Flame Retardants in Fabrics of Children's Play Tents and Other Products

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Abstract

Washington State's Children's Safe Products Act (CSPA; Chapter 70A.430 RCW) restricts the sale of children's products that contain certain toxic chemicals. The CSPA also has reporting requirements for the presence of Chemicals of High Concern to Children (CHCC; WAC 173-334) in children's products sold in Washington.

During 2022 – 2023, the Washington State Department of Ecology (Ecology) conducted a study to assess six restricted or CHCC flame retardants in fabrics of children's products. As a follow-up to a 2016 Ecology study (van Bergen 2018), children's play tents were the main category of products purchased. Additional children's products purchased included sleeping bags, camping chairs, and a few car seat and stroller combinations. Ecology analyzed 40 fabric components to assess manufacturer compliance with CSPA's restrictions on the following six flame retardants in children's products:

- tris(1,3-dichloro-2-propyl) phosphate (TDCPP)
- tris(2-chloroethyl) phosphate (TCEP)
- tris(1-chloro-2-propyl) phosphate (TCPP)
- triphenyl phosphate (TPP)
- 2-ethylhexyl-tetrabromobenzoate (TBB)
- bis(2-ethylhexyl) tetrabromophthalate (TBPH)

One fabric component from a play tent tested in this study contained TDCPP above the 1,000 ppm CSPA regulatory limit. The 39 other fabric components from play tents, sleeping bags, camping chairs, and car seat and stroller combinations did not contain TDCPP, TCEP, TCPP, TPP, TBB, or TBPH above the 100 ppm project reporting limit (RL).

Publication Information

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Data for this project are available in Ecology's Product Testing Database.
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Background

Washington's Children's Safe Products Act (CSPA, Chapter 70A.430 RCW) limits the presence of toxic chemicals, including certain flame retardants, in children's products. CSPA also requires manufacturers to annually report if their children's products contain the listed Chemicals of High Concern to Children (CHCC, Chapter 173-334 WAC).

In 2016, the Washington State Department of Ecology (Ecology) conducted a study to assess flame retardants in children's upholstered furniture, play tents, and tunnels (van Bergen 2018). The study found that 17 out of 46 children's play tents and tunnels tested had flame retardants TDCPP or TCEP above the 1,000 ppm CSPA regulatory limit (van Bergen 2018). Due to the number of play tents with flame retardants in the 2016 study, a follow-up study was conducted in 2022 – 2023.

Ecology's Product Testing Unit conducted the 2022 – 2023 study following the published Quality Assurance Project Plan (QAPP; Salamone 2022). This study assessed levels of six flame retardants (Table 1) in 40 fabric samples from children's play tents, sleeping bags, camping chairs, and a few car seat and stroller combination products. Children's products, as defined in CSPA, are those that are marketed and sold for use by children 12 years of age or younger. Children's products include toys, items to facilitate sleep or relaxation, and car seats. Study data were collected and validated for use in a CSPA compliance assessment.

Table 1: Summary of flame retardants assessed for this study.

Flame Retardant Chemical	Abbreviation	CAS RN	Regulation
tris(1,3-dichloro-2-propyl) phosphate	TDCPP	13674-87-8	Restricted to ≤1000 ppm[1] and Reportable CHCC[2]
tris(2-chloroethyl) phosphate	TCEP	115-96-8	Restricted to ≤1000 ppm[1] and Reportable CHCC[2]
tris(1-chloro-2-propyl) phosphate	TCPP	13674-84-5	Reportable CHCC[2]
triphenyl phosphate	TPP	115-86-6	Reportable CHCC[2]
2-ethylhexyl-2,3,4,5-tetrabromobenzoate	TBB	183658-27-7	Reportable CHCC[2]
bis(2-ethylhexyl) tetrabromophthalate	TBPH	26040-51-7	Reportable CHCC[2]

CAS RN = Chemical Abstracts Service Registry Number
ppm = parts per million
CHCC = Chemical of High Concern to Children
[1]As required by Children's Safe Product Act 70A.430.030 RCW.
[2]Report intentionally added chemicals and contaminant chemicals >100 ppm as required by Children's Safe Product Reporting Rule Chapter 173-334 WAC.

