Safer School Supplies: Shopping Guide

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WashPIRG Foundation

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Executive Summary

For over 30 years, U.S. PIRG Education Fund has surveyed children's products, such as toys, for common hazards, which has led to over 150 recalls and other regulatory actions over the years.

With this Safer School Supplies: Shopping Guide, parents, teachers, and students can make more informed decisions while shopping for school supplies this season. We want to give parents and teachers the option to choose school supplies that do not contain toxic chemicals. This Shopping Guide should serve as a handy tool for finding products free of several types of toxic chemicals.

We conducted laboratory tests for toxic chemicals in popular school supplies. Researchers tested markers (washable and dry-erase), crayons, glue (liquid and sticks), spiral notebooks, rulers, 3-ring binders, lunchboxes, and water bottles for toxic chemicals such as lead, asbestos, phthalates, BTEX compounds (benzene, toluene, ethylbenzene, and xylene), and bisphenol-A (BPA). We purchased the supplies from across the country at a wide variety of stores including big box stores, dollar stores, drug stores, online retailers, and arts and crafts stores.

Among the school supplies surveyed, we found Playskool crayons from Dollar Tree that contained asbestos, a 3-ring binder from Dollar Tree that contained high levels of phthalates, two dry-erase markers containing BTEX compounds, and we highlight two water bottles that have been recalled due to high levels of lead. This guide not only lists the potentially dangerous school supplies that we found and why and how the school supplies can harm students, but also lists the school supplies that tested negative for chemicals of concern.

The presence of toxic hazards in school supplies highlights the need for constant vigilance on the part of government agencies and the public to ensure that school supplies containing toxic chemicals are removed from store shelves.

U.S. PIRG Education Fund staff sent 27 school supplies to an independent laboratory to test for chemicals of concern. The problems we found include:

- Crayons. We tested six types of crayons for asbestos and one tested positive for tremolite: Playskool crayons (36 count) that we purchased at Dollar Tree. We tested the green color crayon. We tested two samples of the same crayon product to confirm our results. Asbestos is a known carcinogen and can lead to serious health conditions, including lung cancer and mesothelioma. Pictures of the tremolite fibers taken from the laboratory are included in Appendix A.
- 3-ring binders. We tested three 3-ring binders for phthalates, and one tested positive for phthalates: Jot-brand blue binder from Dollar Tree contained 240,000 parts per million (ppm) DEHP, and 8,000 ppm

DINP. Research has documented the potential damage of exposure to phthalates at crucial stages of development, including altered development of the male reproductive system and early puberty. Studies have linked phthalates to asthma, childhood obesity and lower IQ scores.

- Water bottles. We tested two water bottles, both of which tested negative for the presence of lead. Two products reviewed by the Consumer Product Safety Commission (CPSC) have been recalled for high levels of lead: Base Brands Children's Reduce Hydro Pro Furry Friends water bottle, sold at Costco and Amazon, and GSI Outdoors Children's Water Bottles, sold at L.L. Bean.
- Markers. We tested two brands of washable markers for BTEX compounds that tested negative. We tested two types of dry-erase markers for BTEX compounds and phthalates, which tested negative for phthalates but positive for BTEX compounds. BTEX chemicals are known endocrine disruptors, linked to dangerous disruptions in sexual reproduction, liver and kidney function and immune system functioning. BTEX chemicals including benzene, xylene, and toluene, one of which, benzene, is considered a carcinogen by the CPSC.
- Glue. We tested two glue sticks and two liquid glues for lead, and the results were negative. Even low levels of lead in blood have been shown to undermine IQ, attentiveness, and academic achievement.
- Spiral notebooks. We tested the metal wires of three spiral notebooks for lead, and the results showed they were safe from lead.
- Rulers. We tested three plastic rulers for BPA and phthalates, and the results showed all rulers that we tested were free of BPA and phthalates. BPA can disrupt hormones.
- Lunchboxes. We tested two lunchboxes with shiny pictures on the front for phthalates, and the results showed they were free of phthalates.

We have the following recommendations:

- Dollar Tree and Playskool should recall the asbestos-tainted crayons and remove them from store shelves. They should also contact customers to warn them about the crayons.
- Dollar Tree and Jot should recall the 3-ring binder that contained high levels of phthalates and remove them from store shelves. They should also contact customers to warn them about the binders.
- The Board Dudes should recall their dry-erase markers that contain BTEX chemicals and remove them from store shelves. They should also contact consumers to warn them about the levels of BTEX chemicals in the markers. Amazon.com should remove the dry erase markers from its website and inform consumers about the markers.
- The U.S. Consumer Product Safety Commission (CPSC) should conduct more testing on school supplies for chemicals of concern.
- Policymakers should maintain the CPSC's funding and authorities to protect the public and mandate the CPSC to regularly test more children's products for toxic chemicals.
- Parents and teachers should use our shopping guide when buying supplies and subscribe to email recall updates from the CPSC and other U.S. government safety agencies available at www.recalls.gov.

