Tea

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Abstract

Tea in the HMI library has 907 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, Ba, CrVI, Mg and Tl from 36 sources. WHO dried gems/food submissions reported lead in tea from 6,382 results in 3 reporting regions, with subgroup medians from 17.7 to 950 µg/kg. In the US Total Diet Study, tea as sold had a median lead result below 1 µg/kg across 3 composites from 2018-2020.

1 | Tea overview

Across 8 other studies of ordinary farms and markets, reported lead means and medians on a dry-weight basis ranged from 46 µg/kg (Al 2010) to 39,000 µg/kg (Muhammed et al. 2026).[8,9] For cadmium, 2 studies on an as-sold or fresh-weight basis reported means and medians from 1.05 µg/kg (S-T et al. 2024) to 32.5 µg/kg (EFSA Panel on Contaminants in the Food Chain (CONTAM) 2009).[10,11] Higher results came from contaminated or exposed settings rather than ordinary supply. Tea as sold from unspiked sample, GF-AAS had cadmium higher at 560 µg/kg, against 530 µg/kg for unspiked sample, MSPME-FAAS in the same study.[7]

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

2 | What counts as tea

This page covers tea in 4 forms kept separate in every comparison: dried tea (495 results), tea as sold (394 results), tea oil (12 results) and tea powder or ground (6 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 tea

The evidence on how metals reach tea comes from studies that compared exposed and ordinary settings. Tea as sold from unspiked sample, GF-AAS had cadmium higher at 560 µg/kg, against 530 µg/kg for unspiked sample, MSPME-FAAS 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 lead, the HMI dried reference median was lowest for tea (410 µg/kg) and highest for tea as sold (450 µg/kg); forms differ in water content, so this compares foods as sold or eaten, not uptake.[1,4] The hmi reference for lead in tea as sold pools 99 subgroup units from 3 sampling families, with a median of below 1 µg/kg and a middle half spanning below 1 (lower quartile) and below 4 µg/kg (upper quartile).[1,2,6] dried for lead in tea, the reference median was 410 µg/kg, with a middle half from 300 to 717 µg/kg across 37 units.[1,4] dried for lead in tea, the reference median was between 300 and 340 µg/kg, with a middle half from between 50 and 135 to between 550 and 580 µg/kg across 61 units.[1]

Among GEMS/Food reporting regions, dried tea had the lowest lead subgroup median in PAHO (17.7 µg/kg) and the highest in WPRO (950 µg/kg); reporting regions are markets, not growing areas.[1] For cadmium, the lowest regional median was in EURO (20 µg/kg) and the highest in EURO (40 µg/kg).[1] For total arsenic, the lowest regional median was in EURO (103 µg/kg) and the highest in WPRO (130 µg/kg).[1]

Dried targeted tea samples in WPRO had lead higher at 940 µg/kg, against 390 µg/kg for WPRO in the same study.[1] In another study, dried targeted tea samples in EURO had cadmium higher at 63 µg/kg, against 40 µg/kg for EURO in the same study.[1]

In one study, lead across 31 groups of tea ranged from 250 µg/kg (Retail sample B14 (Table 3), origin USA) to 1,900 µg/kg (Retail sample B11 (Table 3), origin UK); the lowest is the lowest observed in that study, not an established sourcing preference.[4] In another study, lead across 17 groups of tea ranged from 187 µg/kg (retail tea product 5) to 2,150 µg/kg (retail tea product 9); the lowest is the lowest observed in that study, not an established sourcing preference.[14]

5 | Processing, cooking and preparation

Processed or prepared forms were compared only with unprocessed tea in the same study and group. Dried tea (EURO) had lead equal to at 200 µg/kg, against 200 µg/kg for the unprocessed form in the same group (tea as sold).[1] In another study, dried tea (GEMS/Food contaminants database) had cadmium lower at 37.4 µg/kg, against 68.1 µg/kg for the unprocessed form in the same group (tea as sold).[15] a third study found that tea powder or

ground (European dietary-survey occurrence data) had inorganic arsenic equal to at 0.1 µg/kg, against 0.1 µg/kg for the unprocessed form in the same group (tea as sold).[16]

Forms differ in water content, so a per-kilogram difference is not by itself a measured removal or gain of metal.

6 | Mitigation for tea

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 tea for metals

Results depend on the method and its reporting limit. Reporting limits for lead ranged from 0.7 µg/kg (WHO GEMS/Food) to 8,000 µg/kg (WHO GEMS/Food), so a non-detect from a less sensitive method says much less.[1] Reporting limits for cadmium ranged from 0.03 µg/kg (Dabeka et al. 1995) to 1,200 µg/kg (WHO GEMS/Food), so a non-detect from a less sensitive method says much less.[1,17] Reporting limits for total arsenic ranged from 1 µg/kg (WHO GEMS/Food) to 3,000 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 tea

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

10 | Exposure from tea

No source in the library converted tea 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 tea was decided on its content: 36 occurrence extracted, 36 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 | Tea 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, Ba, CrVI, Mg and Tl in tea, most often lead,

cadmium and total arsenic.[1,2,3,4] WHO dried gems/food submissions reported lead in tea from 6,382 results in 3 reporting regions, with subgroup medians from 17.7 to 950 µg/kg.[1]

In the studies available, tea from contaminated or exposed settings carried more metal than tea from the same study's control.[7] tea as sold from unspiked sample, MSPME-FAAS had lead higher at 5,620 µg/kg, against 5,580 µg/kg for unspiked sample, GF-AAS in the same study.[7]

For lead, the HMI dried reference median was lowest for tea (410 µg/kg) and highest for tea as sold (450 µg/kg); forms differ in water content, so this compares foods as sold or eaten, not uptake.[1,4]

Among GEMS/Food reporting regions, dried tea had the lowest lead subgroup median in PAHO (17.7 µg/kg) and the highest in WPRO (950 µg/kg); reporting regions are markets, not growing areas.[1] For cadmium, the lowest regional median was in EURO (20 µg/kg) and the highest in EURO (40 µg/kg).[1]

Only comparisons between forms in the same study are available, not before-and-after measurements of the same tea.[1] dried tea (EURO) had lead equal to at 200 µg/kg, against 200 µg/kg for the unprocessed form in the same group (tea as sold).[1]

Inorganic arsenic, the more toxic form, was measured in 15 results from 4 sources, far fewer than total arsenic.[1,16,18,19] European Food Safety Authority (EFSA) 2014 reported inorganic arsenic at 7.9 µg/kg (mean) dried in tea from European dietary-survey occurrence data.[16]

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STATUS AND LICENCE

Editorially reviewed in-house; no external peer review has been completed on this ingredient profile. Published as an

COMPETING INTERESTS

The Heavy Metal Index reports what the peer-reviewed and regulatory literature supports. It is operated separately from

institutional technical report with its review state tracked on the article page. Released under CC BY 4.0.

DATA AVAILABILITY

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

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