Methods

Product Selection

Ecology's Product Testing Unit selected children's products to purchase following the study's QAPP (Salamone 2022). An objective was to purchase play tent products as a follow-up to products found to contain flame retardants in Ecology's 2016 study (van Bergen 2018). Selection of follow-up play tents was based on similarity to the 2016 product information, in order of importance: (1) manufacturer, (2) UPC, (3) brand name, (4) distribution company, and (5) the fabric pattern. Follow-up play tent products (N = 21) purchased for this study were from seven different manufacturers. Additional play tents, sleeping bags, and camping chairs unrelated to the 2016 study were also purchased. The CSPA compliance Lead selected the two car seat and stroller combination items.

All products were purchased from 12 retailers between December 2022 and February 2023. Fifty-two products, including the 21 follow-up play tents, were purchased from seven retail stores (N = 23) in Washington's south Puget Sound area and eight online stores (N = 29). Three of the retailers had both retail stores and online stores. Table 2 details the number of products purchased per category.

Table 2: Summary of children's products collected by product category for this study.

Product Category	Number of Products
Play Tents	39
Sleeping Bags	4
Camping Chairs	4
Play Tent and Sleeping Bag Packs[1]	3
Car Seat and Stroller Combinations[2]	2
Total Products	**52**

[1]Packs included one play tent and one sleeping bag each.
[2]Combinations included one car seat and one stroller each.

Purchasing and product information was recorded in the product testing database (PTDB) following SOP PTP002 *Product Testing Database for Data Entry and Data Entry Quality Assurance* (Wiseman 2022a). Once purchased, products were stored securely in the product testing preparation room at Ecology's headquarters in Lacey, Washington. All product packages were photographed and assigned a unique product identification number. Product information, including brand, manufacturer, distributor, importer, country of manufacture, and manufacture date, was recorded in the PTDB.

Chain of custody (COC) was maintained throughout product collection, processing, screening, and submission to Manchester Environmental Laboratory (MEL) to analyze flame retardants.

Sample Processing and Component Screening

Products were received and processed following the study QAPP (Salamone 2022) and SOP PTP001 *Procedure for Product Collection and Sample Processing* (Wiseman 2023). All surfaces and tools were decontaminated before use and between processing different products. A vacuum with a HEPA filter was used to remove debris from processing surfaces and minimize cross-contamination between processing.

For follow-up play tent products, the same component that produced the highest flame retardant detection in the previous study was collected for analysis. Therefore, only one fabric siding component sample was collected from each follow-up product and assigned a component identification number. For additional, non-follow-up products, samples of all colors and types of fabric components were collected and assigned a component ID. From the 52 products purchased, 140 fabric component samples were collected and considered for laboratory testing.

For non-follow-up products only, selected fabric components were screened for bromine, chlorine, and antimony to prioritize samples for laboratory testing. Screening was performed following SOP PTP004 *Thermo Fisher Scientific Niton XL3T GOLDD+ X-ray Fluorescence Analyzer* (Wiseman 2022b). All samples were measured in Niton's TestAll® mode with a scan time of 60 seconds.

A total of 40 fabric component samples from play tents, sleeping bags, camping chairs, car seats, and strollers were hand-reduced and submitted for laboratory testing. Generally, one component from a product was selected for laboratory testing. Two products, a play tent and sleeping bag set and a car seat and stroller combination, had two components selected for laboratory testing. Samples were selected based on the following criteria:

- Product was a follow-up (N = 21) to the 2016 Ecology study (van Bergen 2018).
- Product had a flammability specification label, and XRF screening indicated the presence of bromine, chlorine, and/or antimony (N = 18).
- Product did not have a flammability specification label, but XRF screening indicated the presence of bromine, chlorine, and/or antimony (N = 1).

Flammability specification labels present on product packaging and/or tags were photographed and documented in the PTDB. For this study, flammability specification labels included mandatory and voluntary industry-specific standard codes like:

- CPAI-84 — A Specification for Flame-Resistant Materials Used in Camp Tentage.
- CPAI-75 — Rate of Burn Specifications for Sleeping Bags.
- ASTM F963 — Standard Consumer Safety Specification for Toy Safety.
- JPMA - Juvenile Products Manufacturing Association Certification that the product meets ASTM International standards.

Flammability specification labels also included Technical Bulletin (TB)-117-2013 and California Proposition 65 warnings, which are specific to California's state laws. Any labels that indicated a

flammable warning, like "KEEP ALL FLAME AND HEAT SOURCES AWAY," were also photographed. Notably, a product can meet flammability specifications without added flame retardants since specifications may be met with physical barriers and/or manufacturing modifications.

