Chemicals in Cosmetics Used by Washington Residents: Phase Two Results

Report to the Legislature
Pursuant to ESSB 5693 (2022) Section 302 (56)

Hazardous Waste and Toxics Reduction Program and Environmental Assessment Program

Washington State Department of Ecology

Olympia, Washington

May 2024, Publication 24-04-022

DEPARTMENT OF ECOLOGY
State of Washington

Publication Information

This document is available on the Department of Ecology's website at:
https://apps.ecology.wa.gov/publications/summarypages/2404022.html.

Contact Information

Hazardous Waste and Toxics Reduction Program

Washington State Department of Ecology Headquarters
P.O. Box 47600
Olympia, WA 98504-7600
Phone: 360-407-6700
Website: Washington State Department of Ecology[1]

ADA Accessibility

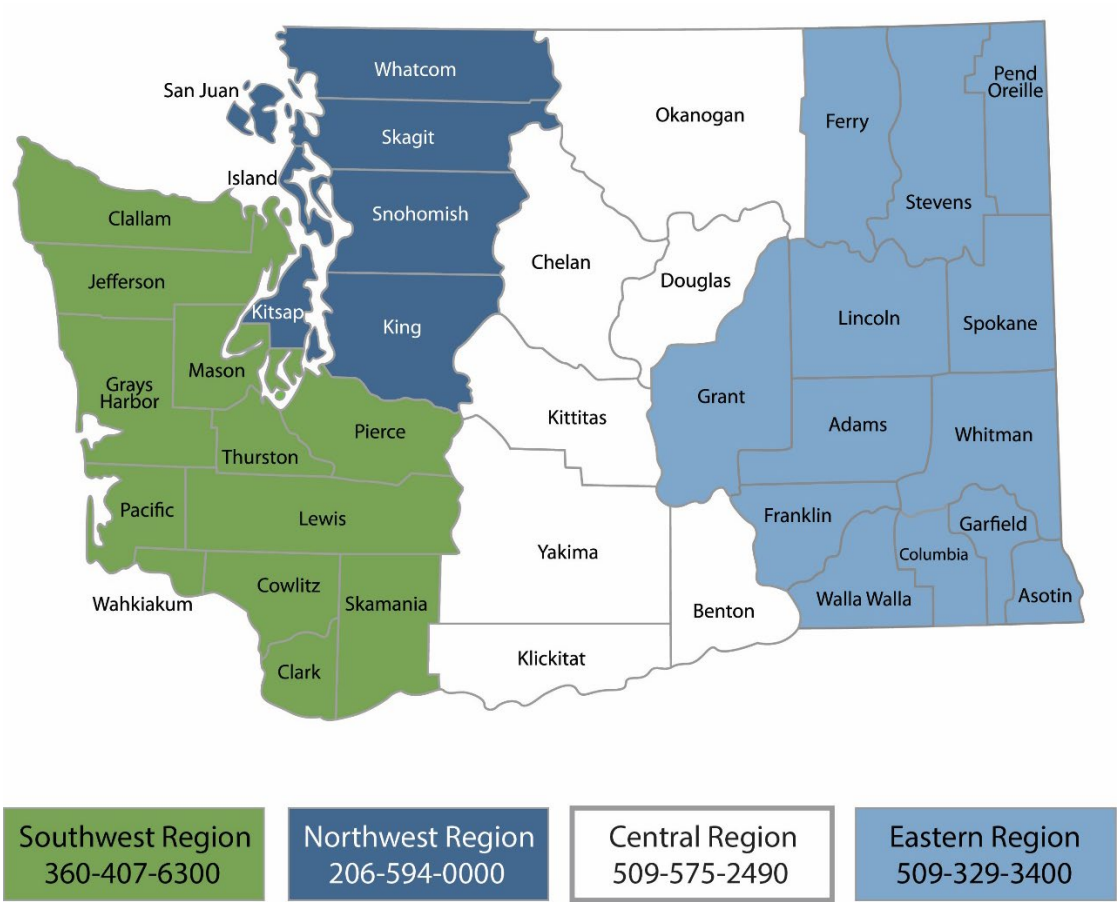
The Department of Ecology is committed to providing people with disabilities access to information and services by meeting or exceeding the requirements of the Americans with Disabilities Act (ADA), Section 504 and 508 of the Rehabilitation Act, and Washington State Policy #188.

To request an ADA accommodation, contact Ecology by phone at 360-407-6700 or email at hwtrpubs@ecy.wa.gov. For Washington Relay Service or TTY call 711 or 877-833-6341. Visit Ecology's website[2] for more information.

