



# A PUBLIC INTEREST GUIDE TO TOXIC FLAME RETARDANT CHEMICALS



Joseph DiGangi, PhD  
Senior Science & Technical  
Advisor

IPEN  
April 2013



a toxics-free future



**"WE DID NOT FIND FLAME RETARDANTS IN FOAM TO PROVIDE ANY SIGNIFICANT PROTECTION," SAID DALE RAY, A TOP OFFICIAL WITH THE CONSUMER PRODUCT SAFETY COMMISSION..." – CHICAGO TRIBUNE, MAY 6, 2012**



# A PUBLIC INTEREST GUIDE TO TOXIC FLAME RETARDANT CHEMICALS

Joseph DiGangi, PhD  
Senior Science and Technical Advisor  
IPEN  
April 2013  
[ipen@ipen.org](mailto:ipen@ipen.org)  
[www.ipen.org](http://www.ipen.org)

## CONTENTS

1. INTRODUCTION .....	4
2. INFORMATION SOURCES.....	4
3. FIRE SAFETY .....	5
4. SUBSTANCES MARKETED AS FLAME RETARDANTS .....	7
5. INDUSTRY ACTIONS: A HISTORY OF DECEPTION .....	12
6. ADDRESSING WASTES CONTAINING FLAME RETARDANT CHEMICALS.....	18
7. REGULATORY POLICY .....	20
8. PUBLIC INTEREST RECOMMENDATIONS AND ACTIONS .....	26
9. CONCLUSION .....	28
10. ABBREVIATIONS .....	28
11. REFERENCES .....	30

## 1. INTRODUCTION

Toxic chemicals marketed as flame retardants are widely present in our homes, our bodies, and even in our wastes. Due to increasing public health concerns, actions to regulate and eliminate them have occurred globally, nationally, and locally. However, the chemical industry continues to formulate new substances with similar toxic properties that are then incorporated into many products. These substances are now found throughout the global environment, wildlife, and people, and even in areas far from where these substances are used or produced, like the Arctic.

This public interest guide is a concise introduction to the science and politics of toxic flame retardants and includes a section on possible actions that can help reduce the harms of toxic chemicals to human health and the environment. It aims to raise public awareness about this harmful class of substances and stimulate action to reform how chemicals are produced, used, and substituted so that harms from toxic chemical exposure can ultimately be eliminated. While reading from start to finish provides a view of all the issues, readers are also encouraged to jump to the section of most interest to them, the same way they would use a tour guide.

## 2. INFORMATION SOURCES

This Guide primarily uses three key sources of information: 1) San Antonio Statement on Brominated and Chlorinated Flame Retardants; 2) *Chicago Tribune* investigative series, "Playing with Fire"; and 3) Reports from UN processes such as the Stockholm Convention on POPs and the Strategic Approach to International Chemicals Management. Links to these sources are provided in the References section.



**TOXIC CHEMICALS MARKETED AS  
FLAME RETARDANTS DO NOT PROVIDE  
FIRE SAFETY BENEFIT IN THE AMOUNTS  
ACTUALLY USED IN PRODUCTS**



In 2010, more than 200 scientists from 30 countries signed the ***San Antonio Statement*** in an effort to publicly raise concerns and call attention to neglected scientific information on bromine- and chlorine-containing flame retardants as a class. Environmental Health Perspectives published the fully-referenced Statement along with an editorial by Linda Birnbaum, Director of the US National Institute of Environmental Health Sciences and the US National Toxicology Program, and Ake Bergman, a prominent Swedish scientist and Director of the Environmental Chemistry Unit in the Department of Materials and Environmental Chemistry at Stockholm University. Birnbaum and Bergman de-

scribed the Statement as, "... a call for attention to a continuing pattern of unfortunate substitution..." and "...a reasoned plea from the scientific community..."

The *Chicago Tribune* published an in-depth four-part series on toxic chemicals marketed as flame retardants in May 2012 and continued with new investigative reports into 2013. The first four front-page articles described the widespread presence of the substances, and exposed how the chemicals do not actually provide fire safety benefit. The series exposed actions by the chemical industry to distort science, invent phony industry advocacy groups, and even pay a prominent physician to invent testimony about non-existent patients to undermine legislative proposals to protect public health. The series shows how the tobacco industry used fire marshals to focus attention on production of flame retarding furniture with toxic chemicals instead of fire-safe cigarettes. Finally the series examines the weaknesses of a current fire safety standard and a chemical regulatory system that allow these substances to be used in the first place. The series spurred senior Illinois Senator Richard Durbin to call for federal action by the US government on the matter, citing the startling facts reported in the series.

Toxic chemicals marketed as flame retardants have attracted global attention and action through *UN agreements*. In 2009, more than 170 governments agreed on the global elimination of three flame retardants through the Stockholm Convention. The widespread presence of flame retardant chemicals in electronic wastes led delegates participating in the Strategic Approach to International Chemicals Management to declare these types of hazardous chemicals to be a global emerging policy issue. At the same meeting, similar concerns about the lack of information on flame retardants and other types of toxic chemicals in consumer products led delegates from more than 100 countries to launch an ongoing project to tackle this problem by the United Nations Environment Programme (UNEP).

## 3. FIRE SAFETY

### 3.1 TOXIC CHEMICALS MARKETED AS FLAME RETARDANTS DO NOT ACTUALLY WORK IN PRODUCTS

The chemical industry claims that adding toxic chemicals marketed as flame retardants to polyurethane foam (known in some countries as "foam rubber") makes the difference "...between life and death." However, in an interview with the *Chicago Tribune*, Dale Ray, a top official with the US Consumer Product Safety Commission said, "We did not find flame retardants in foam to provide any significant protection." Ray also said that the amount of smoke is similar in flame-retarded products and that most fire victims die of smoke inhalation, not flames. The federal agency now believes that the best way to fire-proof furniture is to require upholstery to resist smoldering sources of ignition such as cigarettes. The agency notes that, "Most of the furniture sold today already is covered with fabrics that comply with the proposed smolder standard...If furniture fabric stops a fire from starting in the first place...there is no reason to keep adding flame retardant chemicals to the foam underneath." Underwriters Laboratories also found that placing

a fire-resistant layer that does not contain toxic flame retardant chemicals between foam and fabric was much more effective than adding toxic flame retardant chemicals to the foam.

