Meat and poultry

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Abstract

Meat and poultry in the HMI library has 1,823 reported results for lead, cadmium, total arsenic, inorganic arsenic, dimethylarsinic acid, total mercury, methylmercury, nickel, chromium, aluminum, tin, antimony, Co, Cu, Fe, Mn, Zn, V, Se, Ag, Ba, CrIII, Ga, Hg, I, Mo, Sr and Tl from 69 sources. WHO GEMS/Food submissions reported lead in meat and poultry as sold from 26,467 results in 4 reporting regions, with subgroup medians from 1.19 to 139 µg/kg. For cadmium, GEMS/Food gave subgroup medians from 0.412 to 270 µg/kg from 35,930 results.

1 | Meat and poultry 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 0.4 µg/kg (Berber et al. 2024) to 6,160 µg/kg (Lenti et al. 2021).[7,8] For cadmium, 14 studies on an as-sold or fresh-weight basis reported means and medians from 0.17 µg/kg (ANSES 2026) to 480 µg/kg (Chowdhury et al. 2024).[2,9] Higher results came from contaminated or exposed settings rather than ordinary supply. Meat and poultry as sold from shot animal 1, sample U1: center of wound channel, exit side (experiment) had lead higher at 1,960,000 µg/kg, against 97 µg/kg for shot animal 2, control sample U8 in the same study.[10]

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

2 | What counts as meat and poultry

This page covers meat and poultry in 5 forms kept separate in every comparison: meat and poultry as sold (1,704 results), cooked meat and poultry (59 results), frozen meat and poultry (28 results), canned meat and poultry (24 results) peeled or flesh and meat and poultry (8 results).[1,2,3,4,5,6] Foods made from meat and poultry that

have their own pages, such as bologna luncheon meat, meat and poultry purees, meat and poultry and turkey luncheon meat, 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 meat and poultry

The evidence on how metals reach meat and poultry comes from studies that compared exposed and ordinary settings. Meat and poultry as sold from shot animal 1, sample U1: center of wound channel, exit side (experiment) had lead higher at 1,960,000 µg/kg, against 97 µg/kg for shot animal 2, control sample U8 in the same study.[10] In another study, meat and poultry as sold from Rönnskär (polluted brackish water) (industrial-affected area) had total arsenic higher at 2,600 µg/kg, against 240 µg/kg for Bodaträsk (polluted fresh water) in the same study.[19] A third study found that meat and poultry as sold from smoked (processed) cane rat meat from market, uncooked (table: had Mn higher at 5,330 µg/kg, against 1,250 µg/kg for smoked (processed) cane rat meat, then boiled (table: "Processed in the same study.[20]

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 meat and poultry as sold pools 465 subgroup units from 5 sampling families, with a median of 100 µg/kg and a middle half spanning 21 (lower quartile) and 230 µg/kg (upper quartile).[1,5,7,21,22] for cadmium in meat and poultry as sold, the reference median was 23 µg/kg, with a middle half from 5 to 30 µg/kg across 442 units.[1,5,21,22,23] For total arsenic in meat and poultry as sold, the reference median was below 10 µg/kg, with a middle half from below 2 to between 14.3 and 45 µg/kg across 383 units.[1,22,24]

Among GEMS/Food reporting regions, meat and poultry as sold had the lowest lead subgroup median in PAHO (1.19 µg/kg) and the highest in EURO (50 µg/kg); reporting regions are markets, not growing areas.[1] For cadmium, the lowest regional median was in WPRO (0.412 µg/kg) and the highest in EURO (270 µg/kg).[1] For total arsenic, the lowest regional median was in WPRO (2.25 µg/kg) and the highest in EURO (62 µg/kg).[1]

Targeted meat and poultry as sold samples in WPRO had total arsenic lower at 10 µg/kg, against 10.8 µg/kg for WPRO in the same study.[1] In another study, targeted meat and poultry as sold samples in WPRO had total arsenic higher at 18 µg/kg, against 10.8 µg/kg for WPRO in the same study.[1]

In one study, lead across 48 groups of meat and poultry ranged from 10 µg/kg (retail brand C, batch C3 (60% wild boar meat)) to 18,300 µg/kg (retail brand E, batch E2 (40% wild boar meat)); the lowest is the lowest observed in that study, not an established sourcing preference.[7] In another study, lead across 24 groups of meat and poultry ranged from 0.4 µg/kg (male, April 2021 (month 10), Atikhisar Dam Lake) to 78 µg/kg (male, September 2020 (month 3), Atikhisar Dam Lake); the lowest is the lowest observed in that study, not an established sourcing preference.[8]