[1] ecology.wa.gov/contact
[2] ecology.wa.gov/Accessibility

Department of Ecology's Regional Offices

Map of Counties Served



Region	Counties served	Mailing Address	Phone
Southwest	Clallam, Clark, Cowlitz, Grays Harbor, Jefferson, Mason, Lewis, Pacific, Pierce, Skamania, Thurston, Wahkiakum	PO Box 47775 Olympia, WA 98504	360-407-6300
Northwest	Island, King, Kitsap, San Juan, Skagit, Snohomish, Whatcom	PO Box 330316 Shoreline, WA 98133	206-594-0000
Central	Benton, Chelan, Douglas, Kittitas, Klickitat, Okanogan, Yakima	1250 W Alder St Union Gap, WA 98903	509-575-2490
Eastern	Adams, Asotin, Columbia, Ferry, Franklin, Garfield, Grant, Lincoln, Pend Oreille, Spokane, Stevens, Walla Walla, Whitman	4601 N Monroe Spokane, WA 99205	509-329-3400
Headquarters	Across Washington	PO Box 46700 Olympia, WA 98504	360-407-6000

Chemicals in Cosmetics Used by Washington Residents: Phase Two Results

Report to the Legislature

Pursuant to ESSB 5693 (2022) Section 302 (56)

Hazardous Waste and Toxics Reduction Program and Environmental Assessment Program

Washington State Department of Ecology

Olympia, Washington

May 2024 | Publication 24-04-022

Table of Contents

List of Tables

Executive Summary

Cosmetics are a type of consumer product used to cleanse or alter the appearance of the body. The term “cosmetics” covers not only makeup and perfume, but also personal care items such as shampoo, hair gels, body wash, deodorant, hand lotion, and shaving cream.

In 2022, the Washington State Legislature directed the Department of Ecology to look for potentially harmful chemicals in cosmetic products that are marketed to or used by people of color. We decided to publish product testing results in two phases. This allowed us to provide data by the proviso deadline in December 2022 and conduct additional tests on cosmetic products of interest while funding was available. In phase one, we tested cosmetics for heavy metals and formaldehyde. In phase two, we tested additional cosmetic products for ortho-phthalates and asbestos. We submitted our phase one report on the presence of heavy metals and formaldehyde in January 2023. We describe phase two testing and results in this report.

In phase two, we tested for the presence of:

- Ortho-phthalates in nail polishes, fragrance-free or unscented hair sprays, and unscented skin cleansing products.
- Asbestos in powder makeups, including blush and eyeshadow.

Among 40 products tested for ortho-phthalates, we found diethyl phthalate in one scented nail product. Our findings demonstrate that many cosmetics, especially fragrance-free or unscented products, can be made without ortho-phthalates.

We did not find asbestos above the reporting limit in the 20 powder makeups that we tested, including blush and eyeshadow.

Introduction

Cosmetics, which include personal care products like shampoo, deodorant, and hair spray, may contain substances harmful to human health or the environment. People are widely exposed to chemicals in cosmetics through daily use, but people of color are often exposed to hazardous chemicals more frequently and at higher levels. The disproportionate exposure results from cultural and religious differences, occupation, inequitable beauty standards, and many other factors.

In 2022, the Washington State Legislature directed us (Ecology) to test cosmetic products for hazardous chemicals. Section 302 of the 2022 Supplemental Operating Budget, ESSB 5693,[3] provided:

> (56) $266,000 of the model toxics control operating account—state appropriation is provided solely for the department, in consultation with the department of health and community and social justice organizations, to identify cosmetic products marketed to or used by people of color, including adults and children, and test those products for potentially harmful chemicals or chemical classes. The department must provide a technical report on the results of the tests to the appropriate committees of the legislature by December 31, 2022.

To provide the needed information by the relevant due date, we tested cosmetic products in two phases covering a variety of products and chemicals. We collaborated with the Department of Health, reached out to social justice organizations and communities of color, and summarized findings from scientific literature to identify cosmetic products for both phases of testing. We submitted a technical report to the Legislature summarizing the consultation, research, and phase one testing results in January 2023 (Ecology, 2023). This report presents the phase two testing we performed to discover more about chemicals in cosmetics that are marketed to or used by people of color.

[3] https://lawfilesext.leg.wa.gov/biennium/2021-22/Pdf/Bill%20Reports/Senate/5693-S.E%20SBR%20HA%2022.pdf

Methods

Ecology's approach

To identify products used by Washington residents of color, we collaborated with the Department of Health and researched how different communities use cosmetics.