Introduction

School Supplies

In 2017, Americans spent an estimated $27 billion dollars shopping for 'Back to School' products, a number that annually increases as parents spend increasing amounts equipping their children for the coming school year.[1] A sizeable portion of this amount is spent on back to school supplies, including binders, pencils, pens, notebooks and backpacks.[2] However, while parents can often choose which brands to purchase, obtaining these supplies is often not completely voluntary. Each year, teachers generally provide 'back to school lists,' detailing the various school supplies necessary for classroom participation. With little federal funding, teachers have increasingly been forced to rely on parents to purchase these supplies, resulting in longer and longer supply lists.[3]

Regulations and state of the law

Parents have been purchasing school supplies for many decades. Some of the more well-known brands, such as Crayola, Ticonderoga and Sharpie have been manufacturing school supplies for over a century. In 1990, the first comprehensive legislature was passed to alert consumers of the potential dangers of art supplies (such as glue, markers and crayons). The Labeling of Hazardous Art Materials Act mandated that all art supplies with hazardous chronic effects must have a warning label indicating consumers of these dangers.[4] In 2008, the Consumer Product Safety Improvement Act was passed, tightening regulations on specifically children's art materials. Provisions involve banning the use of some hazardous chemicals, requiring certification before importation and/or distribution and the implementation of tracking labels.[5] Both the LHAMA and CPSIA are upheld and regulated by the Consumer Product Safety Commission, however the burden of testing the chronic hazardous effects of supplies is placed upon the manufacturer.[6]

However, while important, these acts have not ensured the complete protection of consumers. In 2015, the Environmental Working Group tested an even wider variety of chemicals, finding asbestos in five different crayon brands imported from abroad.

Prior Back to School Guides and Studies

A major issue in regulating chemicals in school supplies is the disparity between what research indicates to be dangerous and what the Environmental Protection Agency (EPA) and Food & Drug Administration (FDA) consider to be dangerous. While asbestos in any amount is recognized as dangerous by the EPA and FDA, there are chemicals that both agencies do not acknowledge as toxic in small amounts despite scientific evidence indicating otherwise. The danger of these chemicals for children is not

breaking news; over the past decade multiple groups have published back-to-school reports advising parents how to avoid purchasing products with these toxins. The Environmental Working Group published the first comprehensive report in 2008. [7]

In 2012, the Center for Environmental Health and Justice (CEHJ) tested a variety of children's back-to-school products, finding extremely high levels of phthalates (a dangerous additive to PVC) in some of them.[8] CEHJ then published a more extensive report on how to purchase PVC-free school products.[9] More recently, healthy-living and child-raising bloggers have begun publishing and compiling their own non-toxic back to school suggestion lists, largely echoing the reports of CEHJ and EWG. These websites include Mamavation, Health Holistic Living and Moms Advocating Sustainability.[10] [11] [12] In 2016, U.S. PIRG Education Fund published a list of back-to-school tips on how to avoid toxics, suggesting that parents avoid products with BPA, PVC, solvents and scents.[13] In 2017, Environment America, as a part of their 'Get the Lead Out' campaign, published a toolkit to help parents advocate for safe water in their children's schools.[14]

In order to help parents and teachers clarify what supplies are safer to buy, U.S. PIRG Education Fund tested products and produced this consumer guide. We have provided our methods, lab results, and more information about the possible negative health effects of the chemicals that we tested, below.

Methodology

U.S. PIRG Education Fund staff purchased 27 school supplies from across the country both in-store and online. Those 27 supplies are divided into 8 categories of common school supplies bought by parents each year (crayons, markers, rulers, 3-ring binders, notebooks, glue, lunch boxes, and water bottles). We sent the samples to an independent laboratory, STAT Analysis Corporation in Chicago. For school supplies that tested positive, we had the laboratory conduct a re-test to confirm the results. Below are the laboratory's methodology for the various chemicals.

Lead

For analysis of non-metal samples (eg: glue): A portion of the sample was digested using acid and peroxide and analyzed using Inductively Coupled Plasma Mass Spectrometry (ICP/MS) CPSC Test Method CPSC-CH-E1002-08.3 Standard Operating Procedure for Determining Total Lead (Pb) in Non-Metal Children's Products)

For analysis of Metal Samples (eg: water bottles): A portion of the sample was digested using acid and analyzed using Inductively Coupled Plasma Mass Spectrometry (ICP/MS) (CPSC Test Method CPSC-CH-E1001-08.3 for Determining Total Lead)

Phthalates

For samples for phthalate analyses: A portion of the sample was solvent extracted and analyzed by Gas Chromatography/Mass Spectrometry (CPSC-CH-C1001-09.3)

BPA (bisphenol-A)

For bisphenol-A analyses: A portion of the sample was solvent extracted and analyzed by Gas Chromatography/Mass Spectrometry (EPA 8270)

BTEX (volatile aromatic compounds benzene, toluene, ethylbenzene and xylene)

For each marker, a sample of ink from each marker was extracted and analyzed by USEPA 8260 (Purge and Trap Gas Chromatography/Mass Spectrometry).

Asbestos

Asbestos methodology: Initial identification of asbestos fibers in the samples were made using polarized light microscopy (PLM) according to morphology, sign of elongation, color of fiber, birefringence of the fibers, dispersion staining, and refractive indices. (Reference: Polarized Light Microscopy to determine type of asbestos and calibrated visual estimated concentration in bulk materials. Method: EPA/600/R-93/116).

Confirmation of asbestos fibers in the samples were made by transmission electron microscopy (TEM) according to morphology, aspect ratio, diffraction pattern, and elemental composition by energy dispersive x-ray analysis. (Reference: EPA/600/R-93/116 Section 2.5.5.1).

