

Antimony

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Abstract

Antimony is a metalloid whose trivalent compounds, including antimony trioxide, are IARC Group 2A. Limits exist for drinking water, toy migration, and cosmetic impurities, and they are not interchangeable.

This page draws on the ATSDR toxicological profile, IARC Monograph Volume 131, the WHO drinking-water fact sheet and background document, the OECD SIDS profile for diantimony trioxide, the OEHHA public health goal, the NTP inhalation bioassay and Report on Carcinogens monograph, and the regulatory texts transcribed below. Occurrence in infant articles is synthesized product by product at antimony-in-baby-products. Where a source examined for this page does not print a figure, the gap is named rather than filled.

1 | Overview

Antimony (Sb) is a metalloid, and the sources reviewed here treat its two oxidation states as toxicologically different. Trivalent antimony, Sb(III), includes antimony trioxide and antimony potassium tartrate. Pentavalent antimony, Sb(V), includes compounds used to treat leishmaniasis and the oxo-anion described as the form most likely to leach from antimony-bearing materials into drinking water. The World Health Organization chemical fact sheet, assessment date 2003, states that the form in drinking water is a key determinant of toxicity, that the antimony(V) oxo-anion is the less toxic form, and that the subchronic toxicity of antimony trioxide is lower than that of potassium antimony tartrate, the more soluble form.

The International Agency for Research on Cancer, announcing Monograph Volume 131 on 5 May 2023, classified trivalent antimony as probably carcinogenic to humans (Group 2A), on limited evidence for cancer in humans, sufficient evidence for cancer in experimental animals, and strong mechanistic evidence in human primary cells and in experimental systems. The same announcement classified pentavalent antimony as not classifiable as to its carcinogenicity to humans (Group 3), and stated that pentavalent antimony was evaluated for the first time. The Volume 131 general remarks, as posted on NCBI Bookshelf, record that antimony trioxide had previously been evaluated as possibly carcinogenic to humans (Group 2B) in 1989.

The 2023 classification is a classification of the trivalent class. Antimony trioxide is a trivalent compound, so it sits inside that class, but the announcement is not a sentence that names antimony trioxide alone, and this page does not read it as one.

Antimony is also not one of the eight elemental totals (lead, cadmium, total arsenic, total mercury, nickel, aluminium, total chromium, tin) that dominate food-contaminant panels. A measurement panel that stops at those eight does not report antimony.

2 | At a glance

Three points matter most for anyone trying to interpret an antimony result.

First, the form matters. Trivalent antimony, which includes antimony trioxide, is IARC Group 2A, and pentavalent antimony is Group 3. The animal cancer evidence behind the 2023 classification comes from inhalation of antimony trioxide, while oral carcinogenicity remains weakly quantified, so the classification cannot be read as an oral or dermal potency.

Second, the limits that exist answer different questions. A drinking-water maximum of 0.006 mg/L, a migration limit of 0.04 mg/kg from plastic into food, toy-migration limits in milligrams per kilogram of toy material, and cosmetic impurity guidance of 5 ppm are written on different bases, and none of them is a content limit for a baby wipe.

Third, the evidence on infant articles is a set of screens, not a dose. Surveys have found antimony in wipe components, polyester textiles, and PET plastics, but no study examined here measures how much antimony crosses infant skin from a wipe or a garment.

3 | Chemistry and forms

Elemental antimony and its compounds are not one analyte for hazard classification, and Volume 131 evaluated trivalent and pentavalent antimony separately. Section 4.1.2 of the antimony chapter nevertheless records interconversion between them. About 23.3 percent systemic conversion to trivalent antimony was observed after a single intramuscular dose of 5 mg/kg body weight in five healthy adults. In rhesus monkeys given repeated intramuscular injections, the plasma proportion of trivalent antimony rose from 5 percent on day 1 to 50 percent on day 9. The Working Group treated that interconversion as an evidence gap, not as a reason to collapse the two evaluations.

Antimony trioxide (Sb_2O_3) is the insoluble trivalent oxide that appears in the inhalation cancer studies and in the flame-retardant and plastics uses named by IARC. Antimony potassium tartrate is the soluble trivalent salt used in the oral studies behind the WHO tolerable daily intake and the ATSDR intermediate oral minimal risk level. The two compounds cannot be averaged into one dose. On the evidence available at its 2003 assessment, WHO states that antimony trioxide, because of low bioavailability, was genotoxic only in some in vitro tests and not in vivo, whereas soluble antimony(III) salts exerted genotoxic effects in vitro and in vivo.

4 | Toxicology

ATSDR's systematic review names the respiratory tract, heart, gastrointestinal tract, serum glucose, and the developing animal as the sensitive targets. The studies behind that list are predominantly of trivalent compounds,

especially antimony trioxide and antimony potassium tartrate. Parenteral therapeutic doses produce a different picture (electrocardiogram changes, vomiting, myalgia), and they are not consumer-product doses.

Acute oral toxicity in the profile is anchored by forestomach ulceration in mice given antimony potassium tartrate (NTP 1992). The acute oral minimal risk level is 1 mg Sb/kg/day, from a NOAEL of 99 mg Sb/kg/day and an uncertainty factor of 100. Intermediate-duration oral exposure uses decreased serum glucose in female rats given antimony potassium tartrate (Poon et al. 1998), and the published intermediate oral minimal risk level is 0.0006 mg Sb/kg/day, with an uncertainty factor of 100. Chronic oral data were inadequate for a minimal risk level, and no chronic oral MRL is stated.

The NOAEL behind the intermediate value needs one note. The profile footnote states it as 0.06 mg Sb/kg/day, and the UK Committee on Toxicity, in its 2024-2025 discussion of a drinking-water guidance value, reads the same ATSDR choice as 60 µg Sb/kg body weight per day. An extracted table cell in the profile text is ambiguous between 0.06 and 0.064 mg Sb/kg/day. This page uses 0.06 mg Sb/kg/day, the footnote and COT reading, and does not adopt 0.064 as a second value.

By inhalation, the acute minimal risk level is 0.001 mg Sb/m³, based on squamous metaplasia of the epiglottis in mice exposed to antimony trioxide (NTP 2016), and the intermediate-duration inhalation value is adopted from that acute value. The chronic inhalation minimal risk level is 0.0003 mg Sb/m³, based on chronic lung inflammation in female rats exposed to antimony trioxide (Newton et al. 1994). Occupational series summarized in the profile report cough, upper-airway inflammation, pneumoconiosis, and bronchitis in workers exposed to antimony oxides, often with co-exposure to arsenic, silica, or other metals. Those series do not describe general-population inhalation risk.

Cardiovascular effects appear in two forms. Electrocardiogram changes are a repeated finding after injected therapeutic antimony. The profile also summarizes observational associations between urinary antimony and high blood pressure in NHANES analyses, alongside associations for several other metals. Those urinary studies do not identify a product source, and they do not establish that antimony caused the blood-pressure difference.

The developing animal is one of ATSDR's named sensitive targets. Occupational reports of menstrual disturbance and lower infant weight gain are in the profile, and they are not isolated from co-exposures. No developmental study at a dose relevant to wipe or textile contact was examined for this page, so no infant-product developmental dose is stated.

Genotoxicity follows the valence split. On the WHO 2003 reading, antimony trioxide was genotoxic in some in vitro tests and not in vivo, while soluble antimony(III) salts were genotoxic in vitro and in vivo. IARC's 2023 Group 2A classification for trivalent antimony rests in part on strong mechanistic evidence in human primary cells, including DNA damage, chromosomal aberrations, micronuclei, and sister-chromatid exchange, as described in the Volume 131 general remarks. Pentavalent antimony was not given that classification.