### 3.2 NO FIRE SAFETY BENEFIT IN FURNITURE

The chemical industry claims that adding toxic flame retardant chemicals to foam used in furniture gives people more time to escape a fire. A burn study cited by the industry showed that only very large



amounts of chemicals slowed a fire. Yet, the chemical industry used the study to claim that addition of toxic flame retardant chemicals to consumer products gives a 15-fold increase in escape time in case of a fire. The *Chicago Tribune* interviewed the study's author, Vyto Babrauskas, who called such claims, "... 'totally bogus' because the amounts of flame retardants in the burned samples in his tests were so much greater than what is found in typical consumer items." Babrauskas noted that since furniture is covered with fabric, the flames from the burning fabric quickly overwhelm the foam, even if toxic chemicals are added. He added that household furniture often contains enough chemicals to pose health threats but not enough to stem fires – "...the worst of both possible worlds." Babrauskas called the chemical

industry claims "flat-out deceptive" and said that they should stop misrepresenting his work in order to sell more flame retardants.

### 3.3 NO FIRE SAFETY BENEFIT IN ELECTRONICS

The chemical industry claims that adding toxic flame retardant chemicals to plastics used in electronics provides a large fire safety benefit. However, the *Chicago Tribune* investigation found that this claim is based on unscientific methods. In 1997 as questions were being raised in Europe about flame retardants in electronics, the chemical industry, "...began searching for evidence that the benefits of flame retardants in those products outweighed any risks." The *Tribune* describes how three industry researchers unscientifically used a finding of only eight TV fires in Sweden to extrapolate to all of Europe and claim that it experienced 165 TV fires per million sets each year. Even more surprising (and completely unscientific) was the industry claim that since the US rate was five TV fires per million sets, the difference in "fire rates" must be due to the inclusion of toxic flame retardant chemicals in US products. The *Chicago Tribune* interviewed the author of the Swedish study, Ingvar Enqvist. He told the paper, "...that he did not know Simonson and the chemical industry were relying on the eight TV fires mentioned in his report as the basis for sweeping claims about the benefits of flame retardants, a fact he called 'a little peculiar.' He also said Simonson shouldn't extrapolate the eight fires to all of Europe, given the vast differences among the countries."

### 3.4 TOXIC FLAME RETARDANT CHEMICALS INCREASE DANGER OF DEATH IN FIRES

According to the San Antonio Statement, brominated and chlorinated flame retar-

dants can increase the release of carbon monoxide, toxic gases, and soot, which are the cause of most fire deaths and injuries. For example, the Statement cites a study that demonstrated PentaBDE-treated foam released approximately twice the amount of smoke, seven times the amount of carbon monoxide, and nearly 70 times the amount of soot, and only provided three additional seconds before ignition compared to foam that was not treated with the chemical. In many applications flame retardancy is simply not needed (for example breast feeding pillows) or the product can be designed in such a way that it achieves fire safety standards without the use of toxic flame retardant chemicals.

### **3.5 DIOXIN AND FURAN FORMATION**

The San Antonio Statement notes that when brominated and chlorinated flame retardants burn, high yields of extremely toxic brominated-, chlorinated-, and bromo-chlorinated dioxins and furans are formed. This indicates that combusting waste containing certain consumer products can lead to the generation of highly toxic substances that have been found in human milk, food, and dust. The Stockholm Convention lists chlorinated dioxins and furans as unintentionally formed substances, "...with the goal of their continuing minimization and, where feasible, ultimate elimination." The Convention lists industrial source categories that have a high potential for formation and release of dioxins and furans including waste incinerators, cement kilns firing hazardous waste, various thermal processes in the metallurgical industry, open burning of waste, utility and industrial boilers, chemical processes involving chlorine, and shredder plants for treatment of end of life vehicles. At the Fifth Conference of the Parties, governments decided to encourage parties and stakeholders to implement the recommendations on burning wastes containing PBDE flame retardants provided by the expert committee known as the POPs Review Committee. In 2010, the Committee recommended, "To generate and collect information on releases of brominated diphenyl ethers and unintentionally produced brominated organic compounds such as polybrominated dibenzodioxins and polybrominated dibenzofurans (PBDD/PBDF) in emissions to air and in the solid residues from thermal processes used in treating materials contaminated with brominated diphenyl ethers."

## **4. SUBSTANCES MARKETED AS FLAME RETARDANTS**

### **4.1 LARGE AMOUNTS OF TOXIC CHEMICALS MARKETED AS FLAME RETARDANTS CAN BE PRESENT IN CONSUMER PRODUCTS IN HOMES**

The *Chicago Tribune* reported that a large couch can contain up to one kilogram or two pounds of toxic chemicals marketed as flame retardants in its cushions. This provides a large potential source of exposure to toxic substances since the chemicals emerge over time to contaminate dust. Due to the persistence of the chemicals and lifetime of couches and other products, toxic flame retardant chemicals can continue to contaminate homes and people long after they are prohibited. For example, recent studies show high

PentaBDE levels in California (US) residents even though the substance was prohibited in the state in 2008.

#### **4.2 MANY DIFFERENT TYPES OF CONSUMER PRODUCTS CONTAIN TOXIC CHEMICALS MARKETED AS FLAME RETARDANTS**

The *Chicago Tribune* reported on a scientific study conducted in 2011 that found toxic chemical flame retardants in highchairs, diaper-changing pads, and breast-feeding pillows. In 2011, an IPEN study found the chemicals in carpet padding. Most of the samples contained at least one PBDE flame retardant chemical listed in the Stockholm Convention and half the samples had levels that exceeded hazardous waste standards in the European Union. The San Antonio Statement notes that products containing toxic flame retardant chemicals include foam used in furniture, plastics used in electrical and electronic products, building materials such as insulation, and textiles. In February 2013, the Center for Environmental Health in the US release a study of flame retardants in children's day care nap mats. The study found 22 out of 24 mats contained at least one toxic flame retardant chemical and 19 contained two or more.