Safer Shopping Guide

Below are the results of our investigation into the toxic chemicals in several school supplies. The products listed in **red** were found to contain toxic chemicals. The products listed in **green** did not contain the toxic chemicals that we were investigating. The producs listed in **orange** designates caution: contains BTEX chemicals but not at levels considered a concern by toxicologists, and does not contain benzene.

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CRAYONS

Tested for Asbestos

We tested six popular crayon brands for asbestos. Asbestos may occur in the talc that is used in crayon manufacturing.[61] To help parents find crayons that do not contain asbestos, we recommend parents purchase crayons labeled in green below.

Playskool Crayons (36 count)

Tested POSITIVE for trace amounts of Asbestos (Tremolite)

Store: Dollar Tree

Manufacturer: Leap Year Publishing, LLC

Licensed by: HASBRO

Price: $1

Crayola Crayons (24 pack)

Tested negative for asbestos

Store: Purchased at CVS Pharmacy but widely available

Price: $0.50 - $2

Up & Up crayons classic colors (24 count)

Store: Target

Tested negative for asbestos

Price: $1.19

CRAYONS (cont.)

Tested for Asbestos

Cra-Z-Art crayons (24 count)

Tested negative for asbestos

Store: Party City

Price: $1.50

Disney Junior Mickey and the Roadster Racers (24 count)

Tested negative for asbestos

Store: Dollar Tree

Price: $1

Roseart crayons (8 count)

Tested negative for asbestos

Store: Amazon.com

Price: $4.39

Markers (Washable and Dry-erase)

Washable markers tested for BTEX (benzene, toluene, ethylbenzene, and xylene). Dry-erase markers tested for BTEX and phthalates.

We tested four washable and dry-erase markers. Both washable markers that we tested came back negative for BTEX compounds. Both dry-erase markers that we tested contained BTEX compounds. To help parents find markers that do not contain BTEX compounds, we recommend parents purchase markers labeled in green below.

Crayola markers (10 count)

Store: Purchased at Walgreens but widely available

Tested negative for BTEX

Price: $4.29

Jot markers fine line assorted colors (20 count)

Store: Dollar Tree

Tested negative for BTEX

Price: $1

EXPO dry erase markers scented ink

Tested POSITIVE for BTEX chemicals: 98 ppm xylene, 9 ppm toluene, 12 ppm ethylbenzene

Store: Amazon.com

Price: $5.50

The Board Dudes 6 magnetic dry erase markers

Tested POSITIVE for BTEX chemicals: 87 ppm toluene; 0.78 ppm benzene; 0.52 ppm ethylbenzene; 1.3 ppm xylen

Store: Amazon.com

Price: $4

RULERS

Tested for BPA and phthalates

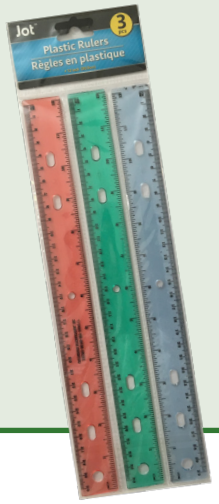
We tested 3 brands of rulers for BPA and phthalates. None of the rulers that we tested were found to contain BPA or phthalates. We recommend that parents buy any of these three rulers if they are trying to avoid buying a product with BPA or phthalates.

Jot plastic rulers 3 count (red, green, blue)

Store: Dollar Tree

Tested negative for BPA and phthalates

Price: $1



Westcott shatterproof ruler 12 inch (green)

Store: Michael's

Tested negative for BPA and phthalates

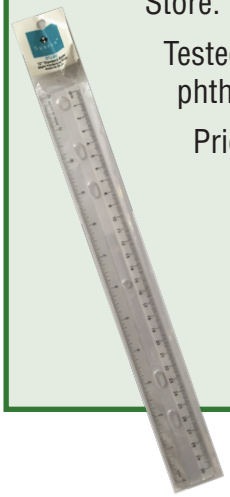
Price: $1.99

Sparco 12 inch standard ruler (clear)

Store: Walmart.com

Tested negative for BPA and phthalates

Price: $2.98



SPIRAL NOTEBOOKS

Metal wires tested for lead

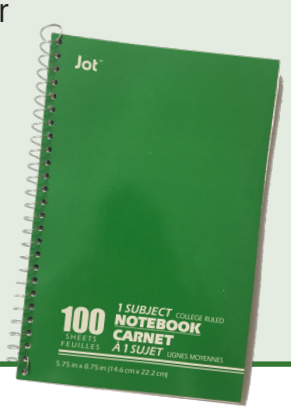
We tested three notebook spirals for the presence of lead in the metal. None of the metal spirals were found to contain lead. We recommend that parents purchase any of these three products if the parents are trying to avoid purchasing products that contain lead.

Jot 1 subject college ruled notebook 100 sheets (green)

Store: Dollar Tree

Tested negative for lead

Price: $1



Norcom 1 subject wide ruled 70 sheets (red)

Store: Target

Tested negative for lead

Price: $0.99

Mead 1 subject wide ruled 90 sheets (yellow)

Store: Target

Tested negative for lead

Price: $2.79

GLUE

Tested for lead

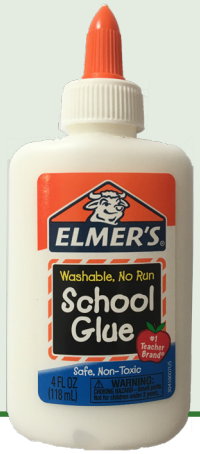
We tested two bottles of glue and two types of glue sticks for the presence of lead. None of the glue products were found to contain lead. We recommend that parents purchase any of these four products if the parents are trying to avoid purchasing products that contain lead.

