Infant Formula Powder

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Abstract

Infant formula powder in the HMI library has 2,520 reported results for lead, cadmium, total arsenic, inorganic arsenic, dimethylarsinic acid, monomethylarsonic acid, total mercury, nickel, chromium, aluminum, tin, antimony, uranium, Co, Cu, Fe, Mn, Zn, V, Se, B, Ba, Bi, Ca, Ce, CrIII, CrVI, Cs, Ga, Hg, K, La, Li, Mg, Mo, Na, Nb, P, Rb, Si, Sr, Ti and Tl from 56 sources. WHO GEMS/Food submissions reported lead in infant formula powder from 2,126 results in 4 reporting regions, with subgroup medians from 0.25 to 23 µg/kg. For cadmium, GEMS/Food gave a subgroup median of 2.5 µg/kg from 2,205 results.

1 | Infant formula powder overview

Across 12 other studies of ordinary farms and markets, reported lead means and medians on an as-sold or fresh-weight basis ranged from 4 µg/kg (Höpfner et al. 2025) to 141 µg/kg (Demir et al. 2023).[8,9] For cadmium, 12 studies on an as-sold or fresh-weight basis reported means and medians from 0.39 µg/kg (Chekri et al. 2019) to 355 µg/kg (Lutfullah et al. 2014).[10,11] Higher results came from contaminated or exposed settings rather than ordinary supply. Infant formula powder from Raw had CrIII higher at 2.72 µg/kg, against 2.51 µg/kg for Hot plate in the same study.[7]

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

2 | What counts as infant formula powder

This page covers infant formula powder (2,520 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 infant formula powder

The evidence on how metals reach infant formula powder comes from studies that compared exposed and ordinary settings. Infant formula powder from Raw had CrIII higher at 2.72 µg/kg, against 2.51 µg/kg for Hot plate 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 infant formula powder pools 78 subgroup units from 10 sampling families, with a median of between 0.4 and 10 µg/kg and a middle half spanning below 6.58 (lower quartile) and between 8.27 and 20 µg/kg (upper quartile).[1,5,14,18,20,22,23,24,25,26] for cadmium in infant formula powder, the reference median was below 9.6 µg/kg, with a middle half from below 1.4 to between 0.52 and 10 µg/kg across 60 units.[1,12,14,18,20,22,23,27] for cadmium in infant formula powder, the reference median was between 13 and 17 µg/kg, with a middle half from between 2 and 8 to 80.7 µg/kg across 4 units.[1]

Among GEMS/Food reporting regions, infant formula powder had the lowest lead subgroup median in PAHO (0.25 µg/kg) and the highest in EMRO (23 µg/kg); reporting regions are markets, not growing areas.[1] For inorganic arsenic, the lowest regional median was in PAHO (0.93 µg/kg) and the highest in WPRO (8 µg/kg).[1]

In one study, lead across 16 groups of infant formula powder ranged from 10 µg/kg (anonymized manufacturer 15 (two batches)) to 141 µg/kg (anonymized manufacturer 13 (two batches)); the lowest is the lowest observed in that study, not an established sourcing preference.[9] In another study, lead across 14 groups of infant formula powder ranged from 8.27 µg/kg (retail product 5) to 49.7 µg/kg (retail product 2); 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 infant formula powder

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 infant formula powder for metals

Results depend on the method and its reporting limit. Reporting limits for lead ranged from 0.1 µg/kg (WHO GEMS/Food) to 10,800 µg/kg (WHO GEMS/Food), so a non-detect from a less sensitive method says much less.[1] Reporting limits for cadmium ranged from 0.2 µg/kg (Akhtar et al. 2017) to 2,100 µg/kg (WHO GEMS/Food), so a non-detect from a less sensitive method says much less.[1,3] Reporting limits for total arsenic ranged from 1 µg/kg (Igweze et al. 2020) to 500 µg/kg (WHO GEMS/Food), so a non-detect from a less sensitive method says much less.[1,28]

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

9 | Buying and verifying infant formula powder

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

10 | Exposure from infant formula powder

No source in the library converted infant formula powder 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 infant formula powder was decided on its content: 56 occurrence extracted, 56 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 | Infant formula powder FAQs

The library reports lead, cadmium, total arsenic, inorganic arsenic, dimethylarsinic acid, monomethylarsonic acid, total mercury, nickel, chromium, aluminum, tin, antimony, uranium, Co, Cu, Fe, Mn, Zn, V, Se, B, Ba, Bi, Ca, Ce, CrIII, CrVI, Cs, Ga, Hg, K, La, Li, Mg, Mo, Na, Nb, P, Rb, Si, Sr, Ti and Tl in infant formula powder, most often lead, cadmium and total arsenic.[1,2,3,4] WHO GEMS/Food submissions reported lead in infant formula powder from 2,126 results in 4 reporting regions, with subgroup medians from 0.25 to 23 µg/kg.[1]

In the studies available, infant formula powder from contaminated or exposed settings carried more metal than infant formula powder from the same study's control.[7] infant formula powder from Microwaved had CrIII higher at 2.63 µg/kg, against 2.51 µg/kg for Hot plate in the same study.[7]

Among GEMS/Food reporting regions, infant formula powder had the lowest lead subgroup median in PAHO (0.25 µg/kg) and the highest in EMRO (23 µg/kg); reporting regions are markets, not growing areas.[1] For inorganic arsenic, the lowest regional median was in PAHO (0.93 µg/kg) and the highest in WPRO (8 µg/kg).[1]

Inorganic arsenic, the more toxic form, was measured in 52 results from 10 sources, far fewer than total arsenic.[1,29,8,30,31,32,33,34,35,36] Across 3 other studies of ordinary farms and markets, reported inorganic arsenic

means and medians on an as-sold or fresh-weight basis ranged from 1 µg/kg (US Food and Drug Administration 2016) to 160 µg/kg (Gu et al. 2020).[29,32]

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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.

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