Laboratory Analysis

Analysis for the flame retardants listed in Table 1 was performed following MEL's accredited SOP, MEL730123 Version 2.2: Flame Retardants and Polybrominated Diphenyl Ethers (PBDEs) in Consumer Products by EPA SW-864 Method 8270E.

Data Quality

A Stage 3 data validation was completed on reported TDCPP, TCEP, TCPP, TPP, TBB, and TBPH results following specifications in the study QAPP (Salamone 2022). Validation evaluates and documents that data quality, including analytical precision, sensitivity, and bias, were acceptable. The principal investigator then verified these data for completeness, correctness, and conformance to the study data quality objectives. The laboratory results are usable as qualified.

Results

Forty fabric components were analyzed for TDCPP, TCEP, TCPP, TPP, TBB, and TBPH, generating 240 individual test results. All laboratory results were validated, reviewed, and entered into PTDB following SOP PTP002 (Wiseman 2022a).

One play tent fabric component, MC-6-1-2, contained 18,200 ppm of TDCPP (Appendix Table A1).

None of the other tested 39 fabric components from children's play tents, sleeping bags, camping chairs, or car seat and stroller combinations contained TDCPP, TCEP, TCPP, TPP, TBB, or TBPH greater than the 100 ppm project RL.

An objective of this study was to document flammability specification labels present on collected products for the review of product labeling practices. All labels identifying a flammability standard, specification, or warning were recorded in the PTDB.

Conclusions

Following the study's QAPP (Salamone 2022), products and data were collected and validated for compliance evaluation and enforcement of Washington's CSPA. Study results only apply to the CSPA flame retardant analytes listed in the QAPP and assessed by the study.

One play tent product's dark blue flooring fabric component, MC-6-1-2, contained 18,200 ppm TDCPP, which is greater than the CSPA limit of 1,000 ppm for restricted flame retardants. Play tent product MC-6-1 was labeled to meet CPAI-84 flammability specification. This play tent product was not a follow-up item to Ecology's 2016 study.

Thirty-nine of the 40 fabric components submitted for testing did not contain TDCPP, TCEP, TCPP, TPP, TBB, or TBPH above the 100 ppm project RL.

None of the follow-up play tent components tested (N = 21) contained the flame retardants assessed in this study above the 100 ppm project RL. This indicates that the seven manufacturers that used TDCPP in children's play tent fabrics collected in 2016 did not use those flame retardants in fabrics of the children's products purchased in 2022 – 2023.

One play tent (FM-47-2) was labeled with a CA Proposition 65 warning for TDCPP, and one play tent (WM-57-3) was labeled with a CA Proposition 65 warning for TCEP. Neither of the fabric components from these play tents contained TDCPP or TCEP above the 100 ppm project RL.

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Appendix A. Summary of flame retardant results

Table A1: Summary of fabric component descriptions and flame retardant results for children's products tested in this study.

Fabric Component ID	Component Description	Prioritization Factor[1]	CSPA Flame Retardant Detected[2]
AM-50-1-1	Fire Engine Play Tent — Printed Siding Fabric	Manufacturer Follow-up	—
AM-50-2-1	Race Pit Stop Play Tent — Printed Siding Fabric	Manufacturer Follow-up	—
AM-51-1-1	UV Shade and Play Tent — Printed Siding Fabric	Manufacturer Follow-up	—
AM-52-1-3	Bluey Play Tent — Pink Fabric	XRF Screening	—
AM-53-1-3	Stroll On 3-Wheel Travel System — Light Gray Car Seat Head Support	XRF Screening	—
AM-53-1-6	Stroll On 3-Wheel Travel System — Black Pattern Car Seat Cushion Fabric	XRF Screening	—
AM-53-2-11	Smooth Ride Travel System — Black Stroller Seat Fabric	XRF Screening	—
AM-53-2-8	Smooth Ride Travel System — Gray Car Seat Fabric	XRF Screening	—
BL-9-1-1	Spider-Man Adventure Play Tent — Printed Siding Fabric	Manufacturer Follow-up	—
BL-9-2-1	Minnie Mouse Play Tent — Printed Siding Fabric	Manufacturer Follow-up	—
BL-9-4-3	Blue's Clues Play Tent — Light Blue Fabric	XRF Screening	—
DSG-6-2-1	Junior Folding Chair — Floral Pattern Fabric	XRF Screening	—
FM-47-1-2	Glow in the Dark Camp Chair — Purple Fabric	XRF Screening	—
FM-47-2-3	Wonder Lake Dome Tent — Silver Flooring Fabric	XRF Screening	—

