

Steward, Kara (ECY)

From: Erika Schreder <eschreder@toxicfreefuture.org>
Sent: Wednesday, October 12, 2016 10:18 AM
To: Steward, Kara (ECY)
Cc: Nancy Uding; Laurie Valeriano
Subject: additional information for CSPA rule
Attachments: BTBPE Supp Info.docx; DBDPE Supp Info.docx; Dechlorane Plus Supp Info.docx; SCCP Supp Info.docx; TCP Supp Info.docx

Hi Kara,

Please find attached five documents with additional information on flame retardants we are asking Ecology to add to the reporting list. We will be following up with additional information on the phthalates as well.

best,

Erika

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1,2-bis(2,4,6-tribromophenoxy)ethane (BTBPE) (CAS # 37853-59-1)

Use: BTBPE is an additive flame retardant introduced to replace octa-BDE and used in various plastic resins including polystyrene and thermoplastics.

Children's Exposure: BTBPE has been detected in household dust in Washington state as well as Boston, California and the U.K.¹⁻⁴ It has been detected in children's toys in China at levels up to 117 µg/g as well as in food samples in Sweden and Ireland.⁵⁻⁷ BTBPE has been detected in human serum in two studies, in Norway and in Canada.^{8,9} Sampling in the Great Lakes region and the Arctic has detected BTBPE in outdoor air at levels up to 1 pg/m³.^{10,11} Higher concentrations in air were seen in Louisiana, up to 70 ng/m³.⁷

Persistence and Bioaccumulation: In its analysis, the European Food Safety Authority identified BTBPE as having high persistence and high potential for bioaccumulation.⁷ BTBPE has been detected in various biota, including marine mammals in the South China sea and the Canadian Arctic as well as in Glaucous gulls from the Norwegian Arctic, juvenile sole from the French Atlantic coast, and trout and other fish in Lake Ontario.^{7,12} A study in juvenile trout given an environmentally relevant dose of BTBPE found fish accumulated the compound and concluded it has a high potential for biomagnification in aquatic food webs.¹³ Researchers also found BTBPE accumulated in fathead minnows.¹⁴

Toxicity:

Endocrine disruption: Tests on chicken eggs and hepatocytes found that BTBPE exposure depressed expression of a key enzyme related to thyroid hormone.¹⁵ In addition, BTBPE's metabolite 2,4,6-tribromophenol is a thyroid disrupting compound.¹⁶ In an epidemiological study, dust concentrations of BTBPE were positively and significantly associated with levels of T3 in adult men.¹⁷

Other effects: Inhalation exposure of rats to BDBPE resulted in behavioral, respiratory, and gastrointestinal effects as well as dermatitis.¹⁸ Dermal exposure of rabbits resulted in "nutritional and gross metabolic changes."¹⁸

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Decabromodiphenylethane (DBDPE)(CAS# 84852-53-9)

Use: DBDPE is used as a substitute for deca-BDE as an additive flame retardant, primarily in housings for electronics. According to industry marketing materials, it can be used in multiple plastic resins.

Children's exposure: DBDPE has been detected widely in house dust, including in Washington state.¹⁻³ Washington Department of Ecology testing has found DBDPE in children's products including a tablet, pajamas, furniture, and car seat.⁴ A study of Canadian mothers detected DBDPE in serum and breast milk.⁵ It has been detected in children's toys in China at levels up to 237 µg/g.⁶ In a survey of sewage sludge from 12 countries, DBDPE was found in sludge from all countries⁷. It has also been detected in outdoor air in the Great Lakes basin as well as the Arctic, and in tree bark.⁸⁻¹⁰

Toxicity: DBDPE was rated as high or very high hazard by the USEPA, an authoritative source, for developmental effects, persistence, and bioaccumulation.¹¹

Developmental effects: EPA estimated a LOAEL of 6 mg/kg-day for decreased levels of T4 in male mice and locomotor effects; a LOAEL of 6.7 mg/kg (single dose gavage) for disruption in habituation in male Sprague Dawley rats; and 20.1 mg/kg (single dose gavage) for disruption in habituation in male mice.¹¹

Hormone disruption: Rats orally exposed to DBDPE for 90 days had significantly increased levels of T3.¹²

Repeated dose effects: The 90-day oral study in rats determined a LOAEL of 100 mg/kg-day (only dose tested) for hepatotoxicity indicated by changes in serum chemistry (also cited by EPA).^{11, 12}

Persistence: EPA designated DBDPE "very high" for persistence based on studies that found it was not inherently biodegradable in activated sewage sludge or anaerobic sewage sludge and an estimated environmental half-life of more than one year.¹¹

Bioaccumulation: EPA designated DBDPE "high" for bioaccumulation hazard based on "monitoring data reporting detections in many different species including those higher on the food chain." EPA cites detections in five fish species in Lake Winnipeg, Canada; giant and red pandas in China; in the muscle of wild water birds from China's Pearl River Delta as well as bird eggs from North China; in herring gull eggs from the Laurentian Great Lakes; in falcon eggs from Canada and Spain; sole from the French Atlantic coast; in polar bears from Canada; in mussels from Japan and Korea; prawns, birds, and fish from Asia; and bird eggs in the Norwegian Arctic.¹¹

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Dechlorane Plus (CAS # 13560-89-9)

Use: Dechlorane Plus is a chlorinated flame retardant used in wires, cables, and connectors and in paper laminates, with typical levels in the range of 20-25%.¹ It can be used in multiple polymers including ABS, HIPS, epoxy, nylon, and polypropylene.² A significant use is reported to be in television enclosures.³