- We spoke with researchers and individuals from social justice organizations such as Black Women for Wellness and WE ACT for Environmental Justice who studied differences in cosmetic usage outside of Washington state.
- We heard from Latinx, Black, and multiracial Washington residents about what cosmetic products they used and what concerns they had about chemicals in cosmetics. The groups we reached out to include Mother Africa, Toxic Free Future, and families participating in an educational project funded by Tacoma Department of Public Health.
- We listened to where people buy cosmetics and what they prioritize.

We used this information to guide our product testing. To be responsive to legislative requests and deadlines, we planned our cosmetic product testing in two phases. More details about the study design, product selection, and phase one testing results are in our previous report to the Legislature (Ecology, 2023). [4]

Product testing

In phase two product testing, we purchased 60 unique low-cost cosmetic products from Walmart, Target, Fred Meyer, and Dollar Tree stores in the Puget Sound area to look for the presence of nine ortho-phthalates and asbestos.

We selected products based on shopping behaviors that we learned about through available scientific literature and our conversations with community members. For example, individuals from local communities of color frequently reported buying cosmetics at large retail chains. We sourced our products in similar locations to mirror the reported behaviors.

We tested the selected products for the presence of either ortho-phthalates or asbestos.

Products tested for ortho-phthalates

- 20 nail polishes.
- 7 fragrance-free or unscented hair sprays.
- 13 fragrance-free or unscented skin cleansing products, including feminine washes, body washes, and baby washes.

[4] https://apps.ecology.wa.gov/publications/UIPages/SummaryPages/2304007.html

Products tested for asbestos

- 10 powder blushes.
- 10 powder eyeshadows.

Results and Discussion

We have summarized our findings below. See Appendix A for full details, including study methods and data quality assessments.

Ortho-phthalates

Ortho-phthalates are a class of chemicals used in cosmetics as plasticizers, solvents, or stabilizers. For example, when added to fragrances, ortho-phthalates help dissolve and hold the fragrance ingredients, so they evaporate at a slower rate. This prolongs the desired scent. When used in nail polishes, ortho-phthalates can improve the flexibility of the film and prevent the polish from chipping (FDA, 2023a). Ortho-phthalates can also be found in cosmetics as contaminants from packaging or manufacturing processes.

We selected ortho-phthalates for testing because they can cause cancer and developmental and reproductive harm. They can also affect endocrine activity. Additionally, we heard concerns in conversations with social justice organizations about ortho-phthalates used in products applied to sensitive areas, such as feminine hygiene products.

We selected 20 nail polishes because other studies have detected ortho-phthalates in this type of product, where they function primarily as plasticizers (FDA, 2023a). For the other 20 products, we selected fragrance-free or unscented cosmetics to test for ortho-phthalates with functions other than fragrance solvents or fixatives.

We chose not to test for ortho-phthalates functioning as fragrance solvents or fixatives because Ecology was already in the process of adopting restrictions on this use of ortho-phthalates in beauty products and personal care products. The new restriction[5] was adopted May 31, 2023, and will go into effect on January 1, 2025.[6]

We tested for nine ortho-phthalates in 20 nail polishes and 20 hair sprays or skin cleansing products. The reporting limit for ortho-phthalates ranges from 15 to 25 ppm. Individual lab reporting limits may vary based upon specific matrix type.

[5]https://ecology.wa.gov/regulations-permits/laws-rules-rulemaking/closed-rulemaking/wac-173-337-may2023.

[6] We made our selection of ortho-phthalates prior to the Legislature's adoption of Chapter 70A.560 RCW, which restricts all uses of ortho-phthalates in cosmetics effective January 1, 2025.

Our test results are as follows:

- We found diethyl phthalate at 577 ppm in a blueberry-scented nail art pen purchased from Dollar Tree.
- We did not find any ortho-phthalates with plasticizer functions in nail polishes.
- We did not detect ortho-phthalates above the reporting limit in any of the fragrance-free or unscented hair spray and skin cleansing products we tested.

Diethyl phthalate is commonly used in personal care products that contain fragrances. The FDA states that diethyl phthalate appears to be the only ortho-phthalate still used in cosmetics (FDA, 2023a). Ecology's previous product testing found diethyl phthalate above 1000 ppm in scented nail polish and perfumes (Stone, 2014).

The fact that only one tested product contained detectable diethyl phthalate indicates that many fragrance-free or unscented cosmetics on the market in Washington can be made without the nine ortho-phthalates we looked for in this study.