Carcinogenicity classification

EVALUATION	AGENT AS NAMED	GROUP	WHAT THE DOCUMENT SAYS
IARC 1989, as recorded in the Volume 131 general remarks	Antimony trioxide	2B	Possibly carcinogenic to humans. Prior evaluation.

IARC Volume 131 (2023), evaluation section of the antimony chapter, and the 5 May 2023 announcement	Trivalent antimony	2A	Probably carcinogenic to humans. The monograph prints limited evidence in humans (lung cancer in three smelter cohorts, with arsenic confounding not ruled out), sufficient evidence in experimental animals for antimony(III) oxide, and strong mechanistic evidence in human primary cells.
IARC Volume 131 (2023), evaluation section of the antimony chapter	Pentavalent antimony	3	Not classifiable. Inadequate evidence in humans and in experimental animals, and limited mechanistic evidence.
NTP Report on Carcinogens Monograph 13 (October 2018)	Antimony trioxide	Reasonably anticipated to be a human carcinogen	The monograph recommends that listing on sufficient evidence in experimental animals and supporting mechanistic evidence. It states that the human studies are inadequate to evaluate cancer from Sb2O3 or from antimony in general.
U.S. EPA IRIS	Antimony	Not stated on this page	The IRIS chemical landing was not examined for this page. ATSDR 2019 states that EPA had not classified the carcinogenicity of antimony. That sentence predates any later IRIS revision.

The WHO fact sheet still records the 1989 Group 2B conclusion for antimony trioxide, and Group 3 for antimony trisulfide, because its assessment date is 2003. For trivalent antimony as a class, the 2023 Volume 131 classification supersedes that reading. Oral carcinogenicity remains weakly quantified: ATSDR notes no tumor increase in lifetime oral studies of antimony potassium tartrate in rats and mice, and WHO states that there are no data to indicate carcinogenicity by the oral route. The inhalation classification must not be rewritten as an oral cancer potency.

NTP Technical Report 590 (December 2017) is the 2-year inhalation bioassay behind that animal evidence. Under the conditions of those studies there was some evidence of carcinogenic activity in male Wistar Han rats (combined alveolar/bronchiolar adenoma or carcinoma of the lung, and benign pheochromocytoma of the adrenal medulla) and some evidence in female Wistar Han rats (alveolar/bronchiolar adenoma of the lung, and benign or malignant pheochromocytoma of the adrenal medulla).

There was clear evidence in male B6C3F1/N mice (alveolar/bronchiolar carcinoma of the lung) and clear evidence in female mice (alveolar/bronchiolar adenoma and carcinoma, and malignant lymphoma). In the same

report, alveolar/bronchiolar tumours from the rats carried Egfr mutations in 13 of 26 and a Kras mutation in 1 of 26. These are inhalation findings in rodents, not an oral potency and not a wipe dose.

5 | Typical exposure routes

The IARC Volume 131 announcement lists uses in flame retardants, lead-acid batteries, lead alloys, plastics, brake pads, clutch discs, glass and ceramics, and ammunition primers, and some pentavalent compounds are used to treat leishmaniasis. The U.S. Environmental Protection Agency's National Primary Drinking Water Regulations page lists discharge from petroleum refineries, fire retardants, ceramics, electronics, and solder as drinking-water sources of antimony. The WHO fact sheet adds that elemental antimony forms hard alloys with copper, lead, and tin, and that there is little evidence that replacing lead with antimony in solder contributes significantly to drinking-water concentrations.

Diet, drinking water, and bottled water are the oral routes, and they carry the regulatory numbers set out below. Inhalation is the route of the occupational lung findings and of the NTP inhalation bioassay summarized by ATSDR. Dust and brake wear are implied by the IARC use list (brake pads, clutch discs) and by occupational airborne exposure in the ATSDR profile, but no house-dust survey with an antimony concentration was examined for this page, so no dust concentration is stated.

Dermal contact is a plausible route for textiles, wipes, and diapers, and the evidence on it is indirect. ATSDR describes occupational dermatosis in workers exposed to airborne antimony that dissolved in sweat (Stevenson 1965), more often in heat. That is sweat acting on airborne dust, not a study of wipe lotion. The OECD SIDS Initial Assessment Profile for diantimony trioxide (SIAM 27, 14 to 16 October 2008) states that dermal absorption is considered negligible on the basis of an in vitro human-skin study that showed 0.26 percent absorption.

The California Office of Environmental Health Hazard Assessment, in its September 2016 public health goal for antimony in drinking water, names that study as Roper and Stupart 2006, an unpublished contract-laboratory report. It prints two results from six skin samples (one abdominal and five breast): 0.26 percent at 100 µg/cm² and 0.14 percent at 300 µg/cm² after 24 hours. The two agencies read the study differently. OECD prints only the 0.26 percent figure and calls the absorption negligible; OEHHA prints both doses and does not, in that paragraph, call the fraction negligible. The primary report is not in this corpus. Neither figure is an absorption fraction for trace antimony on infant skin, and neither comes from a wipe-lotion study.

PET-bottled water and polyester textiles are exposure hypotheses that fit the use pattern. The only bottled-water concentration examined here is the Romanian survey described under Occurrence, and it is not paired with a bottle-wall measurement. The Borca bottle-wall concentrations are totals in the plastic, not concentrations in the water.

Absorption, distribution, and excretion

The ATSDR Toxicological Profile for Antimony and Compounds (October 2019) describes gastrointestinal absorption as poor and form-dependent. Animal estimates for tartrate and trichloride are about 2 to 7 percent, and a dog study of a single gavage dose of pentavalent meglumine antimoniate estimated 10 percent bioavailability. The profile adopts the International Commission on Radiological Protection (1981) reference values for human gastrointestinal absorption: 10 percent for antimony tartrate and 1 percent for all other forms. Those are reference values for dose reconstruction, not measured absorption from a wipe or a meal.

Dermal absorption of a wipe residue or a textile residue has not been measured in the consumer studies examined here. ATSDR reads occluded application of antimony trioxide that killed rabbits as evidence that

at least some forms can cross skin (Myers et al. 1978). A repeated dermal study of antimony trioxide in an artificial-sweat paste also killed rabbits, but the application was not occluded, and ATSDR excluded it from the levels-of-significant-exposure table because the animals may have ingested the paste (Fleming 1938). The only numeric percutaneous fractions are the OECD and OEHA summaries of the unpublished Roper and Stupart 2006 in vitro study: 0.26 percent and, in OEHA only, 0.14 percent.

OECD also prints oral absorption of diantimony trioxide in rats of 0.3 percent at 100 mg/kg body weight and 0.05 percent at 1,000 mg/kg body weight, and states that 1 percent is assumed at relevant human exposure levels. Those trioxide figures are not the ATSDR and ICRP gastrointestinal values, and they are not averaged with them. OECD prints an oral LD50 above 20,000 mg/kg body weight in rats, a dermal LD50 above 8,300 mg/kg body weight in rabbits, and a 4-hour nose-only LC50 above 5.20 mg/L, and it treats acute toxicity by all three routes as low despite poor study quality for the oral and dermal tests.

