Soy

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Abstract

Soy in the HMI library has 613 reported results for lead, cadmium, total arsenic, inorganic arsenic, total mercury, nickel, chromium, aluminum, tin, antimony, uranium, Co, Cu, Fe, Mn, Zn, V, Se, As, Hg, I, Li, Mo and Sr from 32 sources. WHO gems/food submissions reported lead in soy as sold from 2,031 results in 5 reporting regions, with subgroup medians from 2.69 to 50 µg/kg. For cadmium, GEMS/Food gave subgroup medians from 1.17 to 130 µg/kg from 3,905 results.

1 | Soy overview

Across 2 other studies of ordinary farms and markets, reported lead means and medians on an as-sold or fresh-weight basis ranged from 9.8 µg/kg (Marín et al. 2018) to 15 µg/kg (Zhu et al. 2011).[4,8] For cadmium, 5 studies on an as-sold or fresh-weight basis reported means and medians from 4.12 µg/kg (Zhu et al. 2011) to 69 µg/kg (EFSA Panel on Contaminants in the Food Chain (CONTAM) 2009).[8,9] Higher results came from contaminated or exposed settings rather than ordinary supply. Soy as sold from soybean cultivar Hefeng 40, pot soil spiked to 2.5 mg Cd/kg (T2) (experiment) had cadmium higher at 2,060 µg/kg, against 180 µg/kg for soybean cultivar Hefeng 40, control soil in the same study.[7]

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

2 | What counts as soy

This page covers soy in 4 forms kept separate in every comparison: soy as sold (575 results), dried soy (17 results), soy powder or ground (11 results) and soy oil (10 results).[1,2,3,4,5,6] Foods made from soy that have their own pages, such as soy-based infant formula, soy milk, soy protein isolate and soy sauce, 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 soy

The evidence on how metals reach soy comes from studies that compared exposed and ordinary settings. Soy as sold from soybean cultivar Hefeng 40, pot soil spiked to 2.5 mg Cd/kg (T2) (experiment) had cadmium higher at 2,060 µg/kg, against 180 µg/kg for soybean cultivar Hefeng 40, control soil 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

The hmi reference for lead in soy as sold pools 128 subgroup units from 2 sampling families, with a median of below 50 µg/kg and a middle half spanning below 19 (lower quartile) and below 50 µg/kg (upper quartile).[1,5] for lead in soy powder or ground, the reference median was below 20 µg/kg, with a middle half from below 5.25 to between 2.2 and 90 µg/kg across 10 units.[1] for lead in soy as sold, the reference median was below 5 µg/kg, with a middle half from below 5 to 50 µg/kg across 5 units.[1]

Among GEMS/Food reporting regions, soy as sold had the lowest lead subgroup median in WPRO (4 µg/kg) and the highest in PAHO (50 µg/kg); reporting regions are markets, not growing areas.[1] For cadmium, the lowest regional median was in PAHO (1.17 µg/kg) and the highest in WPRO (130 µg/kg).[1]

Targeted soy as sold samples in WPRO had cadmium lower at 2.05 µg/kg, against 20 µg/kg for WPRO in the same study.[1] In another study, targeted soy as sold samples in WPRO had cadmium higher at 50 µg/kg, against 20 µg/kg for WPRO in the same study.[1]

5 | Processing, cooking and preparation

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

6 | Mitigation for soy

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 soy for metals

Results depend on the method and its reporting limit. Reporting limits for lead ranged from 0.04 µg/kg (WHO GEMS/Food) to 25,000 µg/kg (WHO GEMS/Food), so a non-detect from a less sensitive method says much less.[1] Reporting limits for cadmium ranged from 0.4 µg/kg (WHO GEMS/Food) to 100 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 2.5 µg/kg

(WHO GEMS/Food) to 997 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 soy

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

10 | Exposure from soy

No source in the library converted soy 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 soy was decided on its content: 32 occurrence extracted, 32 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 | Soy FAQs

The library reports lead, cadmium, total arsenic, inorganic arsenic, total mercury, nickel, chromium, aluminum, tin, antimony, uranium, Co, Cu, Fe, Mn, Zn, V, Se, As, Hg, I, Li, Mo and Sr in soy, most often lead, cadmium and total arsenic.[1,2,3,4] WHO gems/food submissions reported lead in soy as sold from 2,031 results in 5 reporting regions, with subgroup medians from 2.69 to 50 µg/kg.[1]

In the studies available, soy from contaminated or exposed settings carried more metal than soy from the same study's control.[7] soy as sold from all 25 cultivars, field soil 1.22 mg Cd/kg (experiment) had cadmium higher at 470 µg/kg, against 180 µg/kg for soybean cultivar Hefeng 40, control soil in the same study.[7]

Among GEMS/Food reporting regions, soy as sold had the lowest lead subgroup median in WPRO (4 µg/kg) and the highest in PAHO (50 µg/kg); reporting regions are markets, not growing areas.[1] For cadmium, the lowest regional median was in PAHO (1.17 µg/kg) and the highest in WPRO (130 µg/kg).[1]

Inorganic arsenic, the more toxic form, was measured in 16 results from 5 sources, far fewer than total arsenic.[1,3,4,12,13] 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 3.3 µg/kg (Marín et al. 2018) to 4.6 µg/kg (Food Standards Agency 2014).[3,4]

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STATUS AND LICENCE

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DATA AVAILABILITY

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

brands, and does not use certification thresholds as evidence for the statements made here.

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