Asbestos

Asbestos in cosmetics is mainly associated with talc. Both talc and asbestos are naturally occurring minerals, often found in close proximity in the earth. Other studies have found asbestos in powdered cosmetics where talc is used as a base material or a filler (FDA, 2023b).

We selected asbestos for testing because it can cause cancer when inhaled. Although the health risks of asbestos are well-documented, researchers have found asbestos contamination in powdered cosmetics such as eyeshadows (US PIRG, 2018).

We tested asbestos in 20 powdered blushes and eyeshadows that listed talc in the ingredients. Our product testing found that none of these 20 products contained asbestos. These results are consistent with the 2022 FDA testing of talc-containing cosmetics products. In the FDA's assessment, asbestos was not detected in any of the 50 samples (FDA, 2023c).

Major product recalls and FDA follow-up testing have led to increased scrutiny of talc. In December 2022, the FDA's Modernization of Cosmetics Regulation Act was signed into law. This updated federal regulation will require companies to test talc for asbestos and should further support the elimination of asbestos in cosmetics (FDA, 2023d). For future product testing studies, we will likely move away from looking for asbestos contamination in cosmetics and prioritize testing for other chemicals.

Conclusions

Our product testing results demonstrate that cosmetics can be made without potentially harmful chemicals. We found that 39 of the 40 products we tested were free of ortho-phthalates. The fact that only one tested product contained detectable diethyl phthalate indicates that many fragrance-free or unscented cosmetics can be made without the nine ortho-phthalates we looked for in this study. Meanwhile, Ecology's Safer Products for Washington program identified several alternatives to diethyl phthalate that are safer, feasible, and available, such as dipropylene glycol, isopropyl myristate, and benzyl alcohol (Ecology, 2022). We did not find asbestos in the cosmetics we tested. Careful sourcing of raw materials from mining sites and sufficient ingredient testing can successfully eliminate asbestos in products. Cosmetics can be manufactured with high safety standards to prevent unintentional contamination and intentionally added harmful chemicals.

References

Ecology (Washington State Department of Ecology). (2023). Chemicals in Cosmetics Used by Washington Residents: Report to the Legislature Pursuant to ESSB 5693 (2022) Section 302 (56). Publication No. 23-04-007. Olympia. Retrieved from https://apps.ecology.wa.gov/publications/SummaryPages/2304007.html.

Ecology (Washington State Department of Ecology). (2022). Regulatory Determinations Report to the Legislature: Safer Products for Washington Cycle 1 Implementation Phase 3. Publication No. 22-04-018. Olympia. Retrieved from https://apps.ecology.wa.gov/publications/summarypages/2204018.html.

FDA (US Food and Drug Administration). (2023a). Phthalates in Cosmetics. Retrieved from https://www.fda.gov/cosmetics/cosmetic-ingredients/phthalates-cosmetics.

FDA (US Food and Drug Administration). (2023b). Talc. Retrieved from https://www.fda.gov/cosmetics/cosmetic-ingredients/talc.

FDA (US Food and Drug Administration). (2023c). FDA Releases Data from the Agency's 2022 Testing of Talc-Containing Cosmetic Products for Asbestos. Retrieved from https://www.fda.gov/food/cfsan-constituent-updates/fda-releases-data-agencys-2022-testing-talc-containing-cosmetic-products-asbestos.

FDA (US Food and Drug Administration). (2023d). Modernization of Cosmetics Regulation Act of 2022. Retrieved from https://www.fda.gov/cosmetics/cosmetics-laws-regulations/modernization-cosmetics-regulation-act-2022.

US PIRG (US Public Interest Research Group Education Fund). (2018). In Your Face: Makeup found to be contaminated with asbestos. Retrieved from https://pirg.org/edfund/resources/in-your-face/.

Stone, A. 2014. Phthalates in Children's Products and Consumer and Children's Packaging. Publication 14-04-017. Washington State Department of Ecology, Olympia. Retrieved from https://apps.ecology.wa.gov/publications/SummaryPages/1404017.html.

Appendix A. Toxic Chemicals in Cosmetics: Ortho-Phthalates and Asbestos

by Prajwol Tuladhar
Washington State Department of Ecology
Environmental Assessment Program

About this appendix

This appendix provides the methods, data quality assessment, and results of this study.

You can see the raw data for this project in our product testing database.[7]

Methods

For this study, we followed all methods for product collection, sample processing, and laboratory procedures as outlined in the Quality Assurance Project Plan (QAPP): Toxic Chemicals in Cosmetics[8] (Tuladhar, 2022) and Addendum to QAPP: Toxic Chemicals in Cosmetics: Phthalates and Asbestos (Tuladhar, 2023).[9]

We analyzed cosmetic products for nine different ortho-phthalates and six forms of asbestos fibers in Table A-1. Total asbestos fibers, a sum of all six types, detected in a product is reported as "Asbestos" in the product testing database.

