Mushrooms

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Abstract

Mushrooms in the HMI library has 5,061 reported results for lead, cadmium, total arsenic, inorganic arsenic, dimethylarsinic acid, total mercury, methylmercury, nickel, chromium, aluminum, tin, antimony, uranium, Co, Cu, Fe, Mn, Zn, V, Se, AC, AC2, Ag, As, As(III), As(V), AsB, AsBamide, B, Ba, Ca, Cs, Hg, I, K, La, Li, Mg, Mo, Na, orgAs, Pr, Rb, S, Sc, Sm, Sr, Te, Ti, Tl, Tm and UNK from 69 sources. WHO gems/food submissions reported lead in mushrooms as sold from 10,457 results in 4 reporting regions, with subgroup medians from 5 to 210 µg/kg. In the US Total Diet Study, mushrooms as sold had a median lead result below 4 µg/kg across 27 composites from 2017-2020.

1 | Mushrooms overview

Across 8 other studies of ordinary farms and markets, reported lead means and medians on an as-sold or fresh-weight basis ranged from 5.7 µg/kg (Qin et al. 2024) to 886 µg/kg (Stihi et al. 2025).[6,8] For cadmium, 11 studies on an as-sold or fresh-weight basis reported means and medians from 1.6 µg/kg (Qin et al. 2024) to 1,730 µg/kg (Qin et al. 2024).[6] Higher results came from contaminated or exposed settings rather than ordinary supply. Mushrooms as sold from substrate amended with 0.4 mM each of As(III), As(V) and DMAA (experiment) had As(III) higher at 3,990 µg/kg, against 260 µg/kg for no arsenic added to substrate (control) in the same study.[9]

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

2 | What counts as mushrooms

This page covers mushrooms in 4 forms kept separate in every comparison: mushrooms as sold (4,578 results), dried mushrooms (418 results), canned mushrooms (43 results) and mushrooms powder or ground (22

results).[1,2,3,4,5,6] Foods made from mushrooms that have their own pages, such as canned mushrooms and wild mushrooms, are covered there.

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 mushrooms

The evidence on how metals reach mushrooms comes from studies that compared exposed and ordinary settings. Mushrooms as sold from substrate amended with 0.4 mM each of As(III), As(V) and DMAA (experiment) had As(III) higher at 3,990 µg/kg, against 260 µg/kg for no arsenic added to substrate (control) in the same study.[9] In another study, mushrooms as sold from production strain 2, substrate sodium selenate 2.0 mg/dm3 Se (Z) (experiment) had Se higher at 810 µg/kg, against 110 µg/kg for production strain 2, substrate control, 0 mg/dm3 Se (C) in the same study.[20] a third study found that mushrooms as sold from Large-white carpophores, crude had methylmercury higher at 62.2 µg/kg, against 20.9 µg/kg for All developmental stages combined, braised in the same study.[21]

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 mushrooms (184 µg/kg) and highest for mushrooms as sold (230 µg/kg); forms differ in water content, so this compares foods as sold or eaten, not uptake.[7,22,23,24,25] The hmi reference for lead in mushrooms as sold pools 175 subgroup units from 4 sampling families, with a median of below 4 µg/kg and a middle half spanning below 4 (lower quartile) and 89 µg/kg (upper quartile).[1,2,26,27] for lead in mushrooms as sold, the reference median was 230 µg/kg, with a middle half from 170 to 2,050 µg/kg across 24 units.[22,23,24,25] dried for lead in mushrooms, the reference median was 184 µg/kg, with a middle half from 146 to 367 µg/kg across 8 units.[7]

Among GEMS/Food reporting regions, mushrooms as sold had the lowest lead subgroup median in SEARO (5 µg/kg) and the highest in WPRO (210 µg/kg); reporting regions are markets, not growing areas.[1] For cadmium, the lowest regional median was in WPRO (6.5 µg/kg) and the highest in WPRO (1,050 µg/kg).[1] For total arsenic, the lowest regional median was in EURO (1.79 µg/kg) and the highest in EURO (340 µg/kg).[1]

Targeted mushrooms as sold samples in EURO had cadmium lower at 380 µg/kg, against 700 µg/kg for EURO in the same study.[1] In another study, targeted mushrooms as sold samples in EURO had cadmium lower at 12.5 µg/kg, against 700 µg/kg for EURO in the same study.[1]

