Diet Study, coffee powder or ground had a median lead result below 1 µg/kg across 3 composites from 2018-2020.

1 | Coffee overview

Across 3 other studies of ordinary farms and markets, reported lead means and medians on an as-sold or fresh-weight basis ranged from 10.3 µg/kg (Winiarska-Mieczan et al. 2022) to 86.7 µg/kg (Winiarska-Mieczan et al. 2022).[6] For cadmium, 3 studies on an as-sold or fresh-weight basis reported means and medians from 0.03 µg/kg (Winiarska-Mieczan et al. 2022) to 15 µg/kg (Pokorska-Niewiada et al. 2024).[5,6] Higher results came from contaminated or exposed settings rather than ordinary supply. Coffee as sold from Italian moka brew from processing series had inorganic arsenic higher at 420 µg/kg, against 41 µg/kg for espresso brew from processing series in the same study.[7]

For a buyer the practical points are the form bought, the basis a result is reported on, where the coffee came from and the laboratory’s reporting limit. Testing finds contamination but does not remove it.

2 | What counts as coffee

This page covers coffee in 4 forms kept separate in every comparison: coffee as sold (579 results), coffee powder or ground (229 results), cooked coffee (33 results) and coffee flour or meal (11 results).[1,2,3,4,5,6]

Results stay on the basis each source reports: as sold or fresh weight, dry weight, or unstated. Dry-weight, as-sold and unstated results are never pooled, and no moisture conversion is applied.

3 | How metals reach coffee

The evidence on how metals reach coffee comes from studies that compared exposed and ordinary settings. Coffee as sold from Italian moka brew from processing series had inorganic arsenic higher at 420 µg/kg, against 41 µg/kg for espresso brew from processing series in the same study.[7]

These are observational comparisons from single studies; the size of the difference depends on the site, metal and distance.

4 | Which forms and regions measured lower

For cadmium, the HMI cooked reference median was lowest for coffee (0.585 µg/kg) and highest for coffee as sold (37 µg/kg); forms differ in water content, so this compares foods as sold or eaten, not uptake.[1,6] The hmi reference for lead in coffee powder or ground pools 13 subgroup units from 4 sampling families, with a median of below 1 µg/kg and a middle half spanning below 0.625 (lower quartile) and between 5.75 and 6.25 µg/kg (upper quartile).[2,8,10,11] for lead in coffee as sold, the reference median was between 12.4 and 26 µg/kg, with a middle half from between 0.275 and 10.3 to 41 µg/kg across 104 units.[1,6] for cadmium in coffee powder or ground, the reference median was below 1 µg/kg, with a middle half from below 1 to 4 µg/kg across 14 units.[2,8,10,11,12]

Among GEMS/Food reporting regions, coffee as sold had the lowest lead subgroup median in WPRO (3.5 µg/kg) and the highest in EURO (148 µg/kg); reporting regions are markets, not growing areas.[1] For cadmium, the lowest regional median was in PAHO (0.19 µg/kg) and the highest in EMRO (43 µg/kg).[1]

In one study, lead across 11 groups of coffee ranged from 271 µg/kg (coffee product 1 (blend label)) to 1,620 µg/kg (coffee product 2 (Brazilian-labeled)); the lowest is the lowest observed in that study, not an established sourcing preference.[13] In another study, lead across 10 groups of coffee ranged from 60 µg/kg (sold in bulk (unpackaged)) to 2,230 µg/kg (packaged in glass bottles); the lowest is the lowest observed in that study, not an established sourcing preference.[14]

5 | Processing, cooking and preparation

No processing study for metals in this food is in the library yet.

6 | Mitigation for coffee

Lot testing against the applicable limit is the check that can be verified.

7 | Trade-offs and limits of controls

Avoiding exposed growing areas lowered the metal measured in the studies available, but no study measured the cost or supply effect of doing so.[7] Metals do not move together, so a lot that passes a lead limit says little about cadmium, arsenic or nickel unless those are tested as well.

8 | Testing coffee for metals

Results depend on the method and its reporting limit. Reporting limits for lead ranged from 0.25 µg/kg (Noor et al. 2023) to 1,000 µg/kg (WHO GEMS/Food), so a non-detect from a less sensitive method says much less.[1,10] Reporting limits for cadmium ranged from 0.11 µg/kg (Pokorska-Niewiada et al. 2024) to 300 µg/kg (WHO GEMS/Food), so a non-detect from a less sensitive method says much less.[1,5] Reporting limits for total arsenic ranged from 1 µg/kg (WHO GEMS/Food) to 27,300 µg/kg (WHO GEMS/Food), so a non-detect from a less sensitive method says much less.[1]

A useful lot result names the form, the basis and a quantification limit well below the limit that applies.