Distribution is wide. The profile's chapter summary states that antimony is distributed throughout the body, with the highest concentrations in the lungs, gastrointestinal tract, red blood cells, liver, kidney, bone, spleen, and thyroid. Antimony is not metabolized in the sense of an organic metabolite, but the profile and the IARC remarks both record interconversion between pentavalent and trivalent forms. Excretion splits by valence: trivalent antimony is predominantly excreted in feces, with smaller amounts in urine, and pentavalent antimony is primarily excreted in urine. Parenteral half-lives from leishmaniasis treatment are not oral half-lives, and this page does not collapse them into one number.

6 | Occurrence in water, plastics, textiles, and children's products

Water

The WHO fact sheet, assessment date 2003, states concentrations in groundwater less than 0.001 µg/L, in surface water less than 0.2 µg/L, and in drinking water appearing to be less than 5 µg/L. It states that conventional treatment does not remove antimony, that antimony is not normally a raw-water contaminant, and that the most common drinking-water source appears to be dissolution from metal plumbing and fittings. Those are the fact sheet's own occurrence statements, not a new survey.

The 2003 background document prints a different range: groundwater and surface water normally from 0.1 to 0.2 µg/L, and drinking water appearing to be less than 5 µg/L. Because the two documents do not print the same groundwater figure, this page keeps both.

Ungureanu and colleagues 2022 measured antimony in 50 bottled waters from the Romanian market, from below 0.07 µg/L to a printed maximum of 0.64 ± 6.85 µg/L, with a detection limit for antimony of 0.07 µg/L. The printed uncertainty on the maximum is larger than the maximum itself, and this page preserves that figure as printed rather than correcting it. The result is a Romanian market measurement. It is not a U.S. benchmark, and it is not, by itself, a demonstration that the antimony came from the bottle wall.

PET bottles that are not identified as baby bottles do release antimony into water and beverages in the studies examined here, most clearly at elevated temperature. Carneado and colleagues 2015 found no migration into mineral water at 4 °C and 20 °C, a significant increase at 40 °C that stayed below the EU limit of 5.0 µg/L, and, at 60 °C, migration after 30 days that exceeded that limit, with both Sb(V) and Sb(III) detected. A short-term stress test in the same paper found day-0 totals of 0.3 to 0.7 µg/L and 2.6 to 4.2 µg/L after storage at 60 °C.

Allafi 2020, in commercial bottled water, found no significant change after three months at 25 °C and, after heating to 50 °C, 8.530 ppb at 24 hours and 16.8 ppb at 7 days.

Molae Aghaee and colleagues 2014 found bottled-water antimony still below a 6 ppb maximum contaminant level at room temperature, outdoors, and 40 °C, and above that level at 65 °C and 80 °C for longer storage. Mehdar 2025 (Water SA) prints bottled-water antimony from 0.02 to 2.14 µg/L across 25 to 60 °C over 200 days, with the maximum of 2.14 µg/L at 60 °C after 200 days, above a Japanese limit of 2.00 µg/L that the paper cites. The same abstract calls 0.844 µg/L a concentration in the PET material of one bottle; that unit does not match a weight percent, and it is not the 2.14 µg/L water result. None of these bottles is identified as a baby bottle.

Plastics and textiles

Catalyst residue from polyester and polyethylene terephthalate (PET) is the pathway named for baby wipes on baby-wipes, and total antimony in screened components was measured by Washington Ecology Publication 14-04-014. Borca, Huthwelker, and Filella 2025 (Journal of Environmental Sciences 153:109-117, DOI 10.1016/j.jes.2024.02.006) examined what form that antimony takes. They measured six PET bottles by portable X-ray fluorescence at 351, 331, 361, 322, 370, and 370 mg/kg, and identified the antimony as organically bound, consistent with antimony glycolate or antimony acetate. The same spectra exclude a significant amount of antimony trioxide nanoparticles in those bottles, within the detection limits of the method. The methods paragraph says five PET bottles and the table prints six; this page follows the table.

Three polyester textiles in the same study measured 286, 471, and 452 mg/kg. One textile spectrum resembled senarmontite (an antimony trioxide), and the other two could not be fitted reliably. Electrical objects in the paper were senarmontite at 55,835, 27,812, and 33,122 mg/kg, plus a ring at 28,193 mg/kg. Bromine was measured in the three electrical objects (84,075, 48,712, and 71,949 mg/kg) and not in the ring, and the bromine-bearing objects match a halogenated flame-retardant synergist rather than a catalyst residue. These are consumer plastics and textiles, not samples identified as baby bottles or infant sleepwear.

Biver, Turner, and Filella 2021 (Regulatory Toxicology and Pharmacology 119:104824, DOI 10.1016/j.yrtph.2020.104824) measured both content and release on six polyester textiles bought in the European Union. Portable X-ray fluorescence totals were 125, 185, 286, 357, 452, and 471 µg/g, which the abstract rounds to about 125 to 470 µg/g. Artificial-sweat extraction by ISO 105-E04, three sequential 24-hour extractions at 37 °C, gave 2.572 ± 0.031 , 0.904 ± 0.121 , 0.480 ± 0.126 , 2.477 ± 0.093 , 0.402 ± 0.128 , and 0.689 ± 0.154 µg/g for those six fabrics, in the same order as the totals.

The abstract summarizes default-parameter mobilization as about 0.05 to 2 percent of total antimony, or 0.1 to 1 µg/g. Two of the table extracts, 2.572 and 2.477 µg/g, sit above that 1 µg/g summary, and this page keeps the table. The result is release into a simulant. It is not a dermal absorption fraction, and the samples are not identified as infant sleepwear.

The paper states that the EU Ecolabel for textile products should not exceed 260 µg/g antimony in polyester fibres, tested on raw fibre before wet processing, with a derogation for polyester from recycled PET bottles, and that the OEKO-TEX STANDARD 100 label requires extractable antimony below 30 µg/g for clothing textiles. Those sentences are Biver's citations of the 2014 Ecolabel decision and the 2020 label; neither instrument's own text is relied on in this paragraph.

Washington Ecology Publication 15-03-039 (November 2015) tested children's clothing, footwear, and accessories. Of 50 component samples analysed for metals, antimony was detected in 72 percent, more often

than any other analyte in that panel, mainly in fabric and plastisol prints. Concentrations ranged from below 1 to 2,500 ppm, with a median of 5.9 ppm across sample types and a median of 126 ppm in fabric alone.

The report states that 50 to 300 ppm was typical of polyester clothing and is the range expected from antimony trioxide used as a polyester catalyst. The highest result, 2,500 ppm, was a pair of children's pajamas labeled flame resistant, with an X-ray fluorescence bromine reading of 4.6 percent. That is one component in a clothing screen, not a study designed around polyester sleepwear as a class.

A Greenpeace Research Laboratories technical report (06/2013; Brigden and colleagues, December 2013) quantified antimony in 36 articles that contained polyester or a polyester blend, and detected it in all 36. The executive summary prints 14 to 293 mg/kg of fabric, median 96 mg/kg.

The results text then gives the fabric-blend concentrations as 14 to 293 mg/kg of polyester, median 96 mg/kg, and the polyester fraction of each fabric as also 14 to 293 mg/kg, with a higher median of 120 mg/kg. A summary row in the same report prints a median of 120. This page keeps both medians and does not choose one. Brand names in the article table are not repeated. The articles are clothing and footwear bought for that survey, not items identified as infant sleepwear.

Children's products

Washington Ecology Publication 14-04-014 (revised June 2021) is a screening survey, not a random sample of the market: components were prioritized by XRF and then analysed by ICP-MS. In that design, baby-wipe components measured 70.6, 61.3, and 40.6 ppm antimony, and moist baby-wipes packaging measured 95.8 ppm. Baby bibs measured 116 and 99.6 ppm, two clothing samples (jeans) measured 121 and 128 ppm, and two toy components measured 168 and 94 ppm. The agency reported antimony detected in 57 percent of 150 children's-product components.