Elmer's school glue

Store: Purchased at Target but widely available

Tested negative for lead

Price: $2



Elmer's washable color glue (green)

Store: Target

Tested negative for lead

Price: $2.99

Playskool washable glue stick jumbo size

Store: Dollar Tree

Tested negative for lead

Price: $1

Elmer's washable school glue pens (3 count)

Store: Dollar Tree

Tested negative for lead

Price: $1

3-RING BINDERS

Tested for phthalates

We tested three 3-ring binders for the presence of phthalates. One binder was found to contain high levels of phthalates. We recommend that parents purchase the products labeled in green if the parents are trying to avoid purchasing products containing phthalates.

Jot 1-inch 3-ring binder (blue)

Tested POSITIVE for phthalates DEHP (240,000 parts per million) and DINP (8,000 ppm)

Store: Dollar Tree

Price: $1

Avery 1-inch 3-ring binder (white)

Store: Target

Tested negative for phthalates

Price: $0.89

Yoobi 1-inch D-rings binder (pink)

Store: Target

Tested negative for phthalates

Price: $4.29

LUNCHBOXES

Tested for phthalates

We tested two school lunchboxes for the presence of phthalates. None of the lunchboxes were found to contain phthalates. We recommend that parents purchase either of these two products if the parents are trying to avoid purchasing products that contain phthalates.

Thermos Disney Star Wars lunchbox (BB8)

Store: Target

Tested negative for phthalates

Price: $9.99

Disney princess lunchbox

Store: Amazon.com

Tested negative for phthalates

Price: $8.48

WATER BOTTLES

Tested for lead

We tested two bottles water bottles for the presence of lead. Neither of those water bottles were found to contain lead. We also reviewed recent Consumer Product Safety Commission recalls for water bottles that contain lead. Two of those water bottles were recalled by the CPSC for containing lead. While both of those water bottles were recalled, parents may still have these bottles at home. We recommend that parents purchase the two bottles labeled in green if the parents are trying to avoid purchasing products that contain lead. We also recommend that parents check their cabinets for the two bottles labeled in red and dispose of those bottles if they have the bottles in their homes.

Thermos pink water bottle (with rainbows)

Store: Target

Tested negative for lead

Price: $14.99

Thermos purple water bottle

Store: Target

Tested negative for lead

Price: $14.99

WATER BOTTLES (cont.)

Tested for lead

Base Brands Reduce Hydro Pro Furry Friends water bottle

Store: Costco and Amazon.com

Recalled for lead on April 19, 2018

Price: $13

According to the CPSC's recall notice, the recalled water bottles were sold from January 2018 through February 2018. They were sold in a pack of two bottles: a pink bottle with a character of a bear face and a gray bottle with the character of a lamb head. The recalled water bottles have a removable lid gasket and a rubber carry strap. Reduce, www.reduceeveryday.com, and 14oz/0.41L are printed on the blue or pink underside of the bottle.

More info: https://www.cpsc.gov/Recalls/2018/base-brands-recalls-water-bottles-due-to-violation-of-lead-paint-standard-recall-alert

GSI Outdoors Kids' insulated water bottles

Store: L.L. Bean

Recalled for lead on July 19, 2016

Price: $20

The recalled bottles are 13.5 ounces capacity with the following color prints: Dino Bones, Flower Power, Orange Grid camo, Purple Tie Dye Butterfly and Robo Shark. The item identification number 297684 is printed on a sticker on the bottom of the bottle. Also printed on the sticker are "PO#844" and "BB2D2-LLB-R45-0413."

More info: https://www.cpsc.gov/node/29857

Negative Health Effects of Chemicals

Asbestos

Asbestos is an extremely toxic substance; inhaling or ingesting any form of asbestos can lead to serious health conditions, including lung cancer and mesothelioma.[15] It is classified as a carcinogen by multiple organizations including the U.S. Department of Health and Human Services, the Environmental Protection Agency (EPA) and the International Agency for Research on Cancer (IARC) and has been associated with many deadly forms of cancer.[16] Research has shown that asbestos fibers can disrupt DNA and lead to tissue damage.[17] In the United States, asbestos has been used for many decades and its negative health effects have been recognized as early as the 1930s.[18] However, more recent analysis has shown that even at relatively low exposure rates, asbestos exposure can be linked to increased rates of cancer.[19] Given this research on the adverse effects of asbestos, along with evidence that asbestos fibers persist airborne and in the environment for long periods of time, it is concerning that consumer products such as children's makeup contain even trace amounts of this toxic chemical.[20] Because increased exposure and accumulation of asbestos is associated with higher incidence of cancer, exposing children to asbestos at a young age may result in a higher likelihood of cancer later as adults.[21] There are currently no effective means to predict which individuals exposed to asbestos will develop disease.[22]

There are no current U.S. federal laws regulating the amount of asbestos allowed in children's products.

