Mixed Meals

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Abstract

Mixed meals in the HMI library has 322 reported results for lead, cadmium, total arsenic, inorganic arsenic, dimethylarsinic acid, total mercury, methylmercury, nickel, chromium, aluminum, tin and uranium from 8 sources. WHO GEMS/Food submissions reported lead in mixed meals as sold from 1,888 results in 3 reporting regions, with subgroup medians from 2.65 to 18 µg/kg. In the US Total Diet Study, mixed meals as sold had a median lead result below 4 µg/kg across 2 composites from 2018-2019.

1 | Mixed meals overview

Across 2 other studies of ordinary farms and markets, reported cadmium means and medians with the basis not stated ranged from 4.7 µg/kg (Joint FAO/WHO Expert Committee on Food Additives 2022) to 58.7 µg/kg (European Food Safety Authority 2012).[3,4] For inorganic arsenic, 2 studies with the basis not stated reported means and medians from 11.1 µg/kg (European Food Safety Authority (EFSA) 2014) to 44.8 µg/kg (European Food Safety Authority (EFSA) 2014).[6]

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

2 | What counts as mixed meals

This page covers mixed meals as sold (322 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 mixed meals

No study in the library compared mixed meals 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 mixed meals as sold pools 300 subgroup units from 2 sampling families, with a median of below 6.13 µg/kg and a middle half spanning below 4 (lower quartile) and between 4 and 13 µg/kg (upper quartile).[1,2] for cadmium in mixed meals as sold, the reference median was between 5.5 and 7.9 µg/kg, with a middle half from between 2.05 and 3.5 to between 12.3 and 14 µg/kg across 293 units.[1,2] for total arsenic in mixed meals as sold, the reference median was between 4.3 and 6.6 µg/kg, with a middle half from below 3.2 to between 9.8 and 30.1 µg/kg across 254 units.[1,2]

Among GEMS/Food reporting regions, mixed meals as sold had the lowest lead subgroup median in PAHO (2.65 µg/kg) and the highest in PAHO (18 µg/kg); reporting regions are markets, not growing areas.[1] For cadmium, the lowest regional median was in EURO (1.32 µg/kg) and the highest in PAHO (19 µg/kg).[1] For total arsenic, the lowest regional median was in WPRO (5 µg/kg) and the highest in WPRO (2,810 µg/kg).[1]

5 | Processing, cooking and preparation

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

6 | Mitigation for mixed meals

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 mixed meals for metals

Results depend on the method and its reporting limit. Reporting limits for lead ranged from 0.4 µg/kg (WHO GEMS/Food) to 40,000 µg/kg (WHO GEMS/Food), so a non-detect from a less sensitive method says much less.[1] Reporting limits for cadmium ranged from 0.5 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 2 µg/kg (WHO GEMS/Food) to 500 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 mixed meals

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

10 | Exposure from mixed meals

No source in the library converted mixed meals 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 mixed meals 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 | Mixed meals FAQs

The library reports lead, cadmium, total arsenic, inorganic arsenic, dimethylarsinic acid, total mercury, methylmercury, nickel, chromium, aluminum, tin and uranium in mixed meals, most often lead, cadmium and total arsenic.[1,2,3,4] WHO GEMS/Food submissions reported lead in mixed meals as sold from 1,888 results in 3 reporting regions, with subgroup medians from 2.65 to 18 µg/kg.[1]

Among GEMS/Food reporting regions, mixed meals as sold had the lowest lead subgroup median in PAHO (2.65 µg/kg) and the highest in PAHO (18 µg/kg); reporting regions are markets, not growing areas.[1] For cadmium, the lowest regional median was in EURO (1.32 µg/kg) and the highest in PAHO (19 µg/kg).[1]

Inorganic arsenic, the more toxic form, was measured in 25 results from 3 sources, far fewer than total arsenic.[1,5,6] Across 2 other studies of ordinary farms and markets, reported inorganic arsenic means and medians with the basis not stated ranged from 11.1 µg/kg (European Food Safety Authority (EFSA) 2014) to 44.8 µg/kg (European Food Safety Authority (EFSA) 2014).[6]

References

[1] GEMS/Food Contaminants database heavy-metal exports
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[2] FY2018-FY2020 TDS Elements Analytical Results
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[3] Cadmium dietary exposure in the European population
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[4] Cadmium: dietary exposure assessment
Joint FAO/WHO Expert Committee on Food Additives · WHO Food Additives Series, No. 82 (Safety evaluation of certain contaminants in food, prepared by the 91st meeting of JECFA) · 2022 · www.who.int
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STATUS AND LICENCE

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COMPETING INTERESTS

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DATA AVAILABILITY

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

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