Orange juice

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Abstract

Orange juice in the HMI library has 340 reported results for lead, cadmium, total arsenic, inorganic arsenic, total mercury, nickel, chromium, aluminum, tin, uranium, Co, Cu, Fe, Mn, Zn and CrVI from 23 sources. WHO GEMS/Food submissions reported lead in orange juice from 183 results in 4 reporting regions, with a subgroup median of 6.6 µg/kg. In the US Total Diet Study, orange juice had a median lead result below 1 µg/kg across 3 composites from 2018-2020.

1 | Orange juice 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 2 µg/kg (Alzagtat et al. 2016) to 7 µg/kg (Alzagtat et al. 2016).[3] Alzagtat et al. 2016 reported cadmium at 5 µg/kg (mean ± 3 SD) and total arsenic at 40 µg/kg (mean ± 5 SD) in orange juice from imported nectar, producer code E (sample 15).[3]

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

2 | What counts as orange juice

This page covers orange juice in 2 forms kept separate in every comparison: orange juice (335 results) and orange juice as sold (5 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 orange juice

No study in the library compared orange juice from contaminated and ordinary settings, so the routes by which metals reach it are not measured here.

4 | Which forms and regions measured lower

The HMI reference for lead in orange juice pools 71 subgroup units from 4 sampling families, with a median of below 1 µg/kg and a middle half spanning below 1 (lower quartile) and between 0.2 and 4 µg/kg (upper quartile).[1,2,7,8] for cadmium in orange juice, the reference median was below 1 µg/kg, with a middle half from below 1 to below 1 µg/kg across 29 units.[1,2,8] for total arsenic in orange juice, the reference median was below 1 µg/kg, with a middle half from below 1 to below 7 µg/kg across 13 units.[1,2]

In one study, lead across 22 groups of orange juice ranged from 0.1 µg/kg (FY2017) to 21.7 µg/kg (FY2018); the lowest is the lowest observed in that study, not an established sourcing preference.[7] In another study, lead across 7 groups of orange juice ranged from 2 µg/kg (imported nectar, producer code F (sample 16)) to 7 µg/kg (locally produced nectar, producer code A (sample 13)); the lowest is the lowest observed in that study, not an established sourcing preference.[3]

5 | Processing, cooking and preparation

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

6 | Mitigation for orange juice

Lot testing against the applicable limit is the check that can be verified.

7 | Trade-offs and limits of controls

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 orange juice for metals

Results depend on the method and its reporting limit. Reporting limits for lead ranged from 1 µg/kg (FDA Total Diet Study) to 90 µg/kg (WHO GEMS/Food), so a non-detect from a less sensitive method says much less.[1,2] Reporting limits for cadmium ranged from 0.7 µg/kg (WHO GEMS/Food) to 40 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 (FDA Total Diet Study) to 40 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 orange juice

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

10 | Exposure from orange juice

No source in the library converted orange juice 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 orange juice was decided on its content: 23 occurrence extracted, 23 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 | Orange juice FAQs

The library reports lead, cadmium, total arsenic, inorganic arsenic, total mercury, nickel, chromium, aluminum, tin, uranium, Co, Cu, Fe, Mn, Zn and CrVI in orange juice, most often lead, cadmium and total arsenic.[1,2,3,4] WHO GEMS/Food submissions reported lead in orange juice from 183 results in 4 reporting regions, with a subgroup median of 6.6 µg/kg.[1]

In one study, lead across 22 groups of orange juice ranged from 0.1 µg/kg (FY2017) to 21.7 µg/kg (FY2018); the lowest is the lowest observed in that study, not an established sourcing preference.[7] In another study, lead across 7 groups of orange juice ranged from 2 µg/kg (imported nectar, producer code F (sample 16)) to 7 µg/kg (locally produced nectar, producer code A (sample 13)); the lowest is the lowest observed in that study, not an established sourcing preference.[3]

Inorganic arsenic, the more toxic form, was measured in 7 results from 4 sources, far fewer than total arsenic.[1,-9,10,11] Across 2 other studies of ordinary farms and markets, reported inorganic arsenic means and medians with the basis not stated ranged from 1 µg/kg (EFSA 2021) to 10 µg/kg (EFSA 2021).[10]

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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/orange-juice#sources.

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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