The same rows that print antimony in the tens of ppm often print other metals at the reporting floor, and a printed zero without a detection limit is not treated here as a formal non-detect. The study supports the Children's Safe Products Act reporting threshold of 100 ppm for chemicals of high concern to children. That threshold is a reporting trigger, not a health-based limit.

Choi, Song, and Kim 2016 (Journal of the Korean Oil Chemists' Society 33(1):195-203, DOI 10.12925/jkocs.2016.33.1.195) is a nine-page paper. The methods print: "Approximately 0.2 g of sample was added into a PTFE vessel containing 7 mL of 70% HNO₃ and 1 mL of 50% HF," and the digest was then "transferred and diluted with 25 mL of ASTM type 1 water." That sentence is dilution with 25 mL. It is not a statement that the flask was brought to 25 mL, and it does not state a final volume after the 8 mL of acid. The sample mass is printed as approximate. Table 5 reports the digest in µg/L, and antimony was detected in 12 of 24 wet-wipe nonwovens, from 187.86 ± 5.24 to 19,558.35 ± 3,537.3 µg/L. The highest result is the infant sheet labeled rayon alone. Several sheets labeled rayon plus polyester or rayon plus PET had no detected antimony.

The authors do not print a sheet concentration. If the final volume is treated as 25 mL and the mass as 0.200 g, mg/kg is approximately (µg/L × 0.025 L / 0.0002 kg) / 1,000, which is µg/L × 0.125, and the two ends are about 23.48 and 2,444.79 mg/kg. The quotient of micrograms per litre, times litres, divided by kilograms, is micrograms per kilogram, and one milligram is 1,000 micrograms. If the 8 mL of acid remains and the 25 mL of water is added to it, the volume is 33 mL, the factor is 0.165, and the high end is about 3,227.13 mg/kg. Neither figure is printed. The source page keeps both readings beside the twelve printed means and does not use either as the paper's result. Sample codes are not repeated here.

Mask packs are Table 6, not baby wipes. The source page records one pack at $8,895.28 \pm 42.86 \mu\text{g/L}$ in the nonwoven and $38.95 \pm 1.86 \mu\text{g/L}$ in the liquid, and states that the authors did not publish that split for the wet wipes. Other mask-pack antimony figures are not carried here, because that source page does not adopt them. The authors attribute a high antimony result to antimony trioxide or antimony glycolate used as a polyester catalyst. That is their inference, and the rayon-labeled maximum means it is not a rule for these sheets. Borca's later X-ray absorption work found organic antimony rather than antimony trioxide in PET bottles, so the catalyst inference and the oxide inference are not the same claim.

A 2025 master's thesis from Istanbul University-Cerrahpaşa (English abstract in the PDF) reports solution antimony of 695.40 ppb in one product, which the English abstract rounds to 695.4 ppb, and fiber antimony printed as 565.46 ppb and 537.86 ppb, with a further sentence and section 4.1 printing 476.69 ppb for fiber. All three fiber figures are in the thesis, and 476.69 is lower than the other two. Packaging antimony is printed at 0.03 and 0.04 ppb, at or below the quantification limit of 0.10 ppb. The antimony results of several hundred ppb sit above the stated calibration top of 50 ppb. The methods print an approximate sample mass of 0.2 g and the addition of 10 mL of water after digestion, but no made-up final volume, so no milligrams-per-kilogram conversion is made and the unit stays the ppb of the measured solution. Brand names in that thesis are not repeated.

A monitoring page dated 2 April 2026 from the China Association for Quality Promotion of Consumer Products Safety (<https://cpqs.org.cn/archives/3229>) reports total antimony detected in 20 of 21 baby wet wipes bought online, and not detected in one. The sample-by-sample annex is an image. Preferred reads of total antimony, taken as micrograms per liter, are numeric in 20 of 21 columns. The stable low read is $15.02 \mu\text{g/L}$ and the stable high preferred read is $450.45 \mu\text{g/L}$. The source page's preferred read for one wrapped cell is $383.7 \mu\text{g/L}$, with the last digit low confidence. A second full-cell pass of the same image also produced $490.40 \mu\text{g/L}$ where the preferred read is 450.45, and $399.43 \mu\text{g/L}$ where the preferred read is 355.43. Several other wrapped cells have a less certain second digit. The preparation is not described, and the unit is not converted here to milligrams per kilogram of sheet. The narrative names products; this page does not. The document is an association monitoring report, not a peer-reviewed paper.

Toy data are sparse. Turner 2018 measured second-hand plastic toys in the United Kingdom, and under EN 71-3 conditions migratable antimony exceeded $100 \mu\text{g/g}$ in at least one component; the metals the paper reports as exceeding the EU migration limits, in the cases it names, are cadmium or lead, not antimony. Kawamura and colleagues 2006 found antimony in one of 45 baby toys and 10 paints, at 5.3 mg/kg . The Danish Environmental Protection Agency's 2005 survey of 15 surface-treated wooden toys found antimony below a 6 mg/kg detection limit in every EN 71-3 extract.

Karaś and Frankowski 2018 print mean antimony after acid mineralisation in the hundreds to thousands of ng/g for several colour groups (green $3,806 \pm 981.9 \text{ ng/g}$, black $2,838 \pm 846.9 \text{ ng/g}$) and state that the highest mineralisation antimony was in metallic and blue samples. The blue mean in that table is $218.4 \pm 422.2 \text{ ng/g}$, and the metallic row is printed in mg/g (antimony 0.004 ± 0.04). This page does not reconcile that prose with that table.

Nyamukamba and colleagues 2023 measured extractable metals in 20 disposable diapers bought in Cape Town, using artificial sweat and artificial urine, and antimony was not an analyte. The panel was lead, copper, arsenic, zinc, cobalt, nickel, chromium, cadmium, manganese, and selenium. Nickel exceeded the 0.1 mg/kg Oeko-Tex value stated by the authors in one sweat extract (0.197 mg/kg) and one urine extract (about 0.224 mg/kg). The paper's prose gives a sweat lead range of 0.002 to 0.019 mg/kg , while Table 4 in the same HTML lists a lead

maximum of 0.094 mg/kg, and this page does not adopt a lead range from that conflict. The diaper finding is that a sweat-and-urine extractable panel built around other metals can miss antimony entirely.

7 | Regulatory limits

The instruments below limit different quantities. A drinking-water concentration, a specific migration limit into food, a toy-migration limit in milligrams per kilogram of toy material, and a cosmetic impurity guidance value are different bases, and none of them is a baby-wipe content limit. Limits are copied from the instruments themselves or from the wiki regulation pages that transcribe them.

Reference values

These values answer different questions, and they are not a range to average.

The WHO tolerable daily intake is 6 µg/kg body weight. It rests on a NOAEL of 6.0 mg/kg body weight per day for decreased body-weight gain and reduced food and water intake in a 90-day rat drinking-water study of potassium antimony tartrate, with an uncertainty factor of 1000 (100 for interspecies and intraspecies variation, and 10 for the short duration). The drinking-water guideline of 0.02 mg/L (20 µg/L, a rounded figure) allocates 10 percent of that TDI to a 60 kg adult drinking 2 litres per day.