Fabric Component ID	Component Description	Prioritization Factor[1]	CSPA Flame Retardant Detected[2]
FM-48-3-6	3-in-1 Game Tent — Printed Siding Fabric	XRF Screening	—
HD-10-1-1	Dream House Bed Tent — Printed Siding Fabric	Manufacturer Follow-up	—
LW-7-1-1	My First Bakery Play Tent — Printed Siding Fabric	Manufacturer Follow-up	—
LW-7-2-1	Small Explorer Dome Tent — Green Siding Fabric	Manufacturer Follow-up	—
LW-7-3-1	My First House Play Tent — Printed Siding Fabric	Manufacturer Follow-up	—
MC-6-1-2	Space and Rockets Play Tent — Dark Blue Flooring Fabric	XRF Screening	**18,200 ppm TDCPP**
RE-10-1-1	Kindercamp Kids Sleeping Bag — Dark Blue Fabric	XRF Screening	—
TG-51-2-1	Frozen Adventure Kit Tent — Printed Siding Fabric	Manufacturer Follow-up	—
TG-51-3-1	Spider-Man Adventure Kit Tent — Printed Siding Fabric	Manufacturer Follow-up	—
TG-51-4-2	Spaceship Play Tent — Blue Printed Fabric	XRF Screening	—
TG-51-5-1	Garden Market Play Tent — Red Plaid Fabric	XRF Screening	—
TG-51-7-4	Princess Castle Play Tent — Pink Flag Fabric	XRF Screening	—
TG-52-1-1	School Play Tent — Printed Siding Fabric	Manufacturer Follow-up	—
TG-52-2-1	Fire Station Play Tent — Printed Siding Fabric	Manufacturer Follow-up	—
TG-52-3-1	Dollhouse Play Tent — Printed Siding Fabric	Manufacturer Follow-up	—
TG-53-1-1	Sensory Blackout Play Tent — Black Siding Fabric	Manufacturer Follow-up	—

Fabric Component ID	Component Description	Prioritization Factor[1]	CSPA Flame Retardant Detected[2]
WM-55-2-1	Paw Patrol Adventure Kit Tent — Printed Siding Fabric	Manufacturer Follow-up	—
WM-55-3-1	Barbie Pop-up Dream Camper — Printed Fabric of Play Tent	XRF Screening	—
WM-55-4-1	Dinosaurs Camp Chair — Printed Fabric	XRF Screening	—
WM-56-1-1	Me Too Play Tent — Printed Siding Fabric	Manufacturer Follow-up	—
WM-56-2-1	Lil' Nursery Play Tent — Printed Siding Fabric	Manufacturer Follow-up	—
WM-56-3-1	Super Duper Play Tent — Printed Siding Fabric	Manufacturer Follow-up	—
WM-56-4-1	Sea Buddies Play Tent — Printed Siding Fabric	Manufacturer Follow-up	—
WM-56-5-1	Unicorn Hut Play Tent — Printed Siding Fabric	Manufacturer Follow-up	—
WM-57-3-1	Sparkle the Unicorn Camping Set — Heart Printed Tent Fabric	XRF Screening	—
WM-57-3-4	Sparkle the Unicorn Camping Set — Pink Tent Fabric	XRF Screening	—

CSPA = Children's Safe Products Act
XRF = x-ray fluorescence
[1]Samples were prioritized following the study quality assurance project plan. Screening was performed for bromine, chlorine, and antimony using XRF.
[2]Flame retardants assessed in this study were tris(1,3-dichloro-2-propyl) phosphate (TDCPP), tris(2-chloroethyl) phosphate (TCEP), tris(1-chloro-2-propyl) phosphate (TCP), triphenyl phosphate (TPP), 2-ethylhexyl-2,3,4,5-tetrabromobenzoate (TBB), bis(2-ethylhexyl) tetrabromophthalate (TBPH). Detection is defined as a reported concentration greater than the 100 ppm reporting limit.