9 | Buying and verifying coffee

No maximum level for metals in coffee was verified from primary text for this page; buyers should confirm the limit that applies in the destination market.

10 | Exposure from coffee

No source in the library converted coffee concentrations into a verified estimate of intake for a defined population. Concentrations describe the food, not individual risk.

11 | Evidence review and remaining gaps

Every source record that names coffee was decided on its content: 33 occurrence extracted, 33 records in all. The occurrence table renders every extracted result; held values remain visible with their reason.

References identify the sources used in these answers. The Sources index preserves additional discovery links; inclusion there does not mean a source has been reviewed for this assessment. Corrections, completed searches, new direct evidence and changes in requirements should reopen the relevant answer.

12 | Coffee FAQs

The library reports lead, cadmium, total arsenic, inorganic arsenic, dimethylarsinic acid, total mercury, nickel, chromium, aluminum, tin, antimony, uranium, Co, Cu, Fe, Mn, Zn, V, Se, Ba, Mo, Sr, Ti and Tl in coffee, most often lead, cadmium and total arsenic.[1,2,3,4] WHO gems/food submissions reported lead in coffee as sold from 738 results in 4 reporting regions, with subgroup medians from 3.5 to 148 µg/kg.[1]

In the studies available, coffee from contaminated or exposed settings carried more metal than coffee from the same study's control.[7] coffee as sold from French press brew from processing series had lead higher at 40 µg/kg, against 30 µg/kg for espresso brew from processing series in the same study.[7]

For cadmium, the HMI cooked reference median was lowest for coffee (0.585 µg/kg) and highest for coffee as sold (37 µg/kg); forms differ in water content, so this compares foods as sold or eaten, not uptake.[1,6]

Among GEMS/Food reporting regions, coffee as sold had the lowest lead subgroup median in WPRO (3.5 µg/kg) and the highest in EURO (148 µg/kg); reporting regions are markets, not growing areas.[1] For cadmium, the lowest regional median was in PAHO (0.19 µg/kg) and the highest in EMRO (43 µg/kg).[1]

Inorganic arsenic, the more toxic form, was measured in 34 results from 6 sources, far fewer than total arsenic.[1,4,7,15,16,17] Across 2 other studies of ordinary farms and markets, reported inorganic arsenic means and

medians with the basis not stated ranged from 0.6 µg/kg (European Food Safety Authority (EFSA) 2014) to 420 µg/kg (Guadalupe et al. 2023).[7,17]

References

[1] GEMS/Food Contaminants database heavy-metal exports
World Health Organization · GEMS/Food Contamination Monitoring and Assessment Programme · 2026 · extranet.who.int
DATASET

[2] FY2018-FY2020 TDS Elements Analytical Results
U.S. Food and Drug Administration · FDA Total Diet Study · 2022 · www.fda.gov
DATASET

[3] Determination of Element Contents and Health Risk Assessment of Some Commercial Coffees in Turkiye
Demir F, Uygunoz D, Kipcak AS, and Derun E · Journal of Tekirdag Agricultural Faculty 22(3) · 2025 · doi.org/10.33462/jotaf.1400651
PEER-REVIEWED

[4] Probabilistic Risk Assessment of Metals, Acrylamide and Ochratoxin A in Instant Coffee from Brazil, Colombia, Mexico and Peru
Guadalupe GA, Grandez-Yoplac DE, Arellanos E, and Doménech E · Foods 2024, 13, 726 · 2024 · doi.org/10.3390/foods13050726
PEER-REVIEWED

[5] Tracking Trace Elements Found in Coffee and Infusions of Commercially Available Coffee Products Marketed in Poland
Kamila Pokorska-Niewiada, Aniela Scheffler, Laura Przedpelska, and Agata Witczak · Foods · 2024 · doi.org/10.3390/foods13142212
PEER-REVIEWED

[6] Cadmium and Lead Concentration in Drinking Instant Coffee, Instant Coffee Drinks and Coffee Substitutes: Safety and Health Risk Assessment
Anna Winiarska-Mieczan, Karolina Jachimowicz, Svitlana Kislova, Malgorzata Kwiecien, Zvenyslava Zasadna, and Dmytro Yanovych · Biological Trace Element Research · 2022 · doi.org/10.1007/s12011-022-03129-2
PEER-REVIEWED