Table A-1: List of analytes tested.

Ortho-phthalates	Asbestos Fibers
Di(2-ethylhexyl) phthalate	Chrysotile
Butyl Benzyl phthalate	Tremolite asbestos
Diethyl phthalate	Amosite asbestos
Dihexyl phthalate	Crocidolite asbestos
Diisodecyl phthalate	Asbestos, anthophyllite
Diisononyl phthalate	Asbestos, actinolite
Dimethyl phthalate	N/A
Dibutyl phthalate	N/A
Di-n-octyl phthalate	N/A

Product collection

In December 2022, we (Ecology) purchased 60 unique, low-cost cosmetic products from four retailers in the Puget Sound-area, following selection guidelines in the appendix section of the

[7]https://apps.ecology.wa.gov/ptdbreporting/Reports/ReportViewer.aspx?ReportName=RawDataReport
[8]https://apps.ecology.wa.gov/publications/SummaryPages/2203113.html
[9] https://apps.ecology.wa.gov/publications/SummaryPages/2303108.html

study, Addendum to QAPP: Toxic Chemicals in Cosmetics: Phthalates and Asbestos (Tuladhar, 2023).[10] The number of products purchased from each retailer were as follows:

- 12 products from two Walmart locations.
- 16 products from two Target locations.
- 20 products from three Fred Meyer locations.
- 12 products from three Dollar Tree locations.

We purchased some products in multiples to meet the weight requirements for lab analysis. We did not make any online purchases for this study.

To test for ortho-phthalates, we purchased and sampled 40 products, which included 20 nail polish products, seven hair care products, and 13 skin cleansing products. Skin cleansing products included seven feminine hygiene washes, two adult body washes, and four baby washes. We purchased only fragrance-free or unscented skin cleansing and hair care products that were readily available in the market.

Table A-2: Cosmetic products purchased for ortho-phthalates testing.

Store	Ecology ID	Product Name	Category	QTY
Dollar Tree	DT-33-2	Color Icon Nail Polish (1115473)	Nail polish product	1
Dollar Tree	DT-33-3	Nail Art Pens (Blueberry Scented)	Nail polish product	2
Dollar Tree	DT-33-4	Nail Treatment (Base/Topcoat)	Nail polish product	1
Dollar Tree	DT-33-5	Fast Gel Nail Lacquer (145 Red Punch)	Nail polish product	1
Dollar Tree	DT-33-6	Nail Polish (902)	Nail polish product	1
Dollar Tree	DT-33-7	Color Craze Nail Polish (Bling Babe)	Nail polish product	1
Dollar Tree	DT-35-2	Nail Polish with Hardeners (CV010 A Little Drama)	Nail polish product	1
Fred Meyer	FM-44-11	Hard as Nails, Nail Polish (460 Garnet Attention)	Nail polish product	1
Fred Meyer	FM-45-4	Wildshine Nail Color (487E Grape Minds Think Alike)	Nail polish product	1
Fred Meyer	FM-45-5	Colorstay Gel Envy Longwear Nail Enamel (600 Queen of Hearts)	Nail polish product	1
Target	TG-49-5	Elite Nail Polish (Paradise Isle)	Nail polish product	1
Target	TG-49-6	Nail Polish (Hibiscus)	Nail polish product	1
Target	TG-49-7	Scented Nail Polish (Bubble Gum Bash)	Nail polish product	1
Target	TG-49-8	Coco For Real Chocolate Scented Nail Polish (Rock It Chocolate)	Nail polish product	1
Target	TG-49-9	Nail Lacquer (490 not red-y for bed)	Nail polish product	1
Target	TG-50-3	Nail Lacquer (NLH08 - I'm Not Really a Waitress)	Nail polish product	1