In one study, lead across 23 groups of mushrooms ranged from 120 µg/kg (Lactarius volemus) to 2,070 µg/kg (Lepista nuda, Rize, Çamlıhemşin, Ayder Plateau, conifer forest); the lowest is the lowest observed in that study, n ot an established sourcing preference.[12] In another study, lead across 16 groups of mushrooms ranged from 17 µg/kg (Russula virescens) to 886 µg/kg (Pleurotus ostreatus); the lowest is the lowest observed in that study, not an established sourcing preference.[8]

5 | Processing, cooking and preparation

Processed or prepared forms were compared only with unprocessed mushrooms in the same study and group. Dried mushrooms (all samples) had lead equal to at 20 µg/kg, against 20 µg/kg for the unprocessed form in the same group (mushrooms as sold).[28] In another study, canned mushrooms (Addis Ababa sample) had lead lower at 11,700 µg/kg, against 18,000 µg/kg for the unprocessed form in the same group (mushrooms as sold).[29] dried a third study found that mushrooms (all samples (4 sampling occasions, composites)) had inorganic arsenic higher at 45 µg/kg, against 5 µg/kg for the unprocessed form in the same group (mushrooms as sold).[30]

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

6 | Mitigation for mushrooms

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.[9] 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 mushrooms for metals

Results depend on the method and its reporting limit. Reporting limits for lead ranged from 0.83 µg/kg (Altıkulaç e t al. 2025) to 3,000 µg/kg (WHO GEMS/Food), so a non-detect from a less sensitive method says much less.[1,22] Reporting limits for cadmium ranged from 0.5 µg/kg (WHO GEMS/Food) to 1,000 µg/kg (WHO GEMS/Food), so a non-detect from a less sensitive method says much less.[1] Reporting limits for total arsenic ranged from 1 µg/kg (Qin et al. 2024) to 2,020 µg/kg (WHO GEMS/Food), so a non-detect from a less sensitive method says much less.[1,6]

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

9 | Buying and verifying mushrooms

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

10 | Exposure from mushrooms

No source in the library converted mushrooms 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 mushrooms was decided on its content: 69 occurrence extracted, 69 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 | Mushrooms FAQs

The library reports lead, cadmium, total arsenic, inorganic arsenic, dimethylarsinic acid, total mercury, methylmercury, nickel, chromium, aluminum, tin, antimony, uranium, Co, Cu, Fe, Mn, Zn, V, Se, AC, AC2, Ag, As, As(III), As(V), AsB, AsBamide, B, Ba, Ca, Cs, Hg, I, K, La, Li, Mg, Mo, Na, orgAs, Pr, Rb, S, Sc, Sm, Sr, Te, Ti, Tl, Tm and UNK in mushrooms, most often lead, cadmium and total arsenic.[1,2,3,4] WHO gems/food submissions reported lead in mushrooms as sold from 10,457 results in 4 reporting regions, with subgroup medians from 5 to 210 µg/kg.[1]

In the studies available, mushrooms from contaminated or exposed settings carried more metal than mushrooms from the same study's control.[7] dried mushrooms from certified ecological (organic) products, all species had cadmium higher at 950 µg/kg, against 595 µg/kg for all 164 retail dried mushroom samples, Polish market in the same study.[7]

For lead, the HMI dried reference median was lowest for mushrooms (184 µg/kg) and highest for mushrooms as sold (230 µg/kg); forms differ in water content, so this compares foods as sold or eaten, not uptake.[7,22,23,24,25]

Among GEMS/Food reporting regions, mushrooms as sold had the lowest lead subgroup median in SEARO (5 µg/kg) and the highest in WPRO (210 µg/kg); reporting regions are markets, not growing areas.[1] For cadmium, the lowest regional median was in WPRO (6.5 µg/kg) and the highest in WPRO (1,050 µg/kg).[1]

Only comparisons between forms in the same study are available, not before-and-after measurements of the same mushrooms.[28] dried mushrooms (all samples) had lead equal to at 20 µg/kg, against 20 µg/kg for the unprocessed form in the same group (mushrooms as sold).[28]

Inorganic arsenic, the more toxic form, was measured in 41 results from 8 sources, far fewer than total arsenic.[1,4,31,9,32,30,33,34] Across 2 other studies of ordinary farms and markets, reported inorganic arsenic means and medians on an as-sold or fresh-weight basis ranged from 8.3 µg/kg (Marín et al. 2018) to 17.2 µg/kg (EFSA CONTAM Panel 2024).[4,31]

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COMPETING INTERESTS

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