5 | Processing, cooking and preparation

Processed or prepared forms were compared only with unprocessed meat and poultry in the same study and group. Peeled or flesh meat and poultry (Lahore markets (5 markets pooled)) had lead higher at 1,120 µg/kg,

against 698 µg/kg for the unprocessed form in the same group (meat and poultry as sold).[25] In another study, canned meat and poultry (all samples (EU Member State submissions)) had cadmium lower at 7.37 µg/kg, against 362 µg/kg for the unprocessed form in the same group (meat and poultry as sold).[26] A third canned study found that meat and poultry (European dietary-survey occurrence data) had inorganic arsenic higher at 10.8 µg/kg, against 4.4 µg/kg for the unprocessed form in the same group (meat and poultry as sold).[27]

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

6 | Mitigation for meat and poultry

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.[10] 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 meat and poultry for metals

Results depend on the method and its reporting limit. Reporting limits for lead ranged from 0.08 µg/kg (Iyu 2022) to 3,000 µg/kg (WHO GEMS/Food), so a non-detect from a less sensitive method says much less.[1,28] Reporting limits for cadmium ranged from 0.05 µg/kg (Iyu 2022) to 1,000 µg/kg (WHO GEMS/Food), so a non-detect from a less sensitive method says much less.[1,28] Reporting limits for total arsenic ranged from 0.667 µg/kg (WHO GEMS/Food) to 100,000 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 meat and poultry

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

10 | Exposure from meat and poultry

No source in the library converted meat and poultry 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 meat and poultry was decided on its content: 69 occurrence extracted, 69 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.

The library reports lead, cadmium, total arsenic, inorganic arsenic, dimethylarsinic acid, total mercury, methylmercury, nickel, chromium, aluminum, tin, antimony, Co, Cu, Fe, Mn, Zn, V, Se, Ag, Ba, CrIII, Ga, Hg, I, Mo, Sr and Tl in meat and poultry, most often lead, cadmium and total arsenic.[1,2,3,4] WHO GEMS/Food submissions reported lead in meat and poultry as sold from 26,467 results in 4 reporting regions, with subgroup medians from 1.19 to 139 µg/kg.[1]

In the studies available, meat and poultry from contaminated or exposed settings carried more metal than meat and poultry from the same study's control.[7] meat and poultry as sold from wild boar meat content <35% had lead higher at 160 µg/kg, against 100 µg/kg for all samples, 16 brands, Italian market, March-November 2020 in the same study.[7]

Among GEMS/Food reporting regions, meat and poultry as sold had the lowest lead subgroup median in PAHO (1.19 µg/kg) and the highest in EURO (50 µg/kg); reporting regions are markets, not growing areas.[1] For cadmium, the lowest regional median was in WPRO (0.412 µg/kg) and the highest in EURO (270 µg/kg).[1]

Only comparisons between forms in the same study are available, not before-and-after measurements of the same meat and poultry.[25] peeled or flesh meat and poultry (Lahore markets (5 markets pooled)) had lead higher at 1,120 µg/kg, against 698 µg/kg for the unprocessed form in the same group (meat and poultry as sold).[25]

Inorganic arsenic, the more toxic form, was measured in 71 results from 7 sources, far fewer than total arsenic.[1,29,11,19,12,30,27] 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 2 µg/kg (Food Standards Agency 2014) to 3.3 µg/kg (Marín et al. 2018).[29,11]

References

[1] GEMS/Food Contaminants database heavy-metal exports
World Health Organization · GEMS/Food Contamination Monitoring and Assessment Programme · 2026 · extranet.who.int
DATASET

[2] Opinion of the French Agency for Food, Environmental and Occupational Health & Safety on the results of the Third French Total Diet Study (TDS3) - Acrylamide, aluminium, silver, cadmium, mercury and lead
ANSES · 2026
GOVERNMENT

[3] Effect of vermiculite feed additive on the chemical, mineral, and amino acid compositions of quail meat
Apdraim G, Sarsembayeva N, and Lozowicka B · 2023 · doi.org/10.14202/vetworld.2023.2431-2439
PEER-REVIEWED