[10]https://apps.ecology.wa.gov/publications/SummaryPages/2303108.html

Store	Ecology ID	Product Name	Category	QTY
Walmart	WM-53-2	Mermaid Magic Nail Polish (CNL72 Sea Life)	Nail polish product	1
Walmart	WM-53-3	Just Add Sun Color Changing Nail Polish	Nail polish product	1
Walmart	WM-53-4	Professional Nail Lacquer (346 Shimmer Down)	Nail polish product	1
Walmart	WM-54-7	Complete Nail Set	Nail polish product	1
Dollar Tree	DT-34-1	Fragrance-Free Baby Body Wash & Shampoo	Baby wash	1
Fred Meyer	FM-46-2	Fragrance-Free Premium Baby Shampoo & Wash	Baby wash	1
Target	TG-49-1	Derma Care Soothing Wash	Baby wash	1
Target	TG-49-2	Fragrance-Free Foaming Shampoo & Body Wash	Baby wash	1
Dollar Tree	DT-35-1	Unscented Sensitive Skin Body Wash	Adult body wash	1
Fred Meyer	FM-46-1	Fragrance-Free Skin Relief Body Wash	Adult body wash	1
Fred Meyer	FM-44-1	Daily Care Foam Wash	Feminine hygiene wash	1
Fred Meyer	FM-44-5	Cleanse Fragrance-Free Sensitive Wash	Feminine hygiene wash	1
Fred Meyer	FM-44-6	Fragrance-Free Daily Gentle Wash	Feminine hygiene wash	1
Target	TG-49-3	Feminine Cleanser with Boric Acid	Feminine hygiene wash	1
Target	TG-49-4	Fragrance-Free Cleansing Wash	Feminine hygiene wash	1
Target	TG-50-2	Fragrance-Free pH Balancing Cleanser	Feminine hygiene wash	1
Walmart	WM-53-1	Dye and Scent Free Feminine Cleansing Wash	Feminine hygiene wash	1
Dollar Tree	DT-33-1	Unscented Extra Hold Hairspray	Hair product	1
Fred Meyer	FM-44-2	Unscented Max Hold Hairspray	Hair product	1
Fred Meyer	FM-44-3	Unscented Extra Hold Hairspray	Hair product	1
Fred Meyer	FM-44-4	Unscented 4X Mega Hold Hairspray	Hair product	1
Fred Meyer	FM-45-6	Unscented Hair Spray	Hair product	1
Fred Meyer	FM-46-3	Unscented Max Hold Hairspray (Non-Aerosol)	Hair product	1
Walmart	WM-54-8	Unscented Professional Shaping Hair Spray	Hair product	1

To test for asbestos contamination, we purchased and sampled 20 cosmetic products with talc as a listed ingredient: ten blushes, nine eyeshadow palettes, and one children's variety cosmetics pack. We used only eyeshadows from the children's variety cosmetics pack that contained eyeshadows, lipsticks, blushes, and lip glosses. Multiple eyeshadow color palettes from this variety pack were combined to make one sample to be tested.

Table A-3: Cosmetic products purchased for asbestos testing.

Store	Ecology ID	Product Name	Category	QTY
Dollar Tree	DT-34-2	Powder Blush (CBSB335 Berry Plum)	Cosmetics – blush	2
Fred Meyer	FM-44-10	Clean Classic Color Blush (590 Soft Mink)	Cosmetics – blush	1
Fred Meyer	FM-44-8	Maxi Blush (003 Wild Card)	Cosmetics – blush	1
Fred Meyer	FM-44-9	Color Icon Blush (1111555 Pearlescent Pink)	Cosmetics – blush	2
Target	TG-49-10	True Match Super-Bendable Blush (N5-6 Apricot Kiss)	Cosmetics – blush	1
Target	TG-49-11	Primer Infused Blush (Always Rosy)	Cosmetics – blush	1
Target	TG-49-12	Butter Believe It Blush (1711952 Pink Sands)	Cosmetics – blush	1
Target	TG-50-1	Bite Size Snackaroons Blush (Kiss My Cheeks)	Cosmetics – blush	3
Walmart	WM-54-1	Rose Powder Blush (11 Blossomtime Rose)	Cosmetics – blush	1
Walmart	WM-54-2	Sweet Cheeks Matte Blush (SCCPBM05 Bang Bang)	Cosmetics – blush	1
Walmart	WM-54-3	Be Inspired Glitter Makeover Studio	Cosmetic variety pack	1
Dollar Tree	DT-33-8	3 Color Eyeshadow Palette (C68674 Desert Rose)	Cosmetics – Eyeshadow	1
Fred Meyer	FM-44-7	Eye Enhancers Eyeshadow (428 Maroon Movement)	Cosmetics – Eyeshadow	1
Fred Meyer	FM-45-1	Color Riche Eyeshadow (304 Matte)	Cosmetics – Eyeshadow	1
Fred Meyer	FM-45-2	Expert Wear Eyeshadow (220S Royal Nude)	Cosmetics – Eyeshadow	1
Fred Meyer	FM-45-3	Eye Shadow Squad (Own IT 230)	Cosmetics – Eyeshadow	2
Target	TG-49-13	Color Icon Eyeshadow Palette (1114069 Sundaze)	Cosmetics – Eyeshadow	2
Walmart	WM-54-4	Smoky 10 Shade Eyeshadow Palette	Cosmetics – Eyeshadow	1
Walmart	WM-54-5	Bite Size Eyeshadow Pallet (29924 Rose Water)	Cosmetics – Eyeshadow	1
Walmart	WM-54-6	Illuminance Crème Eye Shadow Palette	Cosmetics – Eyeshadow	3