#### **4.3 FIREMASTER 550 HAS TOXIC EFFECTS AND IS USED IN FURNITURE**

Firemaster 550 is a new, alternative substance introduced by the industry for use in furniture foam after the previous substance, PentaBDE, was prohibited globally under the Stockholm Convention. The *Chicago Tribune* obtained health studies on the substance from Chemtura, the manufacturer. "They found that exposing rats to high doses of Firemaster 550 can lower birth weight, alter female genitalia and cause skeletal malformations such as fused ribs and vertebrae." Chemtura claims the chemical is part of its "Greener Innovation" program. The *Chicago Tribune* reported that the EPA approved the substance knowing that it contained two brominated compounds (TBB and TBPH) that are similar to DEHP, a phthalate substance that the State of California lists as a known carcinogen and developmental toxicant. The newspaper also reported that US EPA scientists have known since the 1990s that burning products containing Firemaster 550 could release dioxins. In June 2012, researchers at Duke University and North Carolina State University published a peer-reviewed study showing that Firemaster 550 altered levels of thyroid hormones in animals at levels that people are typically exposed to. The study raises concerns since thyroid function is important for skeletal and brain development. Linda Birnbaum, Director of the US National Institute of Environmental Health Sciences, told the *Chicago Tribune* that, "Firemaster 550 was put on the market with almost no study." Chemtura, the manufacturer, responded to the results by stating that Firemaster 550 reduces the risk of deadly fires.

#### **4.4 CHLORINATED TRIS IS TOXIC AND PRESENT IN CHILDREN'S PRODUCTS AND COUCHES**

In the 1970s in the US, manufacturers voluntarily removed chlorinated tris from children's pajamas after the substance was linked to cancer. However, it was never banned. In 2011, a study of foam-containing baby products by researchers at Duke University found that chlorinated tris was the most common flame retardant in these products. The *Chicago Tribune* reported that WHO, US National Cancer Institute and the US National Research Council, "...have identified the flame retardant as a cancer risk." The newspa-



per also noted that, "In 2006, researchers at the U.S. Consumer Product Safety Commission cautioned that adding chlorinated tris to furniture would expose children to nearly twice the daily dose deemed acceptable by the federal agency. The cancer risk for children during the first two years of life would be seven times higher than what most physicians, scientists and regulators consider acceptable, according to the safety commission's report." In 2011, the State of California listed chlorinated tris (TDCPP) as a carcinogen. In 2012, a study of foam from 102 couches in the US found chlorinated tris in more than half of them made after 2005. In 2012, the Chicago Tribune tested 27 baby mattresses for three different types of chlorinated tris (TDCPP, TCEP, or TCPP) and found at least one of the toxic substances in 13 of them (other flame retardants may have been present but the paper did not test for them). In response to the testing, Linda Birnbaum, Director of the US National Institute of Environmental Health Sciences, noted that, "If these chemicals are in your child's mattress, they are going to be constantly exposed." The Chair of the US Consumer Product Safety Commission said, "I strongly encourage all mattress manufacturers to comply with our performance standard through the use of barrier technologies and to avoid using any potentially harmful chemicals to which children can be exposed." In March 2013, the US State of Washington House of Representatives passed a proposal to prohibit TCEP and TDCPP in children's products and home furniture beginning in 2014. If the proposal passes the State Senate, Washington will be the first state in the US to ban these substances.

#### **4.5 THE CHEMICAL INDUSTRY DISTORTED THE HEALTH RISKS TO CHILDREN OF A COMMON TOXIC**

#### **CHEMICAL MARKETED AS A FLAME RETARDANT: DECA BDE**

DecaBDE is commonly used in electronics, where it is released in dust. The *Chicago Tribune* described how the industry distorted the risks to children of this substance. In 2002, the chemical industry hired Exponent, a US consulting firm often hired by corporations, to analyze how children might be exposed to DecaBDE. The industry used a very small sample of adults to incorrectly make conclusions about health risks to children and then even distorted the findings from this small sample. The industry used data from 1988 which measured DecaBDE in the blood of just 12 adults and found that five contained the chemical and seven did not. The *Chicago Tribune* reports that when Exponent reported the results for the industry they, "...flipped the findings around, emphasizing the seven samples where none of the chemical was detected." They claimed that since "the majority" of serum samples (of adults) did not contain DecaBDE, that the majority of the entire population had low "if not zero" exposure. Exponent also claimed that no further evaluation of DecaBDE was warranted despite relying on only 12 samples from adults to make this conclusion about children. Dennis Paustenbach was the Vice President of Exponent at the time and he went on to write a publication based on this small number of samples from adults for the now defunct *Journal of Children's Health* - a publication edited by Paustenbach. The journal folded a few months after publishing the "study".

#### **4.6 OTHER CHEMICALS MARKETED AS FLAME RETARDANTS HAVE TOXIC CHARACTERISTICS THAT RAISE CONCERNS**

Overall, toxic chemicals marketed as flame retardants lack adequate toxicity informa-

tion. However, the information that is available has raised concerns. For example, the San Antonio Statement notes a variety of harmful characteristics (see abbreviations list at the end of this document). HBCD used in insulation (Hexabromocyclododecane) is very toxic to aquatic organisms and can disrupt the hypothalamic-pituitary-thyroid (HPT) axis, disrupting normal development, affecting the central nervous system, and inducing reproductive and developmental effects in mammals with some of them being trans-generational. Dechlorane Plus is used for coating electrical wires and cables, connectors used in computers, and plastic roofing material. Dechlorane Plus is poorly characterized toxicologically; however it resembles chlordane, dieldrin, endosulfan, endrin, and heptachlor - all substances listed in the Stockholm Convention for global elimination. BTBPE is used in plastics and its metabolite, 2, 4, 6-tribromophenol, is a thyroid disrupting chemical found in umbilical cord blood. TBECH (1, 2-Dibromo-4-(1, 2-dibromoethyl) cyclohexane) is used in home insulation, cables, plastics, and adhesives and is mutagenic to mammalian cells. PBEB (Pentabromoethylbenzene) is used in polymers and is poorly characterized toxicologically but the substance is a

brominated analogue of ethyl benzene, a carcinogen. TBBPA (Tetrabromobisphenol A) is used in electronics, is structurally similar to thyroxin, shows thyroid hormone activity *in vivo* and *in vitro*, has estrogenic activity, and inhibits neurotransmitter uptake. TCEP (Tris (2-chloroethyl) phosphate) has been used in foam for furniture and other products, causes adverse reproductive outcomes, and is considered a carcinogen under California Office of Environmental Health Hazard Assessment Proposition 65.

#### **4.7 TOXIC CHEMICALS MARKETED AS FLAME RETARDANTS MIGRATE OUT OF PRODUCTS INTO HOMES AND THE ENVIRONMENT**

The San Antonio Statement notes that flame retardant chemicals are being found in all environmental matrices examined including air, water, soil sediment, and sewage sludge. Firemaster 550, a substitute chemical for PentaBDE in foam, has been found in house dust and in Arctic polar bears. Chemtura, the manufacturer, used a flawed method to “prove” the chemical would not migrate from products. As the *Chicago Tribune* reported, the method involved placing saline-soaked filter papers on a cotton covered block of foam and measuring how much leaked out in only eight days. The newspaper interviewed Duke University researcher Heather Stapleton who found Firemaster 550 in house dust. “It’s ridiculous that they would keep saying this isn’t migrating from couches and other products,” Stapleton said. “We know this chemical is out there, and we know kids are chronically exposed to it.” The San Antonio Statement reports that chemical components of Firemaster 550 are also found in the Arctic.