The background document WHO/SDE/WSH/03.04/74 prints that derivation and states that the value could be highly conservative, because of the end-points and the size of the uncertainty factor. The same document prints an oral LD50 for antimony trioxide above 20,000 mg/kg, which it attributes to extremely low water solubility, and gastrointestinal absorption of 5 to 20 percent in animals and 5 percent in four people after involuntary acute intoxication with antimony potassium tartrate. Those absorption figures are the background document's; they are not the ATSDR and ICRP figures above, and they are not averaged with them. Assessment date 2003.

The ATSDR intermediate oral minimal risk level is 0.0006 mg Sb/kg/day, two orders of magnitude below the WHO TDI, because ATSDR and WHO chose different NOAELs from the same Poon et al. 1998 study. The UK Committee on Toxicity, in October 2024, agreed with the WHO and Lynch et al. 1999 reading of a NOAEL of 6,000 µg Sb/kg body weight per day, and recorded that Health Canada and ATSDR had selected 60 µg Sb/kg body weight per day. COT had previously used the WHO TDI of 6 µg/kg body weight per day when it reviewed the 2006 UK Total Diet Study and the 2014 infant-food survey. This page does not average the two NOAELs.

RIVM's 2012 letter report on environmental risk limits states that EFSA (2004) adopted the WHO TDI of 6 µg antimony/kg body weight per day for antimony trioxide in food-contact materials. The EFSA opinion itself was not examined for this page, so the adoption is reported as RIVM's statement.

OEHHA's September 2016 public health goal replaces the agency's 1997 goal of 20 ppb with a goal of 1 ppb, rounded from a calculated 1.1 µg/L. The point of departure is a BMDL10 of 0.14 mg/kg-day for liver nuclear anisokaryosis in male rats in the Poon et al. 1998 drinking-water study of antimony potassium tartrate.

OEHHA applies an uncertainty factor of 1,000 (10 for interspecies extrapolation, 30 for human variation, and the square root of 10 for subchronic-to-lifetime extrapolation), keeps a relative source contribution of 0.40, and uses a lifetime-average drinking-water intake of 0.053 L/kg-day. The 1997 goal had used a different uncertainty factor, 300, on a LOAEL of 0.43 mg/kg-day from Schroeder et al. 1970. The 1 ppb figure is a California drinking-water goal, not a wipe limit, and the Poon study itself was not re-examined for this page.

Kowalczyk and colleagues 2022, an EFSA Journal EU-FORA report on elements in teas (EFSA Journal 20(S1):e200410, DOI 10.2903/j.efsa.2022.e200410), restate the WHO tolerable daily intake of 6 µg/kg body

weight and state that the highest antimony intake they evaluated from tea was 0.03 percent of that TDI. The PDF renders the microgram symbol poorly in that sentence. The number is the WHO TDI already on this page, not a new reference value, and the paper is not the 2004 EFSA food-contact opinion. No tea concentration in micrograms per kilogram is printed in its main text.

Wang and colleagues 2026 (Journal of the Endocrine Society 10(4):bvag011, DOI 10.1210/jendso/bvag011) state that most food-contact migration studies they reviewed fell below the WHO drinking-water figure, which they write as 20 ppb and also as 0.02 mg/kg, and below the EU specific migration limit, which they write as 40 ppb and also as 0.04 mg/kg. Those parentheticals equate a water concentration with a food mass fraction. This page keeps each instrument in its own units: 20 µg/L in water, and 0.04 mg/kg migrating into food. Wang states that leaching below 2.5 µg/L is what many bottle studies report under ordinary storage, and that acidity, heat, and time can push results above 5 µg/L.

Wang also states that the U.S. EPA recommends less than 0.35 µg Sb/kg body weight per day for oral exposure. The IRIS chemical file was not examined for this page, so that sentence is recorded as Wang's citation and is not adopted here as an oral reference dose, and no RfD is printed. The National Primary Drinking Water Regulations page sets the maximum contaminant level goal and the maximum contaminant level for antimony at 0.006 mg/L, and lists increase in blood cholesterol and decrease in blood sugar as the long-term health effects above the MCL. No chronic oral minimal risk level exists in the 2019 ATSDR profile.

Government limits

The rows in this table are transcribed from the official texts. Each value is the figure printed in that text, with the unit, basis, and scope printed beside it. A drinking-water maximum, a voluntary label criterion, a toy migration limit, and a diaper migration limit are different bases, and they are not averaged.

INSTRUMENT	VALUE AS PRINTED	UNIT	BASIS	SCOPE
40 CFR 141.62(b)(11), 1 July 2025 edition	0.006	mg/l	MCL, column headed MCL (mg/l)	Drinking water from public water systems. BAT identifiers printed beside antimony are 2 and 7.
40 CFR 141.51(b)	0.006	mg/l	MCLG, column headed MCLG (mg/l)	Non-enforceable drinking-water goal. The line sits on the page whose running head is section 141.52 because the table continues.
EPA NPDWR web table, last updated 31 August 2026	0.006 and 0.006	mg/L	MCLG, and MCL or TT	Drinking water. This print is the agency web table. Its health-effects cell is filled. It is not the archived fact sheet.

EPA archived consumer fact sheet	6 and 6	ppb	MCLG and MCL	Drinking water. The long-term health paragraph is an unfilled template and is not quoted.
Decision (EU) 2023/1809 of 14 September 2023, Table 9	< 30	mg/kg	Content in the final product, not migration	Absorbent hygiene products, voluntary EU Ecolabel. The listed chemicals shall not be present in the final product above the table. Criteria valid until 31 December 2029.
Directive (EU) 2020/2184, Annex I, Part B	10	µg/l	Parametric value	Water intended for human consumption. Annex III prints measurement uncertainty of 40 percent of the parametric value.
Directive 2009/48/EC, original Official Journal, Annex II, Part III, point 13	45; 11,3; 560	mg/kg	Migration	Dry, brittle, powder-like or pliable toy material; liquid or sticky toy material; scraped-off toy material. The comma in 11,3 is the printed decimal mark, read in English as 11.3.
Same directive, consolidated 29 August 2026	45; 11,3; 560	mg/kg	Migration. The antimony line is flagged as original text (B), not as an amendment.	Same three materials. A text extraction of the consolidated PDF inserts a space inside 45. The original Official Journal and Regulation (EU) 2025/2509 both print 45. The consolidation is a documentation tool and has no legal effect. The directive is repealed with effect from 1 August 2030.

Regulation (EU) 2025/2509, Annex II, Appendix, Part A, point 1	45; 11,3; 560	mg/kg	Migration from toys, components of toys, or micro-structurally distinct parts of toys	Same three materials. The regulation applies from 1 August 2030. Articles 28 to 44 and Articles 49 to 55 apply from 1 January 2026.
Korea MFDS Notice 2026-23, children's diapers	60(~~1~~ 60 or less)	mg/kg	Migration of the topsheet and of the backsheet, each	Children's diapers and children's hygiene mats only. Footnote: synthetic resin and paper only. Enacted as Notice 2018-19 on 21 March 2018. The cover prints 2026. 3. 4. The history line prints 2026.03.24.
Same notice, other articles	60(~~1~~ 60 or less)	mg/kg	Migration	Children's disposable cotton swabs; toothbrushes; dental floss, on the part that can contact the mouth or on the floss; tongue cleaners, on oral-contact parts excluding the handle.
Same notice, tattoo dyes, section 21	2 t(~~1~~ 2 or less)	mg/kg	Content of a restricted element	Tattoo dye. This row is not the diaper migration limit.
Decision 2014/350/EU, criterion 7(a)	260	ppm	Total antimony in polyester fibres, measured on raw fibres before wet processing	Voluntary EU Ecolabel. Fibres manufactured from recycled PET bottles are derogated.
Same decision, Appendix 1 (iv)	30,0 and 30,0	mg/kg	Extractable metals, acid sweat, EN ISO 105-E04-2013, ICP-MS or ICP-OES	Products for babies and children under 3 years old, and, as a separate list, all other products including interior textiles. The comma in 30,0 is the printed decimal mark, read in English as 30.0. Antimony is the same figure on both lists.