Phthalates

Phthalates are a group of chemicals used to soften and increase the flexibility of plastics like polyvinyl chloride (PVC), which is brittle in its original formulation. The plastics industry uses large amounts of phthalates in products such as home siding, flooring, furniture, food packaging, clothing, and toys. Phthalates are also commonly used in industrial products like solvents, lubricants, glue, paint, sealants, insecticides, detergent, and ink.[23] These chemicals can leach from these consumer products and be ingested, absorbed dermally or inhaled in enclosed spaces.[24] Many food products are packaged with phthalates, which have been shown to leach from packaging into food.[25] Research has documented the potential damage of exposure to phthalates at crucial stages of development, including altered development of the male reproductive system and early puberty.[26] Although the exact mechanism of action is unknown, phthalate exposure during pregnancy has also been linked to irregular fetal growth.[27] Additionally, at least one type of phthalate is suspected of causing cancer, as phthalates are thought to be endocrine disruptors.[28] However, those are just some of the many negative effects of phthalates; other studies have linked phthalates to asthma, childhood obesity and lower I.Q. scores.[29] [30] [31] Giv-

en the wide variety of adverse health effects, it's concerning to examine the prevalence with which phthalates are used in consumer products. Especially as more recent animal studies have found developmental impacts even with low dose exposures, the massive number of phthalates present in daily environments raises cause for extreme concern.[32]

The CPSC has set a safety limit of 1000 ppm of DEHP or DINP on any children's product.[33]

Lead

Lead is an extremely dangerous toxin that can be absorbed, inhaled and ingested. Once it enters the body it is stored in various bones, tissue and blood, meaning that as these deteriorate through one's life, it is steadily released.[34] For young children, lead is particularly dangerous as it impairs development of the brain and nervous system leading to lower I.Q.s, antisocial behavior and attentional difficulties.[35] For all humans, lead can cause anemia, reproductive toxicity, reduced kidney function, immune system impairment among other serious effects.[36] Although lead has been banned in the United States, it has not been banned everywhere and therefore can be found in imported products.[37] Children, who frequently will put things in their mouth, typically have the most lead in their bodies according to the National Institute of Environmental Health Science. [38]

According to the Center for Disease Control (CDC), no level of lead is safe for children.[39] The CPSC recalls any water bottles for children that contain more than 100 ppm of lead.

BPA

Bisphenol-A (BPA) is utilized in the production of a variety of polycarbonate plastic products, including many of those utilized by children.[40] Research has shown that aside from gastrointestinal exposure, BPA does leach from these plastic products and thus is absorbed dermally.[41] BPA was first utilized as an artificial estrogen replacement and is a known endocrine disruptor in regards to sexual development in both males and females, however, research indicates that it also is an endocrine disruptor in regards to metabolic hormones.[42]

Moreover, certain estrogen receptors are linked with cardiac function and thus BPA has also been shown to have a connection with increased risk for heart attack and other cardiac irregularities.[43] BPA has effects at low doses; doses which have been linked with increased rates in hormonally linked varieties of cancer, abnormalities in sexual development in both males and females, Type 2 diabetes and obesity and neurobehavioral problems including ADHD.[44] Gestational BPA exposure has also been linked to "impaired behavioral regulation," in young children, highlighting a general scientific consensus on the effects of BPA: it disrupts developmental processes and thus is particularly dangerous for young children.[45] [46] Considering that young children often spend the most time with plastic products such as toys and bottles, this is particularly alarming. None of the products that we tested contained BPA.

BTEX (benzene, toluene, ethylbenzene, and xylene)

BTEX compounds can be found in a wide variety of consumer products. Ethylbenzene, in particular, is very commonly utilized in the production of products for children.[47] Because these chemicals can volatize from the products they are manufactured into, air samples taken from indoor spaces often contain much higher levels than outdoor samples as chemicals volatize and accumulate in contained spaces.[48]

Virtually all of BTEX absorption is achieved

through the inhalation of these volatile organic compounds (VOCs).[49] BTEX chemicals are endocrine disruptors, linked to dangerous disruptions in sexual reproduction, liver and kidney function and immune system functioning.[50] Endocrine disruptors are particularly dangerous to children during certain periods of development, raising particular concern for the high prevalence of BTEX chemicals in toys and other consumer products designated for children and adolescents.[51] Ethylbenzne is a possible carcinogen according to the IARC.[52] Benzene is classified by the U.S. Department of Health and Human Services as a known carcinogen.[53] In addition, studies on benzene in particular indicate a link between respiratory problems (asthma, pulmonary infections, bronchitis, general function) and the presence of the chemical in air sources.[54] Although there is little evidence linking the volatization of BTEX chemicals specifically from consumer products and neurodevelopment impairment, there is evidence that BTEX air pollutants from industrial and vehicle emissions effect neurodevelopment in children.[55] BTEX chemicals including benzene, xylene, and toluene, one of which, benzene, is considered a carcinogen by the CPSC.[56]

Of the BTEX chemicals, benzene is the chemical of most concern, according to toxicologist Daniel Teitelbaum, who spoke with the authors of this consumer guide. Benzene exposure can cause problems in the blood.[57] People who breathe benzene for long periods may experience harmful effects in the tissues that form blood cells, especially the bone marrow.[58] Long-term exposure to benzene can cause cancer of the blood-forming organs. This condition is called leukemia. Exposure to benzene has been associated with development of a particular type of leukemia called acute myeloid leukemia.[59]

According to the Agency for Toxic Substances and Disease Registry, while we do not know what human health effects might occur after long-term exposure to products contaminated with benzene, in animals, exposure to food or water contaminated with benzene can damage the blood and the immune system and can cause cancer.[60]

Conclusion & Recommendations

Each year, millions of parents face the task of preparing their children for the upcoming school year. Binders, crayons and markers are among the many products that frequently appear on back-to-school shopping lists presented to parents. However, some manufacturers of these back-to-school products continue to utilize chemicals such as asbestos, phthalates, BTEX, and lead despite evidence of their danger and despite the heightened sensitivity of children to these chemicals.