#### **4.8 TOXIC FLAME RETARDANT CHEMICALS ARE PRESENT IN DEVELOPING COUNTRIES**

Use of flame retardant chemicals has historically been concentrated in developed countries and studies show corresponding contamination of humans and the environment. However, monitoring data in developing and transition countries is lacking so the scope of the problem is not well understood. The Stockholm Convention POPs Review Committee found that while stocks of wastes were likely to be low in developing countries, hotspots relating to ewaste sites were a potential problem. However, given the lack of data, in 2011 the Committee recommended surveys on flame retardant chemical levels in developing and transition countries, in part to address the possibility that transfer of other types of consumer products to developing and transition countries could be occurring. In 2005, IPEN conducted a study of contaminants in home-grown chicken eggs



near various types of hotspot sites in developing countries. Flame retardant chemicals such as PBDEs and HBCD were found in chicken eggs in Kenya (near a dumpsite), Mexico (near a petrochemical complex), Mozambique (near a cement kiln burning waste), Philippines (near a medical waste incinerator), Turkey (near a hazardous waste incinerator), and Uruguay (near a cement kiln burning waste). A recent study in China measured halogenated flame retardants in home-produced chicken eggs near three ewaste recycling sites. Researchers found very high levels of PBDEs, HBCD, polybrominated biphenyl (also known as hexabromobiphenyl), and other flame retardant chemicals in eggs.

#### **4.9 MANY BROMINATED AND CHLORINATED CHEMICALS MARKETED AS FLAME RETARDANTS ARE PERSISTENT AND BIOACCUMULATIVE**

Flame retardants contaminate the food chain, including human milk. The San Antonio Statement describes monitoring studies that show many toxic chemicals marketed as flame retardants are present in wildlife (including food sources) and humans. These include Firemaster 550 compounds, chlorinated tris, DBDPE, TBECH, HBCD, DBHCTCTD, PBEB, SCCPs, TBBPA, and HBB.

#### **4.10 CALIFORNIA (US) RESIDENTS - EVEN CHILDREN - CONTAIN THE WORLD'S HIGHEST HIGH LEVELS OF TOXIC FLAME RETARDANTS IN THEIR BODIES**

Two recent scientific studies published in 2011 indicate that California residents contain

the world's highest levels of toxic flame retardants in their bodies. The first study by researchers at the University of California - San Francisco, California Department of Toxic Substances Control, and University of Massachusetts - Amherst measured the PBDE flame retardants in pregnant women. As Ami Zota, the lead author noted, "I summarized all the studies of pregnant women to date of PBDEs. There's about 20. They included China, Japan, Sweden, Spain, Korea and various parts of the U.S. The levels in pregnant California women were 10 to 100 times higher than pregnant women in Europe and Asia, about two to three times higher than pregnant women in other parts of the U.S." The second study was conducted by researchers at University of California - Berkeley, Centers for Disease Control and Prevention, and National Institute of Public Health in Cuernavaca, Mexico. The study found that Mexican-American children in California had seven times more flame retardants in their bodies than children in Mexico and three times more flame retardants in their bodies than their mothers. The study notes, "The few studies of PBDEs in children's blood worldwide indicate that children living in California have some of the highest documented PBDE serum concentrations."

#### **4.11 TOXIC CHEMICALS MARKETED AS FLAME RETARDANTS CAN TRAVEL LONG DISTANCES**

The San Antonio Statement describes studies that show the following substances used in consumer products are present in the Arctic or Antarctic: components of Firemaster 550, Dechlorane Plus, BTBPE, DBDPE, PBEB, HBCD, TBBPA, TCEP, and HBB. In addition the Statement notes that the following substances used as flame retardants were identified in modeling studies as likely to be Arctic contaminants: tetra- to octabromodiphenyl ether, DecaBDE, HBCD, tetrabromocyclohexane, chlorendic acid, tetrabromophthalic anhydride, and 2,4,6-tribromophenol.

## **5. INDUSTRY ACTIONS: A HISTORY OF DECEPTION**

### **5.1 TOXIC CHEMICALS MARKETED AS FLAME RETARDANTS ARE MADE IN US, EUROPE, AND ASIA AND EXPORTED GLOBALLY**

Three main manufacturing companies are Albemarle (US), Chemtura (US), and ICL (Israel). In addition, Tosoh Corporation (Japan) also manufactures fire retardant chemicals. Manufacturing sites for these companies include Europe where substances such as HBCD are produced. There also appear to be a number of Chinese manufacturers including Shandong Tianyi Chemical, Shandong Weifang Yukai Chemical, Nanjing Mellon Chemical, Orising Chemical, Weifang Haihua Yuanda Fine Chemical, Star Chemicals and Catalysts, Nanjing Rising Chemical, Qingdao Haida Chemical, Shandong Ocean Chemical, CN Sinosou of Welcom, Weifang Yukai Chemical, Jinan Chenxu Chemical, Weifang Heqde Chemical, Weidong International Group, Shanghai Ruiyuan Chemical, and Weifang Dacheng Yili Pharmaceutical Co. Dow Chemical has developed a new brominated flame

retardant substitute for HBCD known as Emerald Innovation 3000 and made it available for licensing by the manufacturers above.

## 5.2 THE INDUSTRY HAS A HISTORY OF SUBSTITUTING ONE BAD CHEMICAL AFTER ANOTHER

In an editorial published in *Environmental Health Perspectives*, Linda Birnbaum and Ake Bergman describe a history of substitution by the industry from the 1970s to present day. The history begins with hexabromobiphenyl contamination of cattle feed (now banned globally) and tris (2, 3-dibromopropyl) phosphate in children's pajamas (mutagen and banned). The industry next placed polybrominated diphenyl ethers (PBDEs) into millions of products even though PBDEs are very similar in structure and effect to PCBs, substances being eliminated globally through the Stockholm Convention. HBCD, a slightly modified DecaBDE, TBBPA, Firemaster 550, and a whole host of new chemicals followed. The authors note that, "The San Antonio Statement is a call for attention to a continuing pattern of unfortunate substitution...even though there have been early warnings and periodic reminders about the problematic properties of these chemicals... Why do we not learn from the past?" In contrast to the industry practice, the Stockholm Convention POPs Review Committee, an expert committee of the Convention, concluded in its alternative guidance document that alternatives should not have hazardous properties, such as mutagenicity and carcinogenicity, or adverse effects on the reproductive, developmental, endocrine, immune, or nervous systems.