Same decision, antimony trioxide back-coating derogation	0,50	mg/m3	Eight-hour workplace air value	Interior textiles where antimony trioxide is used as a flame-retardant synergist. Not extractable antimony in the fabric.
Same decision, consolidated 6 January 2026	260; 30,0; 30,0	ppm; mg/kg; mg/kg	The same fibre-content and acid-sweat bases as the original decision	Criteria valid until 31 December 2028. The consolidation is a documentation tool and has no legal effect.
Korea KATS Notice 2022-0220, section 3.1.1	60 mg/kg (60 mg/kg or less)	mg/kg	Migration, tested by KS G ISO 8124-3	Products made to be put in the mouth, or products for children under 36 months, limited to painted surfaces including coatings, synthetic resin, and paper. The PDF is a conversion from HWP, not a PDF issued by KATS. The remark that excludes textile fabric is printed on the total lead and cadmium content table, not on this migration row.
KATS Annex 1, infant textiles, in force 7 March 2024, Table 2	none printed	none	none	No antimony row. This annex sets no antimony limit for infant textile fabric.
Japan Cabinet Order No. 334 of 1974	none printed	none	none	The designated harmful-substance list does not name antimony. This order sets no antimony limit for household products.

No US federal limit exists for antimony in diapers or in textiles. The federal texts examined here, 40 CFR 141.51, 40 CFR 141.62, the NPDWR table, and the archived consumer fact sheet, regulate drinking water.

China GB 31701 and GB 18401 were not obtained, so no antimony value from those standards is recorded. GB/T 18885 and FZ/T 73025 were not obtained either, and no value from them is recorded.

Other instruments transcribed in this corpus

The table below indexes further instruments transcribed on the wiki's regulation pages. Where both tables print a figure, the figure in the government-limits table above is the one read from the official text.

INSTRUMENT	WHAT IT LIMITS	VALUE	BASIS
U.S. EPA NPDWR, confirmed on the EPA regulations page	Drinking water	0.006 mg/L MCL and MCLG	Water, as consumed
FDA 21 CFR 165.110	Bottled water	0.006 mg/L	Bottled water
WHO Guidelines for drinking-water quality, and the chemical fact sheet	Drinking water	0.02 mg/L (20 µg/L)	Guideline, 2003 derivation
EU 2020/2184	Water intended for human consumption	10 µg/L	Parametric value
Health Canada GDWQ summary, 2025	Drinking water	0.006 mg/L	Drinking water
Australia NHMRC ADWG	Drinking water	0.003 mg/L	Drinking water
EU 10/2011 Annex II	Plastic food-contact migration	0.04 mg/kg	Specific migration into food
Council of Europe CM/Res(2013)9	Metals and alloys in food contact	0.04 mg/kg	Specific release limit. A comparator resolution, not EU law.
Japan MHLW Notice No. 370	Metal used to make or repair food-contact parts	5 percent by weight	Composition of the metal, not migration and not a food limit
EU Toy Safety Directive 2009/48/EC, EN 71-3	Soluble migration from toy material in 0.07 M HCl	45 / 11.3 / 560 mg/kg	Category I (dry, brittle, powder-like, or pliable) / Category II (liquid or sticky) / Category III (scraped-off)
ASTM F963	Soluble migrated antimony	60 mg/kg	Toy material, U.S. mandatory toy standard under CPSIA
Health Canada cosmetic impurity guidance	Finished cosmetic products	5 ppm (5 mg/kg)	Administrative guidance, not a regulation. The guidance does not name wipes.
Germany BVL 2017	Cosmetic products in general, and toothpaste	0.5 mg/kg	Orientation value for technically avoidable content. Not a statute.
Korea MFDS cosmetic trace allowance	Marketed cosmetic products	10 µg/g	Unintentional trace. A later notice records the same 10 µg/g figure.

EU 1223/2009	Antimony and its compounds as cosmetic ingredients	Prohibited (Annex II, entry 40)	Article 17 allows technically unavoidable traces under good manufacturing practice and product safety, and sets no ppm.
OEKO-TEX 2024 notice in this corpus	Textile-mill wastewater under STeP	100 µg/L	Effluent, not extractable antimony in a finished garment or wipe

The corpus OEKO-TEX page does not record an extractable antimony limit for STANDARD 100. The 30 µg/g STANDARD 100 figure appears on this page only as Biver's citation, under Plastics and textiles, and the label's own text was not examined, so it is not entered in this table. The cosmetic ingredient prohibition is EU Regulation 1223/2009.

8 | Testing

Total antimony by ICP-MS after acid digestion, as in the Washington confirmatory analyses, reports elemental antimony and does not distinguish Sb(III) from Sb(V). EN 71-3 and ASTM F963 report soluble or migrated antimony under acid conditions, in mg/kg of material, which is not a total-content ppm. Artificial-sweat and artificial-urine extractions, as in the diaper study and in Biver 2021, are a third basis, and cosmetic guidance values are finished-product impurity concentrations. A single number cannot be moved across those methods.

Speciation is the missing layer in most of this work. Borca 2025 is the speciation measurement examined here, finding organic antimony in PET bottles, senarmontite in flame-retardant electrical objects, and an unresolved mix in polyester textiles. The wipe and clothing screens cited above did not speciate.

9 | Microbiome context

No study examined here measured the skin microbiome of the diaper area under antimony exposure, so that cell is unknown. The strength of each line of evidence below is stated with it.

Microbial handling of Sb(III) shares hardware with arsenic. Li and colleagues 2017, in Scientific Reports 7:43225 (doi.org/10.1038/srep43225), studied *Agrobacterium tumefaciens* GW4 in vitro. The paper states that the glycerol facilitator GlpF and its homolog Fps1p take up Sb(III) because Sb(OH)3 resembles glycerol, and that the arsenite efflux pumps ArsB and Acr3 can also efflux Sb(III). A cytoplasmic Sb(III) oxidase, AnoA, a short-chain dehydrogenase, and the periplasmic arsenite oxidase AioAB both oxidize Sb(III) to the less toxic Sb(V).

Knockout of anoA decreased Sb(III) oxidation efficiency by about 30 percent. Deletion of aioA did not decrease log-phase oxidation in GW4 and slightly increased it later, although the paper notes that aioA deletion decreased oxidation in a different strain (5A). At 50 µM Sb(III), growth was unaffected; at 100 and 200 µM, katA, anoA, and aioA were required for resistance. Cellular hydrogen peroxide also oxidizes Sb(III) abiotically (R2 0.93 in vivo and 0.94 in vitro in the experiments reported). The paper states that genes and enzymes for microbial Sb(V) reduction and Sb(III) methylation had not been identified, although the phenomena were described as environmentally widespread, and this page does not name a methylation gene. This is in vitro evidence.

In the animal gut, Wu and colleagues 2025 (International Journal of Molecular Sciences 26(7):3332, DOI 10.3390/ijms26073332) gavaged male C57BL/6 mice, about 20 g and six weeks old, n = 7 per group, every two days for six weeks. The groups were control, antimony at 10 mg/kg as potassium antimony tartrate, copper

at 100 mg/kg, and both, so an antimony-only group exists. Alpha-diversity (ACE and richness) was elevated in the antimony group in the results, while the discussion says paired comparisons of alpha-diversity were not significant. Both sentences are in the paper, and this page does not resolve them. Beta-diversity differed across groups ($p = 0.001$).