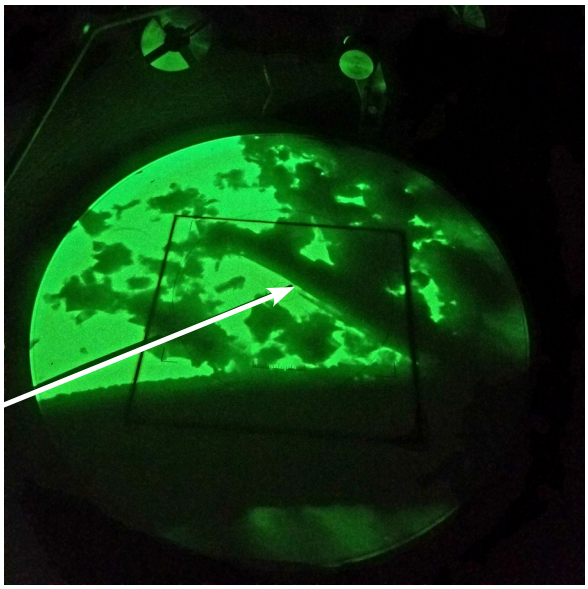
While parents and teachers can take a step in protecting children by using this shopping guide, the companies producing these products should take action by ensuring that dangerous and potentially dangerous chemicals stay out of consumer products, especially those destined for use by children. Additionally, government agencies and legislators can protect children by increasing regulatory oversight over these products and manufacturers.

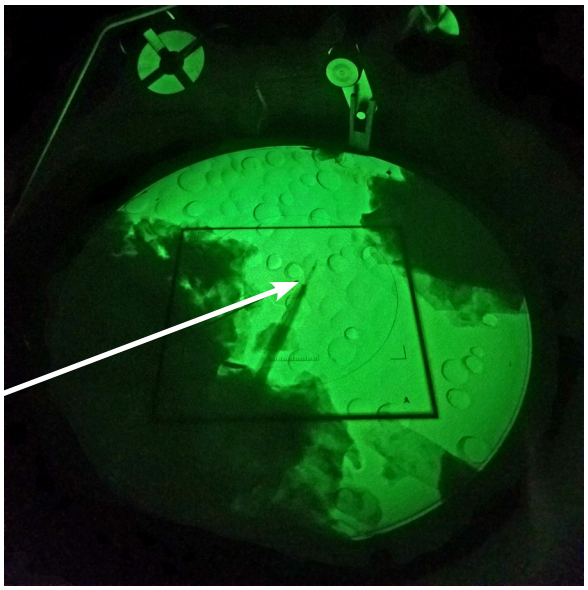
We have the following recommendations:

- **Dollar Tree and Playskool** should recall the asbestos-tainted crayons and remove them from store shelves. They should also contact customers to warn them about the crayons.
- **Dollar Tree and Jot** should recall the 3-ring binder that contained high levels of phthalates and remove them from store shelves. They should also contact customers to warn them about the binders.
- **Expo and The Board Dudes** should recall their dry-erase markers that contain BTEX chemicals and remove them from store shelves. They should also contact consumers to warn them about the levels of BTEX chemicals in the markers. Amazon.com should remove the dry erase markers from its website and inform consumers about the markers.
- **The U.S. Consumer Product Safety Commission (CPSC)** should conduct more testing on school supplies for chemicals of concern.
- **Policymakers** should maintain the CPSC's funding and authorities to protect the public and mandate the CPSC to regularly test more children's products for toxic chemicals.
- **Parents and teachers** should use our shopping guide when buying supplies and subscribe to email recall updates from the CPSC and other U.S. government safety agencies available at www.recalls.gov.

Appendix A

Below are images taken from the laboratory depicting asbestos tremolite fibers. The white arrows point to the tremolite fibers.





Endnotes

[1] Deloitte, "2018 Back to School Survey", https://www2.deloitte.com/us/en/pages/consumer-business/articles/back-to-school-survey.html

[2] Ibid.

[3] Jessica Brown, "Prices jump 7.3% for back-to-school supplies", USA Today, 24 July 2013, https://www.usatoday.com/story/money/business/2013/07/24/prices-jump-for-back-to-school-supplies/2585331/

[4] Hamilton College, "Health & Safety Labeling, and other Chemical Hazard Management Issues in the Arts," https://www.hamilton.edu/documents/Art%20Hazard%20Labeling%20Considerations.pdf

[5] United States Consumer Product Safety Commission, "Art Materials Business Guidance", https://www.cpsc.gov/Business--Manufacturing/Business-Education/Business-Guidance/Art-Materials

[6] Ibid.