**"...TOBACCO EXECUTIVES DIDN'T CARE FOR ONE OBVIOUS SOLUTION: CREATE A 'FIRE-SAFE' CIGARETTE, ONE LESS LIKELY TO START A BLAZE..."**



## 5.3 THE TOBACCO INDUSTRY SHIFTED ATTENTION AWAY FROM CIGARETTES TO FLAME RETARDANT FURNITURE AS THE SOLUTION TO HOUSE FIRES INSTEAD OF FIRE-SAFE CIGARETTES

In a time of rising numbers of house fires due to cigarette smoking, the tobacco industry sought to focus blame and a solution away from the actual cause of the fires. As the *Chicago Tribune* notes, "...tobacco executives didn't care for one obvious solution: create a 'fire-safe' cigarette, one less likely to start a blaze...The industry insisted it could not make a fire-safe cigarette that would still appeal to smokers and instead promoted flame retardant furniture – shifting attention to the couches and chairs that were going up in flames. But executives realized they lacked credibility, especially when burn victims and firefighters were pushing for changes to cigarettes. So Big Tobacco launched an aggressive and cunning campaign to 'neutralize' firefighting organizations and persuade these far more trusted groups to adopt tobacco's cause as their own." Peter Sparber, a former tobacco industry executive served as the organizer of the US National Association of State Fire Marshals and the *Tribune* notes that, "He shaped its requests for federal rules requiring flame retardant furniture and fed the marshals tobacco's arguments for why

altering furniture was a more effective way to prevent fires than altering cigarettes... The fire marshals' actions helped Big Tobacco fend off fire-safe requirements for years."

#### **5.4 THE CHEMICAL INDUSTRY PAID FIRE MARSHALS TO LOBBY ASIAN ELECTRONICS MANUFACTURERS TO ADD CHEMICALS MARKETED AS FLAME RETARDANTS TO THEIR PRODUCTS**

The *Chicago Tribune* reports that the chemical industry paid for fire marshals' lobbying trips to Japan, Korea, and Taiwan to convince manufacturers to add chemicals to plastic components of computer monitors and TVs.

#### **5.5 THE CHEMICAL INDUSTRY PAID FIRE MARSHALS TO LOBBY FOR GLOBAL FIRE STANDARDS ENCOURAGING USE OF CHEMICALS MARKETED AS FLAME RETARDANTS**

As the *Chicago Tribune* notes, "The marshals later pushed for worldwide standards requiring that the plastic casings of electronics resist a candle flame and posted Internet videos comparing name-brand computer monitors that went up in flames with those that didn't." The industry waged this campaign within the International Electrotechnical Commission (IEC). IEC is a standards setting body based in Switzerland with a technical committee (TC108) that focuses on safety standards including fire, electrical, and labeling. The chemical industry pressured the IEC to adopt a candle flame ignition standard in electronics which would require addition of their chemicals in plastics parts of electronic equipment. Opponents of the proposal included the US Consumer Product Safety Commission, US National Fire Protection Association, Consumer Electronics Association, and the Telecommunications Industry Association. They cited information that concluded that candle flames were not appropriate or realistic as a standard and that no fire safety benefit would result from using this standard. Despite strong opposition, the chemical industry proceeded to propose and pressure for passage of the standard. In 2008, international civil society networks raised awareness among TC108 members about the lack of fire safety benefit, and the measure was defeated. In May 2012 and March 2013, similar measures were defeated again. If the proposals had succeeded, then millions of kilograms of toxic flame retardant chemicals would have been dispersed globally in electronic products.

#### **5.6 A LEADING US MEDICAL DOCTOR FABRICATED PATIENTS AND CAUSE OF DEATH IN TESTIMONY TO LEGISLATORS**

Dr. David Heimbach, a prominent retired burn specialist, fabricated testimony on numerous occasions about children dying due to fires started by a candle on products lacking flame retardants. As noted by the *Chicago Tribune*, "...records and interviews show that the baby Heimbach said he had in mind when testifying didn't die as he described and that flame retardants were not a factor." The paper notes that, "The baby he described didn't exist. Neither did the 9-week-old patient who Heimbach told California legislators died in a candle fire in 2009. Nor did the 6-week-old patient who he told Alaska lawmakers was fatally burned in her crib in 2010. Heimbach is not just a prominent burn doctor. He is a star witness for the manufacturers of flame retardants." Under question-

ing by the *Chicago Tribune*, Heimbach admitted that the chemical industry paid for his travel and “some of his time”. In June 2012, Heimbach’s former employer, the University of Washington, publicly stated it was “...very disappointed in Dr. Heimbach’s actions in regard to this issue,” noting his contract work for the chemical industry and his violation of federal privacy rules.

## **5.7 CHEMICAL INDUSTRY HAS EXPLOITED RACE TO ARGUE FOR ADDITION OF TOXIC CHEMICALS IN CONSUMER PRODUCTS**

As the *Chicago Tribune* notes, the chemical industry, through their front group, Citizens for Fire Safety, have used a “...powerful and surprising tactic: making flame retardants a racial issue. The group and witnesses with ties to it have argued that impoverished, minority children would burn to death if flame retardants were removed from household products.” The assertion was not true, and the group did not disclose their connection to the industry association during their legislative testimony. Ironically, on 23 May 2012, the *Chicago Tribune* reported on a new US scientific study showing that African American and Latino toddlers had twice the levels of PBDE flame retardants in their bodies as white children. The paper noted that the study “...challenges one of industry’s chief arguments for expanding use of the chemicals.” In August 2012, the National Medical Association passed a resolution on flame retardant chemicals noting their toxicity, lack of fire safety benefit, and the chemical industry front group campaigns that used African Americans to justify their use. The organization expressed support for phase-out of chlorinated tris and brominated flame retardants at the state and federal levels. The National Medical Association is the largest and oldest organization representing African-American physicians and their patients in the US.