Hepatic taurine-beta-muricholic acid was elevated 1.5-fold in the antimony group, and serum total bile acids 1.6-fold. The 1.8-fold serum T-beta-MCA increase is stated for the copper and combined groups, not as an antimony-only serum result. *Lactobacillus* spp. were reduced 2.6-fold in the wording "antimony- and/or copper-treated groups," so the fold is not attributed to antimony alone. Liver inflammation on histology was present in all three treated groups and more pronounced when both metals were given. The 10 mg/kg dose is orders of magnitude above dietary or wipe exposure. This is animal evidence at a high dose, not in an infant and not from a wipe.

An Ecotoxicology and Environmental Safety abstract in adult zebrafish (0, 30, 300, and 3000 $\mu\text{g/L}$ for 14 days) reports intestinal-barrier injury and a microbiota shift at 300 $\mu\text{g/L}$ (*Cetobacterium* down, *Vibrio* up), and says 30 $\mu\text{g/L}$ was enough to perturb microbiota and metabolites. The full text was not checked line by line. This is fish evidence from an abstract only, not a human infant.

Deng and colleagues 2021 (Frontiers in Microbiology 12:738596, DOI 10.3389/fmicb.2021.738596) review Sb(III)-oxidizing bacteria. They cite a disruption of *aioA* that decreased Sb(III) oxidation by 25 percent in one strain, and they describe *AnoA* as a distinct Sb(III) oxidase. On methylation, the review names monomethyl, dimethyl, and trimethyl antimony as the products reported in fungi, archaea, and bacteria, and it says arsenic methylase and S-methionine methyltransferase have been reported to take part in Sb(III) methylation. The same section states that the genes or enzymes required for antimony methylation are still unknown. This is a review of microbial studies, not a new experiment, and not a human gut.

Later and earlier enzyme papers narrow that statement without closing it. Bentley and Chasteen 2002 review microbial methylation of arsenic, antimony, and bismuth. Thomas and colleagues 2011 showed that *Methanosarcina mazei* methylates antimony in vivo, and that purified methyltransferase *MtaA*, with *cob(I)*alamin, methylates antimony in vitro among several metalloids; that is in vitro work and one archaeon, not a human gut. Kambara, Yamamura, and Amachi 2024 identified a DMSO-reductase-family protein, *AnrA*, as a dissimilatory antimonate reductase in *Geobacter* sp. SVR, one environmental bacterium rather than a gut commensal.

Shi and colleagues 2018 identified the efflux transporter *ArsK* as conferring resistance to antimonite as well as to arsenite and two methylated arsenicals, by heterologous expression in vitro. Zhang and colleagues 2022 report that the flavin monooxygenase *ArsV* oxidizes antimonite as well as methylarsenite, in vitro, in a soil bacterium and a hypersensitive *E. coli* strain. Terry and colleagues 2015 isolated two mine-sediment bacteria that oxidize Sb(III) with oxygen or nitrate and that also carry an *aioA* homolog, and Wang and colleagues 2025 demonstrated hydrogen oxidation coupled to antimonate reduction in mine tailings and river sediment; both are environmental isolates, not an infant microbiome. None of these papers measures antimony on a wipe or in formula.

At the level of enzyme structure, Engrola and colleagues 2023 (Journal of Biological Chemistry 299(8):105036, DOI 10.1016/j.jbc.2023.105036) report four crystal structures of arsenite oxidase bound to arsenic or antimony oxyanions, and state that Sb(III) salts are oxidized about 6,500 times more slowly than the corresponding As(III) salt. This in vitro enzymology shows a shared active site. It does not show an effect on a microbiome.

In the human gut, Yan and colleagues 2025 measured 26 metals in serum from 342 infants at Hunan Children's Hospital, drawn from an initial 459, mean gestational age 34.71 ± 3.36 weeks. The abstract and the Chao1 results text say antimony was negatively associated with the Chao1 index, along with chromium, tungsten, cobalt,

copper, lanthanum, praseodymium, and uranium. No single-metal beta for antimony versus Chao1 is printed in the main text, so none is stated. Bayesian kernel machine regression identified antimony, copper, arsenic, and uranium as contributors to the mixture association with Chao1, each with a posterior inclusion probability above 0.7, while the discussion names arsenic and copper as the most influential metals for alpha diversity.

Printed interaction terms that include antimony are Sb-Pr, beta 2.17 (95 percent confidence interval 0.77 to 3.58), and Sb-U, beta 2.14 (0.78 to 3.50). The figure caption assigns full term N = 95, preterm N = 191, and very preterm N = 56, but one results sentence assigns N = 191 to very preterm infants and the next assigns N = 56 to very preterm infants. This page follows the figure caption and records that sentence as inconsistent.

Antimony's maintained Chao1 association is the one the paper ties to the N = 56 stratum, and in very preterm infants the paper also reports genus-level associations with tin and antimony, without naming the genera in the main text. This is observational human evidence from a hospital sample weighted toward preterm birth, measured in serum rather than as a product dose, and not on skin.

In the mouth, Davis and colleagues 2020 measured 21 metals in saliva from 61 children and adults. After multiple-testing adjustment, bacterial taxa were associated with antimony, arsenic, and mercury, and antimony was associated with decayed teeth. No salivary concentration is extracted on the source page, so none is stated. This is observational human evidence from the oral cavity.

On skin, Zeldin and colleagues 2023 (Environmental Science & Technology Letters 10(5):452-457, DOI 10.1021/acs.estlett.3c00142; author manuscript PMC10485844) reanalyzed U.S. postal-code atopic dermatitis billing against EPA pollutant inventories in a region of low diisocyanate exposure, and identified antimony compounds as the top associated pollutant there. The printed correlation with pediatric atopic dermatitis visits was 0.84 in Montana, Idaho, Wyoming, and the Dakotas, and -0.014 in the remaining states. In vitro, antimony inhibited ceramide-family lipids in the skin commensal *Roseomonas mucosa* and induced calcium flux in human Schwann cells that was blocked by the TRPA1 antagonist HC030031. The manuscript does not print an antimony concentration for those assays.

The methods, in the author manuscript and in the PMC HTML, name ICD-10 code L40.9 as the billing code. That code is psoriasis, unspecified, while the title and discussion treat the outcome as atopic dermatitis, and this page does not resolve the conflict. The authors state that the work lacks mouse models and direct human challenge. The evidence is an ecological association plus in vitro bacterium and neuron assays. It is not a diaper-area cohort, and it is not a measurement of antimony on infant skin.

Whether microbial oxidation of Sb(III) to Sb(V) lowers toxicity to the host is a mechanistic inference from the in vitro chemistry. No document examined here shows it in an infant gut or on infant skin.

10 | Vulnerable populations

Infants meet antimony, where they meet it, through water used to prepare feeds, through polyester and PET articles against the skin or in the mouth, and through any antimony in the diet. No infant-formula concentration has been extracted from a source page. Source records that list antimony among the analytes in infant food, including the 2003 COT statement on a UK infant-food survey, are indexed on this page and are not quoted as a parts-per-billion result.