[7] Environmental Working Group, "EWG's Back-to School Guide," 12 October 2008, https://www.ewg.org/research/ewgs-back-school-guide#.W0TP0C3My1s

[8] Amber Moore, "Back-to-School Supplies Contain Toxic Chemicals, Report," Medical Daily, 27 August 2012, https://www.medicaldaily.com/back-school-supplies-contain-toxic-chemicals-report-242176

[9] Center for Health, Environment & Justice, "Back-to-School Guide to PVC-Free School Supplies," August 2012, http://www.chej.org/publications/PVCGuide/PVCfree2012_1.pdf

[10] Mamavation, "Back to School: Non-Toxic and Eco-Friendly School Supplies", https://www.mamavation.com/featured/back-to-school-non-toxic-and-eco-friendly.html

[11] Irina Webb, "8 Tips on Finding Non-Toxic Back to School Supplies," Moms Advocating Sustainability, 11 August 2014, https://www.momsadvocatingsustainability.org/school-supplies/

[12] Healthy Holistic Living, "Dozens of Back to School Products That Are Exposing Your Children to Toxic Chemicals," https://www.healthy-holistic-living.com/toxic-school-supplies.html

[13] Anna Low-Beer, "Back-to-School: Tips for Toxic-Free School Supplies," U.S. PIRG, 26 August 2016, https://uspirg.org/blogs/blog/usp/back-school-tips-toxic-free-school-supplies

[14] Environment America, News Release: "'Back to School' Toolkit for Parents to Get the Lead Out of school's drinking water," 5 September 2017, https://environmentamerica.org/news/ame/%E2%80%9Cback-school%E2%80%9D-toolkit-parents-get-lead-out-schools%E2%80%99-drinking-water

[15] World Health Organization, "Public Health: Asbestos," http://www.who.int/ipcs/assessment/public_health/asbestos/en/

[16] National Cancer Institute, "Asbestos Exposure and Cancer Risk," https://www.cancer.gov/about-cancer/causes-prevention/risk/substances/asbestos/asbestos-fact-sheet#q3

[17] Solbes E, Harper RW, "Biological responses to asbestos inhalation and pathogenesis of asbestos-related benign and malignant disease," Journal of Investigative Medicine, Published Online First: 06 January 2018, doi: 10.1136/jim-2017-000628.

[18] A. J. Lanza, William J. McConnell and J. Willam Fehnel, "Effects of the Inhalation of Asbestos Dust on the Lungs of Asbestos Workers, Public Health Reports 50: 1-21, 4 January 1935, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1996125/?page=1

[19] S. Van der Bij, et al., "Lung cancer risk at low cumulative asbestos exposure: meta-regression of the exposure-response relationship," Cancer Causes Control (1):1-12, 24 January 2013, doi: 10.1007/s10552-012-0107-7

[20] Agency for Toxic Substances & Disease Registry, "Public Health Statement for Asbestos," September 2001, https://www.atsdr.cdc.gov/phs/phs.asp?id=28&tid=4

[21] Bruce Y. Lee, "What Was Asbestos Doing In Children's Makeup?" Forbes, 31 December 2017, https://www.forbes.com/sites/brucelee/2017/12/31/what-was-asbestos-doing-in-childrens-makeup/#20cf5e57c000

[22] Agency for Toxic Substances & Disease Registry, "Public Health Statement for Asbestos," September 2001, https://www.atsdr.cdc.gov/phs/phs.asp?id=28&tid=4

[23] National Institute of Environmental Health Sciences, "Phthalates, the Everywhere Chemical,"https://www.niehs.nih.gov/research/supported/assets/docs/j_q/phthalates_the_everywhere_chemical_handout_508.pdf

[24] Ursel Heaudorf, et al., "Phthalates: Toxicology and exposure," International Journal of Hygiene and Environmental Health 210: 623-634, 31 October 2007, https://doi.org/10.1016/j.ijheh.2007.07.011

[25] Luca De Toni, et al., "Phthalates and heavy metals as endocrine disruptors in food: A study on pre-packed coffee products," Toxicology Reports 4: 234-239, 2017, https://doi.org/10.1016/j.toxrep.2017.05.004

[26] Male development: National Institutes of Health, National Library of Medicine, Tox Town, Phthalates, toxtown.nlm.nih.gov/text_version/chemicals.php?id=24, (accessed on 2 November, 2017); Early puberty: I. Colon, et al., "Identification of Phthalate Esters in the Serum of Young Puerto Rican Girls with Premature Breast Development," Environmental Health Perspectives 108: 895-900, 2000.