## **5.8 THE TOBACCO INDUSTRY ATTEMPTED TO GET FURNITURE WITHOUT TOXIC CHEMICALS LABELED AS HAZARDOUS MATERIAL**

Peter Sparber, a US tobacco industry executive, worked as a lobbyist for Chemtura. As the *Chicago Tribune* reports, Sparber helped get the fire marshals to ask federal regulators to require warning labels made with non-fire-retardant foam saying they were hazardous material. The *Tribune* notes that Sparber also tried, “...to get furniture stores declared ‘hazardous occupancies,’ a classification usually reserved for locations handling gasoline...” The rules were not adopted, but the *Tribune* notes that the furniture industry was intimidated into including the chemicals into its products.

## **5.9 CITIZENS FOR FIRE SAFETY WAS A TRADE ASSOCIATION FOR CHEMICAL COMPANIES**

Despite the “grassroots” appearance on their former website, Citizens for Fire Safety had as its members the three main flame retardant manufacturers; Albemarle, ICL Industrial Products, and Chemtura. Tax records show the mission of the association was to “...promote common business interests of members involved with the chemical manufacturing industry.” According to the *Chicago Tribune*, the association revenue was “...about \$17 million between 2008 and 2010...” and “Many of the witnesses supporting flame retardants at these [legislative] hearings were either paid directly by Citizens for Fire Safety or were members of groups that benefited financially from Citizens for Fire Safety’s donations.” In September 2012, after the considerable publicity generated

by the Chicago Tribune series, the three chemical companies broke ties with Citizens for Fire Safety and transferred their lobbying activities to the American Chemistry Council (ACC) trade association for chemical manufacturers. The Citizens for Fire Safety website has been replaced by a note from Albemarle, ICL, and Chemtura which states that future advocacy on the chemicals will be carried out through the North American Flame Retardant Alliance of ACC. The Alliance portion of the ACC site lists the same three companies as members and states their objective as "... promoting the safe and effective use of flame retardants."

#### **5.10 BROMINE SCIENCE AND ENVIRONMENTAL FORUM (BSEF) IS A TRADE ASSOCIATION FOR CHEMICAL COMPANIES**

*Chicago Tribune* notes that BSEF: "...may sound like a neutral scientific body. But it was founded and funded by four chemical manufacturers, including Albemarle, to influence the debate about flame retardants made with bromine." Albemarle's Raymond Dawson described BSEF as, "...a group dedicated to generating science in support of brominated flame retardants." The association includes Albemarle, ICL, Chemtura, and Tosoh Corporation and is run by the giant public relations firm, Burson-Marsteller. Corporate clients of Burson-Marsteller have included Union Carbide after the Bhopal gas leak, Philip Morris, Monsanto, Foxconn after worker suicides, and companies involved in the European horse meat scandal.

#### **5.11 ALLIANCE FOR CONSUMER SAFETY IS A TRADE ASSOCIATION FOR CHEMICAL COMPANIES.**

The *Chicago Tribune* notes that the global PR firm, Burson Marstellar, helps run the

Alliance for Consumer Safety, "...which is funded by a trade association of flame retardant manufacturers."

#### **5.12 THE CHEMICAL INDUSTRY SPONSORS THE US FIRE MARSHALS**

Chemtura, one of the world's largest manufacturers of toxic chemicals marketed as flame retardants, is a financial sponsor of the National Association of State Fire Marshals and their logo appears on the group's website. Karen Deppa, who worked at the Tobacco Institute and later with Peter Sparber, is employed by the Fire Marshals in the area of external relations.

#### **5.13 A CHEMICAL INDUSTRY EXECUTIVE BECOMES A US EPA OFFICIAL**

Todd Stedeford worked from 2008 - 2011 as an attorney and toxicology advisor at Albemarle, one of the world's largest manufacturers of toxic chemicals marketed as flame retardants. At Albemarle, Stedeford criticized efforts of California EPA to list TDCPP (a toxic chlorinated flame retardant) as a carcinogen. The substance was voluntarily removed from children's pajamas in the US in the 1970s after it was linked to cancer. His views on toxic chemicals emerged in a response to scientific societies who noted that current government review practices for commercially available chemicals are inadequate. Stedeford and others wrote that there was no public health emergency connected to toxic chemicals and that the concern of the scientific societies, "...caters to the growing trend of claiming vague risks based on the mere detection of a chemical, without regard to hazard and exposure." After Albemarle and other manufacturers voluntarily agreed to stop production of DecaBDE, Stedeford kept pushing US EPA for weaker safety standards insisting that people could be exposed to more than 500



times the level of DecaBDE than the US EPA thought was acceptable. In 2011, Stedeford became Chief of the Existing Chemicals Assessment Branch at US EPA, a division that evaluates chemical substances for possible regulation or removal from the market. According to the EPA, Stedeford has removed himself from matters related to Albemarle or flame retardants.

#### **5.14 CALLS FOR EXPELLING FLAME RETARDANT COMPANIES FROM RESPONSIBLE CARE**

In May 2012, Safer Chemicals Healthy Families (SCHF), a US public interest NGO coalition with 300 members, called on the American Chemistry Council to expel Albemarle, Chemtura, and ICL from the industry's Responsible Care program citing practices revealed in the Chicago Tribune series that conflict with the program. SCHF noted that the unethical practices revealed in the investigative series conflicted with the Responsible Care requirements to "...lead in ethical ways", address health and safety matters, and "communicating forthrightly". In June 2012, 21 legislators from 10 US states also urged the American Chemistry Council to expel Albemarle, Chemtura, and ICL from the industry program. In their letter to ACC, the legislators noted, "The deception practiced by these companies and revealed by the Chicago Tribune is completely unacceptable in our state legislatures." The legislators criticized the destructive role of the industry front group, Citizens for Fire Safety, and noted that efforts to regulate the substances were supported by the International Association of Fire Fighters, the State Fire Chiefs organization in each state, and other fire safety professionals. Despite this, the legislators noted, "...the industry continued its sham campaign." The chemical industry association responded by saying that it did not advocate with state legislatures on flame retardants or have any affiliation with Citizens for Fire Safety.