[4] Keywords: Meat, Heavy metal, Toxic elements, Health risk, Exposure assessment
Unknown authors · Peer-reviewed article · 2021 · doi.org/10.21203/rs.3.rs-1102078/v1
PEER-REVIEWED

[5] Evaluation of Concentrations and Health Risk Assessment of Cadmium, Lead, Chromium and Arsenic in
Unknown authors · Peer-reviewed article · 2025 · doi.org/10.4314/jasem.v29i9.58
PEER-REVIEWED

[6] Trace Metals in Pork Meat Products Marketed in Italy: Occurrence and Health Risk Characterization
Barone G, Storelli A, Quaglia NC, Garofalo R, Meleleo D, Busco A, et al. · Biological Trace Element Research (2021) 199: 2826-2836 · 2021 · doi.org/10.1007/s12011-020-02417-z
PEER-REVIEWED

[7] Lead Levels in Wild Boar Meat Sauce (Ragù) Sold on the Italian Market
Lenti A, Menozzi A, Fedrizzi G, Menotta S, Iemmi T, Galletti G, et al. · International Journal of Environmental Research and Public Health 2021, 18, 3989 · 2021 · doi.org/10.3390/ijerph18083989
PEER-REVIEWED

[8] Metal content and fatty acid profiles in narrow-clawed crayfish (Pontastacus leptodactylus) from Atikhisar Dam Lake, Turkey: seasonal variation and health risk assessment
Berber S, Acarlı S, Bayraklı B, Kale S, Vural P, and Sönmez AY · Environmental Science and Pollution Research · 2024 · doi.org/10.1007/s11356-024-32858-1
PEER-REVIEWED

[9] Health effects of heavy metals in meat and poultry consumption in Noakhali, Bangladesh
Chowdhury AI and Alam MR · Toxicology Reports 12 (2024) 168-177 · 2024 · doi.org/10.1016/j.toxrep.2024.01.008
PEER-REVIEWED

[10] Lead in game meat: a study of bioaccessibility of lead metal fragments
Ulf Qvarfort and Christer Holmgren · Journal of Analytical Techniques and Research · 2025 · doi.org/10.26502/jatr.47
PEER-REVIEWED

[11] Assessment of metal levels in foodstuffs from the Region of Valencia (Spain)
Marín S, Pardo O, Sánchez A, Sanchis Y, Vélez D, Devesa V, et al. · Toxicology Reports 5 (2018) 654-670 · 2018 · doi.org/10.1016/j.toxrep.2018.05.005
PEER-REVIEWED

[12] Total Diet Study of metals and other elements in food
Baxter M and Brereton N · Food and Environment Research Agency report for the UK Food Standards Agency, Fera report 15/06, project FS102081 · 2015 · www.food.gov.uk
GOVERNMENT

[13] Determination of some heavy metals concentration in species animal meat (sheep, beef, turkey, and ostrich) and carcinogenic health risk assessment in Kurdistan province, western Iran
Raeeszadeh M, Gravandi H, and Akbari A · Research Square · 2021 · doi.org/10.21203/rs.3.rs-407310/v1
PREPRINT

[14] Technogenic contamination of livestock- and fish-derived food products with heavy metals and radionuclides in industrial and post-nuclear regions of Kazakhstan
Adilbekov Z, Mustafina R, Suleimenov S, Serikova A, Zhuzzassarova G, Suranshiyev Z, et al. · Veterinary World 2026, 19(3): 1052-1068 · 2026 · doi.org/10.14202/vetworld.2026.1052-1068
PEER-REVIEWED

[15] Estimation of heavy metal concentrations in imported frozen meat sold in the Libyan market
Altalib SA, Ghania AA, and Alazzabi AA · Mediterranean Journal of Medical Research · 2025 · doi.org/10.5281/zenodo.17986261
PEER-REVIEWED

[16] Probabilistic assessment of the cumulative risk from dietary heavy metal exposure in Chongqing, China using a hazard-driven approach
Chen J, Chen J, Li M, Feng P, Qin M, Chen T, et al. · Scientific Reports 15:2229 · 2025 · doi.org/10.1038/s41598-024-83299-2
PEER-REVIEWED