[7] Probabilistic Risk Characterization of Heavy Metals in Peruvian Coffee: Implications of Variety, Region and Processing
Grobert A. Guadalupe, Segundo G. Chavez, Erick Arellanos, and Eva Domenech · Foods · 2023 · doi.org/10.3390/foods12173254
PEER-REVIEWED

[8] Concentrations of selected metals (Na, K, Ca, Mg, Fe, Cu, Zn, Al, Ni, Pb, Cd) in coffee
Grazyna Adler, Arkadiusz Nedzarek, and Agnieszka Torz · Zdravstveno Varstvo / Slovenian Journal of Public Health · 2019 · doi.org/10.2478/sjph-2019-0024
PEER-REVIEWED

[9] Determination of heavy metals in the roasted and ground coffee beans and brew
Sabrina Alves da Silva, Fabricia Queiroz Mendes, Marcelo Rodrigues Reis, Flavia Regina Passos, Andre Mundstock Xavier de Carvalho, Katia Rodrigues de Oliveira Rocha, et al. · African Journal of Agricultural Research · 2017 · doi.org/10.5897/AJAR2016.11832
PEER-REVIEWED

[10] Quality Characteristics of Merapi Robusta Coffee Products from the Traditional, Semi Modern, and Modern Process
Noor R, Wagiman, and Jumeri · Proceedings of the 3rd International Conference on Smart and Innovative Agriculture · 2023 · doi.org/10.2991/978-94-6463-128-9_32
PEER-REVIEWED

[11] Infants' and young children's dietary exposures to lead and cadmium: FDA total diet study 2018-2020
Spungen JH and et al. · Food Additives & Contaminants: Part A · 2024 · doi.org/10.1080/19440049.2024.2396910
PEER-REVIEWED

[12] Scientific Opinion of the Panel on Contaminants in the Food Chain on a request from the European Commission on cadmium in food
EFSA Panel on Contaminants in the Food Chain (CONTAM) · The EFSA Journal · 2009 · doi.org/10.2903/j.efsa.2009.980
GOVERNMENT

[13] Determination of Lead and Cadmium Concentration in Different Samples of Tea and Coffee Circulating in the Libyan Market
Abraheem Ezuldeen Mohammad, Etorki Abdunnaser Mohamed, Elgornazi Aborawi M., and Atrabelse Sabreen · International Journal of Science and Research · 2022 · doi.org/10.21275/sr211222165040
PEER-REVIEWED

[14] Evaluation of trace metallic element levels in coffee by ICP-MS: a comparative study among different origins, forms, and packaging types and consumer risk assessment
Zergui A, Boudalia S, Ababou A, and Marlie-Landy J · Biological Trace Element Research · 2023 · doi.org/10.1007/s12011-023-03582-7
PEER-REVIEWED

[15] Total Diet Study of metals and other elements in food
Baxter M and Brereton N · Food and Environment Research Agency report for the UK Food Standards Agency, Fera report 15/06, project FS102081 · 2015 · www.food.gov.uk
GOVERNMENT

[16] The First Hong Kong Total Diet Study: Inorganic Arsenic
Centre for Food Safety FEHD HKSAR · Centre for Food Safety, Food and Environmental Hygiene Department, Government of the Hong Kong Special Administrative Region · 2012 · www.cfs.gov.hk
GOVERNMENT

[17] Dietary exposure to inorganic arsenic in the European population
European Food Safety Authority (EFSA) · EFSA Journal 2014;12(3):3597 · 2014 · doi.org/10.2903/j.efsa.2014.3597
GOVERNMENT

STATUS AND LICENCE

Editorially reviewed in-house; no external peer review has been completed on this ingredient profile. Published as an institutional technical report with its review state tracked on the article page. Released under CC BY 4.0.

COMPETING INTERESTS

The Heavy Metal Index reports what the peer-reviewed and regulatory literature supports. It is operated separately from any certification program, does not evaluate or endorse brands, and does not use certification thresholds as evidence for the statements made here.

DATA AVAILABILITY

Every source behind this ingredient profile is listed with its own source record at https://heavymetalindex.com/ingredients/coffee#sources.

PUBLICATION HISTORY

This revision 2026-10-22. The full dated record is maintained at https://heavymetalindex.com/ingredients/coffee.