#### **5.15 FLAME RETARDANT COMPANIES QUESTIONED BY US CONGRESS**

The Chicago Tribune investigative series prompted US Senators to question representatives of Albemarle, Chemtura, and ICL in July 2012. The newspaper reported on Senators' criticism of the industry for its, "...misuse of science, misleading testimony and creation of a phony consumer group that stoked the public's fear of house fires." In response, the chemical industry insisted the substances save lives and defended industry-funded lobbying to influence federal and state regulatory policy. A representative of the US EPA noted that the agency failed to identify that TBB, a component of Firemaster 550 (replacement for PentaBDE), is persistent and bioaccumulative. As a result, the substance turned up in household dust, sewage sludge, and in Arctic animals. The agency said that TBB would be one of the chemicals EPA would review in 2013 to determine the need for regulation. The hearing prompted a vote in a Senate Committee on overhauling TSCA, the US chemical regulatory law. The new proposed law, Safer Chemicals Act, passed the Committee along party lines in a 10 - 8 vote. Further legislative processes and votes are required before the proposal can become law.

#### **5.16 THE CHEMICAL INDUSTRY CREATES A NEW STUDY**

In 2012, Matthew Blais, a technical advisor to the chemical industry, released a study justifying the use of toxic chemicals marketed as flame retardants concluding that they are important to home fire safety because they increase the time people have to escape

a fire. A Chicago Tribune investigation reported that the Blais study “...reaches unsupported conclusions and misleads the public, much like previous studies embraced by industry.” The Tribune noted that the study examined 79 pieces of furniture and only found one that took longer to burn. Blais’ group concluded that the single sample was an outlier but Blais used it as the principal evidence that flame retardants slow the spread of fires. The newspaper also reported that Blais claimed that flame retardants in a common furniture fabric dramatically slowed down fire. The Tribune investigated the claim and revealed that the fabric is not used in home furniture but actually in commercial theatre curtains designed to self-extinguish. Blais admitted that the study was not even designed to test the effectiveness of flame retardants but rather utilized data from an arson study to draw conclusions about flame retardants. He admitted to the newspaper that, “...the arson study data provided limited direct comparisons to precisely assess the effectiveness of flame retardants.” Chemical industry lobbyists have pointed to the Blais paper at legislative hearings as proof that flame retardant chemicals are effective and needed. When the paper asked Blais why he did not disclose his ties to the chemical industry in his paper or at a conference, Blais said he did not think that fact was relevant. The newspaper noted that study was not peer-reviewed and that Blais had never written a paper on this topic before.

## **6. ADDRESSING WASTES CONTAINING FLAME RETARDANT CHEMICALS**

### **6.1 WASTES CONTAINING FLAME RETARDANT CHEMICALS WITH PERSISTENT ORGANIC POLLUTANT (POP) CHARACTERISTICS SHOULD BE DISPOSED OF SAFELY**

Many toxic chemicals marketed as flame retardants have POPs (persistent organic pollutants -chemicals that bio-accumulate and persist in the environment) properties. When these products become wastes, these chemicals can further contaminate the environment and food chain. As noted above, highly toxic dioxins and furans are formed if these products are burned. According to the Stockholm Convention, the POPs content of wastes should be destroyed or irreversibly transformed so that they do not exhibit the characteristics of POPs. This prevents further release of substances into the environment and food chain that will simply bioaccumulate again, causing further harm. This is a legal obligation of more than 170 countries for the substances listed in the Stockholm Convention.

### **6.2 FLAME RETARDANT CHEMICALS SHOULD BE REMOVED BEFORE PRODUCT RECYCLING**

Plastics and foam containing flame retardant chemicals are often recycled into other consumer products. This raises concerns about toxic chemicals moving from one product into another and continuing human and environmental exposure. The Stockholm Convention prohibits disposal operations that may lead to recovery, recycling, reclamation, direct reuse, or alternative uses of the substances. However in 2009, when flame

retardant chemicals such as PentaBDE and OctaBDE were listed in the treaty, delegates agreed to make an exemption to allow the recycling of foams and plastics containing these substances. Due to concerns about the practice, they requested the expert committee, the POPs Review Committee (POPRC) to examine the practice. The POPRC recommended eliminating the flame retardant chemicals from recycling "...as swiftly as possible." The POPRC said that simply recycling the products would disperse the chemicals into other products and continue exposure. To highlight the issue, IPEN did a study to examine recycled foam carpet padding. PentaBDE, OctaBDE or both substances were found in 88% of samples from Canada, Hungary, and the US. Half the samples contained components of PentaBDE at levels that exceeded the indicative hazardous waste limit under European Union regulation. For OctaBDE components, 46% of the samples exceeded the limit. Products included items from Budapest, Hungary, the Canadian provinces of British Columbia, Manitoba, and Ontario, and US states of Alaska, Michigan, New York, and Washington. PentaBDE and OctaBDE are released from foams and plastics into house dust and pose significant hazards for infants and toddlers. Children under four years old who crawl around on carpets already have the highest levels of PBDEs in the general population. People who recycle foam and lay carpet have been found to have 10 times the amount of these chemicals in their body as the general public. The New York Times investigated the issue and found that according to the industry, 12.3 billion pounds (~6 billion kg) of recycled foam carpet padding is in homes and offices in the US alone.

**POPs in Recycled & New Products**

Under the guise of "recycling," the POPs Treaty is allowing the continued use and global distribution of POPs.

**OLD PRODUCTS**

**NEW PRODUCTS**

**RECYCLED**

**DILUTION OF POPS INTO NEW PRODUCTS IS NOT THE SOLUTION TO PROTECT CHILDREN FROM THE POLLUTION OF BROMINATED FLAME RETARDANTS. IT ENSURES BROADER EXPOSURE AND MORE HARM.**

*"Failure to [stop recycling] will inevitably result in wider human and environmental contamination and the dispersal of brominated diphenyl ethers into matrices from which recovery is not technically or economically feasible and in the loss of the long-term credibility of recycling."*

— Stockholm Convention Expert Committee (see Annex to UNEP POPs COP5/15)

### 6.3 DUMPING OF NEAR-END-OF-LIFE AND END-OF-LIFE ELECTRICAL AND ELECTRONIC PRODUCTS RELEASES TOXIC FLAME RETARDANT CHEMICALS

Near-end-of-life and end-of-life electrical and electronic products are a growing concern as a result of dumping in developing countries, which results in the illegal transboundary movement of toxic substances such as metals and toxic chemical flame retardants. More than 110 countries agreed that this represented a serious problem in a formal decision taken at the Second International Conference on Chem-

icals Management in 2009 to develop recommendations for global action. Electronic waste is the fastest growing waste stream in the world with rates three times faster than municipal solid waste. Approximately 20 - 50 million tonnes a year of electronic waste is generated and large amounts are dumped in Asia and Africa. The subsequent recycling operations cause large chemical exposures to workers including women and children as well as environmental contamination.