[17] Assessment of quality and safety of meats from various animal species in the Shuchinsk-Burabay resort zone, Kazakhstan
Maikanov BS, Ismagulova GT, Auteleyeva LT, Kemeshov ZO, and Zhanabayeva DK · Veterinary World 14(6):1615-1621 · 2021 · doi.org/10.14202/vetworld.2021.1615-1621
PEER-REVIEWED

[18] Determination of several heavy metals in staple foods from traditional markets in Jakarta using neutron activation analysis
Kurniawati S, Damastuti E, Adventini N, Syahfitri WYN, Kusmartini I, Lestiani DD, et al. · AIP Conference Proceedings (4th International Seminar on Chemistry) · 2021 · doi.org/10.1063/5.0053376
PEER-REVIEWED

[19] Concentration of inorganic and total arsenic in fish from industrially polluted water
Norin H, Vahter M, Christakopoulos A, and Sandstrom M · Chemosphere · 1985 · doi.org/10.1016/0045-6535(85)90060-890060-8)
PEER-REVIEWED

[20] Effects of Different Cooking Methods on Heavy Metals Level in Fresh and Smoked Game Meat
Joyce K, Emikpe BO, Asare DA, Asenso TN, Yeboah R, Jarikre TA, et al. · Journal of Food Processing & Technology · 2016 · doi.org/10.4172/2157-7110.1000617
PEER-REVIEWED

[21] Levels of Metals in Kidney, Liver, and Muscle Tissue and their Influence on the Fitness for the Consumption of Wild Boar from Western Slovakia
Gašparík J, Binkowski ŁJ, Jahnátek A, Šmehýl P, Dobiaš M, Lukáč N, et al. · Biological Trace Element Research · 2017 · doi.org/10.1007/s12011-016-0884-z
PEER-REVIEWED

[22] Concentrations of toxic elements in tissues of slaughtered animals and cow's milk - a five year study
Szkoda J, Żmudzki J, Nawrocka A, and Kmiecik M · Bulletin of the Veterinary Institute in Pulawy 57, 529-533 · 2013 · doi.org/10.2478/bvip-2013-0092
PEER-REVIEWED

[23] Scientific Opinion of the Panel on Contaminants in the Food Chain on a request from the European Commission on cadmium in food
EFSA Panel on Contaminants in the Food Chain (CONTAM) · The EFSA Journal · 2009 · doi.org/10.2903/j.efsa.2009.980
GOVERNMENT

[24] Dietary Exposure to Essential and Toxic Trace Elements in the Portuguese Population: A Total Diet Study Approach
Ventura M, Rego A, Gueifão S, Delgado I, and Coelho I · Foods · 2025 · doi.org/10.3390/foods15050838
PEER-REVIEWED

[25] Accumulation of Heavy Metals in Edible Organs of Different Meat Products Available in the Markets of Lahore, Pakistan
Jamil N, Baqar M, Manzoor M, Abbas N, Qadir A, Ahsan N, et al. · Pakistan Journal of Scientific and Industrial Research Series B: Biological Sciences 58(2):92-97 · 2015 · doi.org/10.52763/pjsir.biol.sci.58.2.2015.92.97
PEER-REVIEWED

[26] Cadmium dietary exposure in the European population
European Food Safety Authority · EFSA Journal 2012;10(1):2551 · 2012 · doi.org/10.2903/j.efsa.2012.2551
GOVERNMENT

[27] Dietary exposure to inorganic arsenic in the European population
European Food Safety Authority (EFSA) · EFSA Journal 2014;12(3):3597 · 2014 · doi.org/10.2903/j.efsa.2014.3597
GOVERNMENT

[28] Characterizing the Exposome of Food Contamination and China Total Diet Study: Project for Improving Food Safety Risk Assessment in China
Iyu · China CDC Weekly · 2022 · doi.org/10.46234/ccdcw2022.039
PEER-REVIEWED

[29] Survey of metals and other elements in commercial infant foods, infant formula and non-infant specific foods
Food Standards Agency and Hallmark Meat Hygiene · Food Standards Agency report · 2014
GOVERNMENT

[30] The First Hong Kong Total Diet Study: Inorganic Arsenic
Centre for Food Safety FEHD HKSAR · Centre for Food Safety, Food and Environmental Hygiene Department, Government of the Hong Kong Special Administrative Region · 2012 · www.cfs.gov.hk
GOVERNMENT

STATUS AND LICENCE

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/meat#sources.

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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