Children's Exposure: Dechlorane Plus is used in consumer products and has been detected in house dust in California and Canada.^{4,5} It has also been detected in outdoor air in the Great Lakes region as well as in Europe and the Arctic.⁶⁻⁸ A Canadian study detected the compound in breast milk, and European and Chinese studies have detected it in human serum.⁹⁻¹¹ It has also been found to cross the placenta.¹²

Persistence and Bioaccumulation: The predicted half-life is 360 days in soil and 1600 days in sediment.¹³ The bioaccumulation appears to differ between the two isomers (syn- and anti-), but the predicted BCF is 3.2.¹³ Modeling and detections in sediment and biota led the authors of a review to conclude Dechlorane Plus is persistent and bioaccumulative.⁸

Toxicity:

Reproductive Toxicity: In a 28-day dermal toxicity study in rabbits, there was a significant decrease in absolute ovarian weights at the lowest dose tested, 500 mg/kg-day.¹⁴

Endocrine Disruption: Serum levels of Dechlorane Plus were associated with higher total T3 levels in women living more than 20 years in an e-waste recycling region of China.¹²

Organ Toxicity: In a 28-day day inhalation study in rats, at the lowest dose tested, 0.64 mg/L (dust), both male and female rats showed significant increases in absolute liver weights. Females also had significantly greater lung weights and slightly increased numbers of macrophages in the alveoli.¹⁴

Additional Considerations: Dechlorane Plus has a high degree of structural similarity to organochlorine pesticides including heptachlor, chlordane, nonachlor, and aldrin, substances restricted due to persistence, bioaccumulation, and toxicity.¹⁵

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Short-Chain Chlorinated Paraffins (SCCPs) (CAS # 85535-84-8)

Use: SCCPs are used in lubricants, as coolants in metal operations, and as flame retardants in plastics, particularly PVC.¹ According to the industry, they are commonly used as secondary plasticizers together with phthalates or phosphate esters; they can also be used in other plastics including ABS, polyester, polyethylene, polypropylene, and urethane foam.² U.S. production has ceased, but they are also produced in China.

Children's Exposure: SCCPs have been detected in breast milk as well as other human tissues.^{1, 3} They have also been detected in indoor air as well as household dust, and researchers have identified both inhalation and dust as important sources of exposure (inhalation greater for adults and dust greater for young children).⁴ SCCPs have been detected in food including oils, butter, animal fat, fish, and shellfish.⁵ They have been found in outdoor air in Norway at up to 10.6 ng/m³ as well as in the UK; in river water in Europe and Canada; and in sediments in Europe, Japan, and Canada.⁵

Persistence and Bioaccumulation: The USEPA has stated that SCCPs are "persistent, bioaccumulative, and toxic to aquatic organisms at low concentrations. They can remain in the environment for a significant amount of time and can bioaccumulate in animal tissues, increasing the probability and duration of exposure."¹ The Washington Department of Ecology and the European chemical Substances Information System (ESIS) have listed SCCPs as a PBT.⁶ The Persistent Organic Pollutant Review Committee of the Stockholm Convention concluded that SCCPs meet the criteria for listing under the convention, stating that they "are likely as a result of long-range environmental transport to lead to significant adverse human health and environmental effects such that global action is warranted."⁷ Chlorinated paraffins have been detected in fish and aquatic invertebrates, Beluga whales, and earthworms.⁵

Toxicity: SCCPs are listed as a Substance of Very High Concern by the European Chemicals Agency.⁸

Cancer: SCCPs have been identified by the State of California as carcinogenic under the Safe Drinking Water and Toxic Enforcement Act (Prop 65).⁹ The National Toxicology Program has listed chlorinated paraffins as "reasonably anticipated to be human carcinogens."¹⁰

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Tricresyl Phosphate (TCP) (CAS # 1330-78-5)

Use: TCP is a flame retardant used in PVC and other plastics as well as in hydraulic fluids.

Children's Exposure: TCP has been detected in house dust in California and Canada as well as in other countries.¹⁻³ It has not been widely analyzed in biota, but was detected in a Swedish study in perch, mussels, eelpout, and salmon.⁴

Persistence and Bioaccumulation: The USEPA rated TCP as High hazard for bioaccumulation.⁵ Bioconcentration factors between 385 and 2,768 have been measured for fish.⁶ Biodegradation appears to occur in the aquatic environment, but TCP persists in sediment with a projected half-life of 300 days.⁶

Toxicity:

Reproductive Toxicity: The USEPA has rated TCP as High hazard for reproduction based on a LOAEL of 7 mg/kg/day for ovarian lesions.⁵ In rats exposed by gavage, sperm concentration, motility, and progressive movement were lower than in control rats, and a dose-dependent increase in abnormal sperm morphology was observed; fewer exposed females delivered live young; the LOAEL was established at 100 mg/kg/day based on abnormal sperm morphology.^{5,7} From a dietary exposure study in mice, EPA estimated a LOAEL of 62.5 mg/kg/day based on decreased sperm motility.⁵ Histopathologic changes were observed in both male and female reproductive organs. A National Toxicology Program 2-year feeding study in rats found those exposed to 300 ppm (estimated equivalent 15 mg/kg) had increased incidence of ovarian lesions.⁸

Organ Toxicity: The USEPA has rated TCP as High hazard for repeated dose toxicity.⁵ A 9-week feeding study of Wistar rats found increased absolute and relative liver weights as well as changes in levels of protein, cholesterol, and other compounds in rats exposed to 5 g/kg TCP in their diets.⁶

Neurotoxicity: In the National Toxicology Program's 13-week gavage study in mice, neuronal degeneration was observed in mice exposed to doses of 100 mg/kg and above.⁸

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