Sample processing

All nail polishes, hair care products, and skin cleansing products were sent to Ecology's Manchester Environmental Laboratory in their original unopened bottles to minimize sample exposure to the atmosphere. Manchester Environmental Lab received all samples in good condition, as indicated in the chain of custody.

All eye shadow makeup and blushes for asbestos testing were processed into sample jars under the fume hood one day before being transported to a contract laboratory via FedEx.

Some eyeshadow products had multiple color palettes combined to make one sample to generate enough weight for analysis. The laboratory received all samples in good condition, as indicated in the chain of custody.

Laboratory procedures

Phthalates analysis

Sample preparation for ortho-phthalates analysis followed U.S. Environmental Protection Agency (EPA) 3580A method for extraction. Samples in pressurized containers, such as hair sprays, were slowly sprayed onto the wall of a tared sample vial with extraction solvent, allowing the sample to condense into a liquid form. The samples were then weighed and processed through the extraction steps as usual.

Analyses for nine ortho-phthalates were performed following the EPA 8270E method.

Asbestos analysis

All samples were prepared using gravimetric protocols of EPA 600/R-93/116 method to address potential interferences by sample matrices and to ensure maximum detection when asbestos is present. Samples were subject to ashing to remove organic materials, followed by filtration of residue with acid to remove any soluble materials or carbonates. The prepared sample residuals were split and analyzed by X-Ray diffraction, polarized light microscopy, and transmission electron microscopy.

X-Ray diffraction screening was used to qualitatively determine the presence or absence of serpentine[11] and amphibole minerals in product samples. X-Ray diffraction analysis followed specifications in the EPA 600/R-93/116 method supplemented by the USP talc monograph.[12]

Polarized light microscopy analysis followed the contract laboratory's standard operating procedure. The standard operating procedure was developed with guidance from the EPA 600/R-93/116 method, supplemented by International Standards Organization (ISO) methods (ISO 22262-1 and ISO 22262-2) and the USP talc monograph. This analysis was used to determine the qualitative characteristics of a sample. This method also provided a semi-quantitative determination of the projected percent area for asbestos in the sample analyzed.

Transmission electron microscopy analysis provided the final determinative results for asbestos. In the transmission electron microscopy analysis, the samples were loaded onto two calibrated index grids with a certified grid opening area. A total of 35 grid openings were

[11] Asbestos minerals fall into two classes depending on silicate mineral structure: (1) serpentine asbestos and (2) amphibole asbestos. Chrysotile is the most abundantly used form of asbestos and belongs to the serpentine class. Amosite, crocidolite, and the fibrous variety of tremolite, actinolite, and anthophyllite belong to the amphibole class. Each of the six asbestos minerals have a non-regulated chemically identical counterpart crystallized in a non-fibrous form.
[12] https://www.usp.org/harmonization-standards/pdg/excipients/talc

scanned at multiple magnifications following the ISO 22262-2 method as a fiber-counting strategy. This method allows for the large fibers and fiber bundles to be counted and more accurately estimates the mass fractions of asbestos observed.

At 20,000× magnification, 10 openings were scanned, counting all structures above 0.5 µm with an aspect ratio >5:1. At 10,000× magnification, 25 different grid openings were analyzed for all structures greater than 5 µm with an aspect ratio >5:1. Morphology, quantitative energy dispersive spectroscopy, and zone axis indexing techniques referenced in EPA 600/R-93/116 and ISO 22262-1 methods were used for chrysotile and amphibole asbestos identification.

Data quality and usability

We verified and validated data following the technical specifications and quality assurance/quality control (QA/QC) requirements of the laboratory method and the study's quality assurance project plan (Tuladhar, 2023). The data validators provided written case narratives with a description of the quality of the data to the project manager. The data were deemed usable for all purposes as reported without qualifications.

The following qualifier was assigned to non-detects:

- "U" indicates that the analyte was not detected at the quantitation or reporting limit.

Phthalates data

Manchester Environmental Laboratory's data validation team conducted a stage 4 data validation on the level 4 package of ortho-phthalates data. The samples were extracted in three batches. All samples, batch QC samples, and instrument QC samples had surrogate standards added prior to extraction and internal standards added to the extracted samples before analysis.

