Ketchup

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HEAVY METAL INDEX · INGREDIENT PROFILE October 2026

DOI 10.83376/hmi.ingredient.ketchup

CITE AS

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

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

Ketchup in the HMI library has 120 reported results for lead, cadmium, total arsenic, inorganic arsenic, total mercury, nickel, chromium, aluminum, tin, antimony, uranium, Co, Cu, Fe, Mn, Zn and V from 8 sources. WHO gems/food submissions reported lead in ketchup as sold from 197 results in 5 reporting regions, with subgroup medians from 1.6 to 21.5 µg/kg. In the US Total Diet Study, ketchup as sold had a median lead result below 4 µg/kg across 3 composites from 2018-2020.

1 | Ketchup 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 31 µg/kg (Vaishali et al. 2020) to 540 µg/kg (Torkashvand et al. 2026).[4,5] For cadmium, 2 studies with the basis not stated reported means and medians from 23 µg/kg (Centre for Food Safety (Hong Kong) 2013) to 37.2 µg/kg (Dabeka et al. 1995).[6,7] Higher results came from contaminated or exposed settings rather than ordinary supply. Ketchup as sold from sachet-packed, 4 brands x 3 production series, Iranian market had aluminum higher at 1,700 µg/kg, against 1,380 µg/kg for all packaging types, Iranian market in the same study.[4]

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

2 | What counts as ketchup

This page covers ketchup in 2 forms kept separate in every comparison: ketchup as sold (110 results) canned and ketchup (10 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 ketchup

The evidence on how metals reach ketchup comes from studies that compared exposed and ordinary settings. Ketchup as sold from sachet-packed, 4 brands x 3 production series, Iranian market had aluminum higher at 1,700 µg/kg, against 1,380 µg/kg for all packaging types, Iranian market in the same study.[4]

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 ketchup as sold pools 37 subgroup units from 2 sampling families, with a median of below 4 µg/kg and a middle half spanning below 4 (lower quartile) and between 5.9 and 13.7 µg/kg (upper quartile).[1,2] for cadmium in ketchup as sold, the reference median was 20 µg/kg, with a middle half from between 7.75 and 10 to 20.8 µg/kg across 33 units.[1,2] for total arsenic in ketchup as sold, the reference median was below 6.5 µg/kg, with a middle half from below 3 to between 25 and 45.7 µg/kg across 10 units.[1,2]

Among GEMS/Food reporting regions, ketchup as sold had the lowest lead subgroup median in PAHO (1.6 µg/kg) and the highest in EMRO (21.5 µg/kg); reporting regions are markets, not growing areas.[1] For cadmium, the lowest regional median was in EURO (7 µg/kg) and the highest in WPRO (21.5 µg/kg).[1] For total arsenic, the lowest regional median was in EURO (10 µg/kg) and the highest in EURO (35.3 µg/kg).[1]

In one study, lead across 6 groups of ketchup ranged from 96.8 µg/kg (retail product DTK3 (domestic (Nigerian-made), bottle)) to 148 µg/kg (retail product ITK1 (imported, bottle)); the lowest is the lowest observed in that study, not an established sourcing preference.[3] In another study, lead across 4 groups of ketchup ranged from 31 µg/kg (ketchup samples 1-3, Gurugram street vendors) to 183 µg/kg (ketchup samples 1-3, Delhi street vendors); the lowest is the lowest observed in that study, not an established sourcing preference.[5]

5 | Processing, cooking and preparation

Processed or prepared forms were compared only with unprocessed ketchup in the same study and group. Canned ketchup (5 city composites) had lead higher at 48.9 µg/kg, against 8.1 µg/kg for the unprocessed form in the same group (ketchup as sold).[7]

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

6 | Mitigation for ketchup

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.[4] 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 ketchup for metals

Results depend on the method and its reporting limit. Reporting limits for lead ranged from 1 µg/kg (WHO GEMS/Food) to 130 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 69.4 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 3 µg/kg (FDA Total Diet Study) to 200 µg/kg (WHO GEMS/Food), so a non-detect from a less sensitive method says much less.[1,2]

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

9 | Buying and verifying ketchup

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

10 | Exposure from ketchup

No source in the library converted ketchup 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 ketchup was decided on its content: 8 occurrence extracted, 8 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 | Ketchup FAQs

The library reports lead, cadmium, total arsenic, inorganic arsenic, total mercury, nickel, chromium, aluminum, tin, antimony, uranium, Co, Cu, Fe, Mn, Zn and V in ketchup, most often lead, cadmium and total arsenic.[1,2,3,4] WHO gems/food submissions reported lead in ketchup as sold from 197 results in 5 reporting regions, with subgroup medians from 1.6 to 21.5 µg/kg.[1]

In the studies available, ketchup from contaminated or exposed settings carried more metal than ketchup from the same study's control.[4] ketchup as sold from plastic-packed, 4 brands x 3 production series, Iranian market had lead higher at 540 µg/kg, against 510 µg/kg for all packaging types, Iranian market in the same study.[4]

Among GEMS/Food reporting regions, ketchup as sold had the lowest lead subgroup median in PAHO (1.6 µg/kg) and the highest in EMRO (21.5 µg/kg); reporting regions are markets, not growing areas.[1] For cadmium, the lowest regional median was in EURO (7 µg/kg) and the highest in WPRO (21.5 µg/kg).[1]

Only comparisons between forms in the same study are available, not before-and-after measurements of the same ketchup.[7] canned ketchup (5 city composites) had lead higher at 48.9 µg/kg, against 8.1 µg/kg for the unprocessed form in the same group (ketchup as sold).[7]

Inorganic arsenic, the more toxic form, was measured in 2 results from 2 sources, far fewer than total arsenic.[1,8] Centre for Food Safety FEHD HKSAR 2012 reported inorganic arsenic at 7 µg/kg (mean) in ketchup as sold from all samples (4 sampling occasions, composites).[8]

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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 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

PUBLICATION HISTORY

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

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