Body weight makes the same ingested mass a larger dose in an infant than in a 60 kg adult, which is why the WHO guideline derivation (60 kg, 2 L/day, 10 percent of TDI) does not describe an infant. This page does not rescale the TDI or the MRLs onto an infant body weight, and no dermal dose from a wipe was calculated. The

0.26 percent figure is OECD's summary of an unpublished in vitro study on diantimony trioxide, not a wipe-lotion measurement, and no wipe-lotion migration result was examined here.

Infant formula itself was not analysed for antimony in any document examined here, and the infant data that exist are urinary. Pikounis and colleagues 2024 measured antimony in urine from infants of about 6 weeks and did not use it as an exposure biomarker, because few published studies assess general-population antimony exposure in urine. Du and colleagues 2025, in 56 infants with reflux or dysphagia, print urinary antimony medians of 0.2 µg/L in the control group, 0.15 µg/L in an added-rice formula group, and 0.68 µg/L in an oatmeal or rice-cereal thickener group (Table 2, $p = 0.022$).

The same paper's prose on urinary arsenic (1.78, 0.96, and 0.76 µg/L) does not match Table 2 (0.74, 0.96, and 1.78 µg/L), and this page follows Table 2 for antimony. Those are urine concentrations, not antimony in the formula or in the water used to mix it. The brand name in that table is not repeated.

11 | Open questions

The first open question is dermal absorption. There is no accessible primary dermal absorption study: the 0.26 percent figure, and OEHHHA's additional 0.14 percent, are summaries of the unpublished Roper and Stupart 2006 report, which was not examined, and the EU risk assessment that contains that study was not obtained. Biver 2021 measures release into artificial sweat, which is not absorption.

The second is the infant article itself. No study is specific to PET baby bottles, and none to polyester sleepwear. The PET migration papers examined here use commercial beverage bottles. Washington Ecology 15-03-039 includes one flame-resistant pajama component at 2,500 ppm, which is one clothing component, not a sleepwear class study, and the Greenpeace polyester results are clothing and footwear bought for that survey, not sleepwear. The Washington wipe and textile numbers are an XRF-prioritized screen. The 2026 China monitoring annex prints total antimony in µg/L, from 15.02 to 450.45, and does not print a sheet concentration in milligrams per kilogram.

The third is infant formula water, which is covered only indirectly. Drinking-water limits exist, and Pikounis 2024 and Du 2025 report urinary antimony in infants, but neither paper reports antimony in formula or in the water used to prepare it. The Romanian bottled-water maximum carries a printed uncertainty larger than the value.

The oral reference values have gaps of their own. There is no chronic oral minimal risk level, and no IRIS oral reference dose was re-read for this page. Wang 2026 cites an EPA oral figure of 0.35 µg/kg/day, but that citation is not a substitute for the IRIS file. EFSA's 2004 food-contact opinion was not examined, and Kowalczyk 2022 is a tea exposure report, not that opinion.

The microbiome questions are the most open. No diaper-area cohort links antimony to the skin microbiome. Zeldin 2023 is an ecological association plus in vitro work on one skin commensal, and its billing code conflicts with its title. Deng 2021 states that the genes required for microbial antimony methylation are still unknown, and Thomas 2011 shows only that MtaA can methylate antimony in vitro, which is not a dedicated antimony methylase demonstrated in an infant gut. The 2024 paper that names ArsM as the antimony biomethylase was not obtained.

A restriction dossier on the oxide as used in electrical and electronic equipment was examined. That dossier sets no baby-product concentration, and none of its occupational or article figures are adopted here.

12 | 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.

13 | Frequently asked questions

What is antimony, and which forms matter?

Antimony (Sb) is a metalloid, and its forms are not the same hazard. Trivalent antimony, which includes antimony trioxide and antimony potassium tartrate, is treated differently from pentavalent antimony. IARC Monograph Volume 131, announced on 5 May 2023, classifies trivalent antimony as Group 2A (probably carcinogenic to humans) and pentavalent antimony as Group 3 (not classifiable). Antimony trioxide was Group 2B in the 1989 evaluation. Because antimony trioxide is trivalent, it falls inside the 2023 classification, which covers the trivalent class rather than a separate line that names only the oxide.

How do people come into contact with antimony?

IARC lists uses in flame retardants, plastics, brake pads, glass, ceramics, and lead alloys. For water, WHO's drinking-water fact sheet treats plumbing and fittings as the common source and states that drinking-water concentrations appear to be below 5 µg/L. In Romania, Ungureanu and colleagues 2022 measured bottled-water antimony from below 0.07 µg/L to a printed maximum of 0.64 ± 6.85 µg/L. Washington Ecology measured tens of ppm of antimony in screened baby-wipe, bib, and clothing components, but those figures come from a prioritized screen, not a random market mean. Skin contact is the least documented route. OECD and OEHA summarize an unpublished in vitro dermal study at 0.26 percent, and OEHA also prints 0.14 percent at a higher dose. That is not an absorption fraction for a wipe or a textile, and the primary report was not examined.

What are the intake values and water limits for antimony?

WHO's tolerable daily intake is 6 µg/kg body weight, from a NOAEL of 6.0 mg/kg/day in a 90-day rat study of potassium antimony tartrate and an uncertainty factor of 1000, and its drinking-water guideline is 0.02 mg/L. ATSDR's 2019 intermediate oral minimal risk level is 0.0006 mg Sb/kg/day, because ATSDR took a much lower NOAEL (0.06 mg Sb/kg/day) from the same study, and there is no chronic oral minimal risk level. For drinking water, the U.S. EPA maximum contaminant level is 0.006 mg/L, and OEHA's 2016 public health goal is 1 ppb, from a BMDL of 0.14 mg/kg-day and an uncertainty factor of 1,000. These values answer different questions and are not averaged. The EPA IRIS oral reference dose was not examined for this page, so it is not stated.

Do toy, food-contact, and cosmetic limits mean the same thing?

No. Each is written on a different basis. EU 10/2011 sets a specific migration limit of 0.04 mg/kg into food from plastic. EN 71-3 sets soluble toy migration at 45, 11.3, and 560 mg/kg of toy material for Categories I, II, and III. Health Canada's cosmetic guidance is 5 ppm in a finished cosmetic, and it is guidance, not a wipe regulation. EU cosmetics law prohibits antimony and its compounds as ingredients (Annex II, entry 40) and sets no trace ppm in Article 17. A drinking-water limit cannot be copied onto a textile or a wipe either. The OEKO-TEX record in this corpus is a wastewater limit of 100 µg/L, not an extractable limit in a finished article.

What is known about antimony and microbes?

The evidence is mostly in vitro, animal, and observational. In vitro, Li and colleagues 2017 showed that bacterial proteins shared with arsenic (AnoA, AioAB, ArsB, Acr3, GlpF) oxidize, efflux, or take up Sb(III). Deng and colleagues 2021, a review, state that the genes required for microbial antimony methylation are still unknown. Engrola and colleagues 2023 found antimonite in the arsenite-oxidase active site and state that Sb(III) is oxidized about 6,500 times more slowly than As(III). In mice, Wu and colleagues 2025 found gut and bile-acid changes after a high gavage dose of potassium antimony tartrate (10 mg/kg), which is not a consumer-product dose. In hospitalized infants, Yan and colleagues 2025 report a negative association between serum antimony and the Chao1 diversity index, without a single-metal beta in the main text. In saliva, Davis and colleagues 2020 associated antimony with oral taxa and decayed teeth. Zeldin and colleagues 2023 associated antimony air-release inventories with atopic dermatitis billing in one U.S. region and, in vitro, showed effects on a skin commensal and a neuronal itch receptor. That is not a diaper-area cohort, and the printed billing code does not match the title.

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DATA AVAILABILITY

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