For the method blanks extracted and analyzed with each batch, no analytes were detected above the method reporting limit.

The measurement quality objectives and frequency for all QC samples for ortho-phthalates were in line with the quality assurance project plan criteria.

Asbestos data

The contract lab presented a level 4 data package for asbestos analysis to an external validator. The data was validated following the QA/QC requirements of the study's quality assurance project plan and guidance from standard EPA validation documents for transmission electron microscopy and polarized light microscopy methods outlined in the quality assurance project plan.

All relevant documents for X-Ray diffraction analysis, such as annotated diffraction patterns, alignment and intensity checks of the instruments, and results from reference sample analysis provided by the laboratory, were validated to be within EPA method specifications.

The measurement quality objectives and frequency for all QC samples for the polarized light microscopy method followed the quality assurance project plan criteria. All relevant instrument calibrations, alignments, and reference sample analysis documents were included in the data package and were confirmed to be within specifications. For non-asbestos fibers, detected optical properties that distinguished them from asbestos were recorded in the bench sheets for verification.

For the transmission electron microscopy analysis, the contract laboratory employed QC targets that include 10% of the total transmission electron microscopy asbestos analyses performed each month as specified in the laboratory's accredited method. The minimum 4% (1/25) inter-analyst QC, 2% (1/50) intra-analyst QC, 1% (1/100) verified QC, and 3% additional QC (i.e., combination of inter/intra analysis, blanks, re-prep) required on random on-going project samples was met.

The quality assurance project plan's QC requirements for transmission electron microscopy were set at 1/10 inter-analyst QC, 1/20 intra-analyst QC and 1/20 verified analysis for a batch of 20 samples within this project. The inter-analyst QC was not performed frequently enough to meet the quality assurance project plan specifications. However, the verified analysis on one sample conducted by a different analyst was considered satisfactory to meet the requirement of one inter-analyst QC. Multiple replicate analysis was also conducted on a sample where a suspected amphibole particle was found.

All QC analyses performed for the transmission electron microscopy analysis were within the specifications of the measurement quality objectives. Since the data provided met the inter-analyst frequency of one per 25 samples required by the accredited method and other additional QCs were within specifications, the data is usable for all purposes.

Results

Phthalates

One of 20 samples tested in the nail products category for nine different ortho-phthalates had detectable levels of diethyl phthalate. A blueberry-scented nail art pen purchased from a Dollar Tree had diethyl phthalate detected at 577 ppm.

Ortho-phthalates were not detected above the reporting limit in the seven products tested from the hair care products category. All hair sprays purchased were marketed as unscented and did not contain any fragrance or parfum listed as an ingredient.

Ortho-phthalates were also not detected above the reporting limit in the 13 skin cleansing products tested, including the four baby washes that were tested. Only products that were

marketed as unscented or fragrance-free were tested. All four of the baby washes tested were also marketed as "phthalates-free."

Asbestos

Ten eyeshadow samples and 10 blush samples with talc as a listed ingredient were tested for asbestos contamination. None of the six forms of asbestos were detected in the 20 samples. Results from the transmission electron microscopy analyses have been uploaded into the product testing database.

Conclusions

Based on the results discussed above, we conclude the following:

- One ortho-phthalate, diethyl phthalate, was detected in one out of 40 product samples tested for nine different ortho-phthalates. diethyl phthalate was detected at 577 ppm in a blueberry-scented nail art pen purchased at a Dollar Tree.
- Phthalates were not detected above the reporting limit in the seven-hair care and 13 skin cleansing products tested. All 20 products were marketed as unscented or fragrance-free.
- None of the six forms of regulated asbestos were detected in the 20 cosmetic products tested.

Acknowledgements

The author is grateful to the staff at Manchester Environmental Laboratory, the Environmental Assessment Program, and the Hazardous Waste and Toxics Reduction Program for their support. Any questions may be directed to the author at prajwol.tuladhar@ecy.wa.gov.

References for Appendix A

Tuladhar, P. 2022. Quality Assurance Project Plan: Toxic Chemicals in Cosmetics. Publication 22-03-113. Washington State Department of Ecology, Olympia. https://apps.ecology.wa.gov/publications/SummaryPages/2203113.html.

Tuladhar, P. 2023. Addendum to Quality Assurance Project Plan: Toxic Chemicals in Cosmetics: Phthalates and Asbestos. Publication 23-03-108. Washington State Department of Ecology, Olympia. https://apps.ecology.wa.gov/publications/SummaryPages/2303108.html.