[27] Yan Zhao, et al., "Prenatal phthalate exposure, infant growth, and global DNA methylation of human placenta," Environmental and Molecular Mutagenesis 56(3): 286-292, April 2015
[28] National Institutes of Health, National Library of Medicine, Tox Town, Phthalates, toxtown.nlm.nih.gov/text_version/chemicals.php?id=24,
[29] Shin Hye Kim and Min Jung Park, "Phthalate exposure and childhood obesity," Annals of Pediatric Endocrinology & Metabolism 19(2): 69-75, 30 June 2014, doi: 10.6065/apem.2014.19.2.69
[30] Ming-Ju Tsai, et al., "The association between phthalate exposure and asthma," The Kaohsiung Journal of Medical Sciences 28(7): S26-S38, July 2012, https://doi.org/10.1016/j.kjms.2012.05.007
[31] National Institute of Environmental Health Sciences, "Phthalate Exposure Linked to Lower IQ," https://www.niehs.nih.gov/research/supported/sep/2015/phthalate/index.cfm
[32] Kayla M. Quinnies, et al., "Direct and transgenerational effects of low doses of perinatal di-(2-ethylhexyl) phthalate (DEHP) on social behaviors in mice," 15 February 2017, https://doi.org/10.1371/journal.pone.0171977
[33] 16 C.F.R. Part 1307Consumer Product Safety Commission, October 2017, https://www.gpo.gov/fdsys/pkg/FR-2017-10-27/pdf/2017-23267.pdf
[34] Centers for Disease Control and Prevention: The National Institute for Occupational Safety and Hazard, "Information for Workers: Health Problems Caused by Lead," https://www.cdc.gov/niosh/topics/lead/health.html
[35] World Health Organization, "Lead poisoning and health," 9 February 2018, http://www.who.int/news-room/fact-sheets/detail/lead-poisoning-and-health
[36] Ibid.
[37] Centers for Disease Control and Prevention, "Lead Hazards in Some Holiday Toys and Toy Jewelry," 27 November 2017, https://www.cdc.gov/features/leadintoys/index.html
[38] National Institute of Environmental Health Sciences, "Lead and Your Health," https://www.niehs.nih.gov/health/materials/lead_and_your_health_508.pdf
[39] Centers for Disease Control and Prevention, "Lead," https://www.cdc.gov/nceh/lead/default.htm
[40] Sher Singh and Steven Shoei-Lung Li, "Bisphenol A and phthalates exhibit similar toxicogenomics and health effects," Gene 494(1): 85-91, 15 February 2012, https://doi.org/10.1016/j.gene.2011.11.035
[41] Andaluri G, et al., "Plastic toys as a source of exposure to bisphenol-A and phthalates at childcare facilities," Environmental Monitoring and Assessment 190(2): 65, 6 January 2018, doi: 10.1007/s10661-017-6438-9.
[42] Sher Singh and Steven Shoei-Lung Li, "Bisphenol A and phthalates exhibit similar toxicogenomics and health effects," Gene 494(1): 85-91, 15 February 2012, https://doi.org/10.1016/j.gene.2011.11.035
[43] Frederick S. vom Saal, et al., "Chapel Hill bisphenol A expert panel consensus statement: Integration of mechanisms, effects in animals and potential to impact human health at current levels of exposure," Reproductive Toxicology 24(2): 131-138, August-September 2007, doi: 10.1016/j.reprotox.2007.07.005
[44] Ibid.
[45] Joe M. Braun, et al., "Impact of Early-Life Bisphenol A Exposure on Behavior and Executive Function in Children," Pediatrics, 128(5): 872-882, November 2011, doi: 10.1542/peds.2011-1335
[46] Ejaredar M, et al., "Bisphenol A exposure and children's behavior: A systematic review," Journal of Exposure Science and Environmental Epidemiology 27(2):175-183, March 2017, DOI: 10.1038/jes.2016.8
[47] Ashley L. Bolden, et al., "New Look at BTEX: Are Ambient Levels a Problem?" Environmental Science and Technology 49(9): 5261–5276, 15 April 2015, DOI: 10.1021/es505316f
[48] Ibid.
[49] Seong Kwang Lim, et al., "Risk Assessment of Volatile Organic Compounds Benzene, Toluene, Ethylbenzene, and Xylene (BTEX) in Consumer Products," Journal of Environmental Health Part A 77(22-24): 1502-1521, 24 October 2014, https://doi.org/10.1080/15287394.2014.955905
[50] Ashley L. Bolden, et al., "New Look at BTEX: Are Ambient Levels a Problem?" Environmental Science and Technology 49(9): 5261–5276, 15 April 2015, DOI: 10.1021/es505316f
[51] Ibid.
[52] IARC. Ethylbenzene. IARC Monograph Evaluating Carcinogenic Risks. 2000;77:227–66.
[53] Ohio Department of Health, "BTEX," 30 June 2016, https://www.odh.ohio.gov/-/media/ODH/ASSETS/Files/eh/Chemical-Fact-sheets/008-BTEX.pdf?la=en
[54] Amparo Ferrero, et al., "Benzene Exposure and Respiratory Health in Children: A Systematic Review of Epidemiologic Evidences," Journal of Pollution Effects & Control, 22 August 2014, https://www.omicsonline.org/open-access/benzene-exposure-and-respiratory-health-in-children-a-systematic-review-of-epidemiologic-evidences-2375-4397.1000114.php?aid=33894
[55] Jeanette A. Stingone, et al., "Early-life exposure to air pollution and greater use of academic support services in childhood: a population-based cohort study of urban children," Environmental Health 16:2, 18 January 2017, doi: 10.1186/s12940-017-0210-z
[56] Consumer Product Safety Commission, "Art and Craft Safety Guide," https://www.acmiart.org/files/CPSC_Art_and_Craft_Safety_Guide_5015.pdf
[57] Agency for Toxic Substances and Disease Registry (CDC), "Benzene," https://www.atsdr.cdc.gov/sites/toxzine/benzene_toxzine.html#Benzene%20and%20Children
[58] Ibid.
[59] Ibid.
[60] Ibid.
[61] Environmental Working Group, Is Asbestos in Your Children's Toys? https://www.ewg.org/enviroblog/2015/07/asbestos-your-children-s-toys