#### **6.4 LACK OF CAPACITY TO HANDLE ELECTRONIC WASTE**

There is a lack of capacity to handle electronic waste in an environmentally sound manner in almost all developing countries and countries with economies in transition. Many developed countries also struggle to address this growing waste stream. This leads to the release of hazardous substances that cause harm to human health and the environment. More than 110 countries agreed that this represented a serious problem in a formal decision taken at the Second International Conference on Chemicals Management in 2009.



#### **6.5 WASTES CONTAINING FLAME RETARDANTS WITH POPS PROPERTIES SHOULD NOT BE TRANSPORTED ACROSS INTERNATIONAL BOUNDARIES UNLESS IT IS FOR PROPER DISPOSAL**

In 2009, a major debate erupted at the Stockholm Convention 5<sup>th</sup> Conference of the Parties over whether wastes containing flame retardants could be exported to developing and transition countries. The 53 countries of the African group, led by Kenya, pushed developed countries to ensure that wastes containing toxic flame retardants are not exported to Africa. Kenya proposed the ban after the treaty expert committee recommended ending the practice of recycling products containing flame retardants and stopping their export. After a long debate, delegates agreed on text that encourages countries to ensure that waste materials containing PBDEs listed in the treaty are not exported to developing and transition countries. The decision cites the treaty text which notes that POPs can only be transported across international boundaries for the purpose of environmentally sound disposal in such a way that the POPs content is destroyed or irreversibly transformed.

## **7. REGULATORY POLICY**

### **7.1 THE CALIFORNIA STANDARD, TB117, HAS HAD A PROFOUND GLOBAL INFLUENCE**

The state of California established TB117 in 1975 in response to concerns about fires on furniture started by cigarettes. All products sold in California must meet the TB117 stan-

standard and California is the only US state that has such a law. Therefore, manufacturers usually opt for including flame retardant chemicals in all foam products to ensure access to the California market. Since many US companies export products and many countries are urged to follow US standards, the California TB117 standard has become the *de facto* global standard for foam-containing products. Items bearing the TB117 label can be found in states and countries that are not required to abide by it. In this way, TB117 has helped contaminate products, humans, and the global environment. The TB117 standard is based on exposing raw foam to a candle flame for 12 seconds. Chemicals added to the foam help it pass the test. However in a house fire, the fabric covering the foam burns first and overwhelms the foam, even if it contains the chemicals. The standard does not reflect real life conditions in a fire. Instead, it merely paves the way for requiring toxic chemicals that do not actually provide a fire safety benefit. In June 2012, California Governor, Jerry Brown, called for an update to TB117 stating that, "We must find better ways to meet fire safety standards by reducing and eliminating – wherever possible – dangerous chemicals." On February 8, 2013, California regulatory officials formally proposed an updated "real-world" standard known as TB117-2013 which would require furniture fabric to resist smoldering sources such as cigarettes that are the largest cause of furniture fires. Even though the proposal does not prohibit the addition of flame retardant chemicals, furniture manufacturers noted that they could reduce production costs and meet this standard without adding chemicals to either the fabric or the underlying foam.

## **7.2 A BETTER FIRE SAFETY STANDARD REQUIRES FABRIC TO RESIST SMOLDERING SOURCES**

The US Consumer Product Safety Commission believes that the best way to fireproof furniture is to require upholstery to resist smoldering sources of ignition such as cigarettes. The agency notes that, "Most of the furniture sold today already is covered with fabrics that comply with the proposed smolder standard... If furniture fabric stops a fire from starting in the first place, there is no reason to keep adding flame retardant chemicals to the foam underneath." Underwriters Laboratories also found that placing a fire-resistant layer between foam and fabric was much more effective than adding toxic chemicals marketed as flame retardants.

## **7.3 THREE TOXIC FLAME RETARDANT CHEMICALS ARE BANNED GLOBALLY**

Parties to the Stockholm Convention have taken action on three flame retardants that have been listed in the treaty for global elimination. The substances are commercial pentabromodiphenyl ether (PentaBDE) used in foam for furniture; commercial octabromodiphenyl ether (OctaBDE) used in plastics for electronics products; and hexabromobiphenyl used in plastics and auto upholstery. Velsicol manufactured hexabromobiphenyl in the 1970s. PentaBDE and OctaBDE were manufactured by Albemarle (US), Chemtura (US), ICL (Israel), and Tosoh (Japan).

## **7.4 HBCD, THE THIRD MOST COMMONLY USED FLAME RETARDANT, REQUIRES GLOBAL ACTION**

The Stockholm Convention is preparing to decide whether to add HBCD to its list for global elimination. In 2010, the Stockholm Convention POPs Review Committee concluded that, HBCD is likely, as a result of its long-range environmental transport, to lead to

significant adverse human health and environmental effects, such that global action is warranted. This conclusion means that the treaty expert committee considers HBCD to be a persistent organic pollutant (POP) and one of the world's worst chemicals.

## **7.5 BUILDING INSULATION AND NON-CHEMICAL ALTERNATIVES**

The Stockholm Convention POPs Review Committee (POPRC) examined alternatives to HBCD - the most common toxic chemical marketed as a flame retardant used in building insulation. The POPRC Risk Management Evaluation for HBCD noted that non-chemical alternatives could substitute for flame-retarded polystyrene insulation. "These [alternatives] include phenolic foams, glass and rock wool blankets, cellular glass, foam glass, and loose fills that may contain rock wool, fiber glass, cellulose or polyurethane foam. Another alternative used in some countries is to use EPS/XPS [polystyrene] without flame retardants together with alternative construction techniques and thermal barriers." US fire statistics show that foam insulation is rarely a fire hazard due to the use of walls as thermal barriers. In 2012, a peer-reviewed paper published in *Building Research and Information* questioned the fire safety benefit of building codes that require flame retardant chemicals to pass a flame test since foams that meet the test still pose a fire hazard if they are used in buildings without a thermal barrier (like a wall) to protect them. The authors noted that code regulations in Sweden and Norway allow the use of polystyrene insulation without flame retardants if used together with thermal barriers and that there is no reduction in fire safety. The study concluded that insulation protected by a thermal barrier is fire safe and that the use of toxic chemicals marketed as flame retardants does not provide any additional fire safety benefit. In January 2013, a Member of the California State Assembly introduced a proposed law to reduce flame retardants in building insulation. The proposal notes that it is in the best interest of the State to, "... eliminate unnecessary chemicals from building insulation..." The Member specifically mentioned HBCD and TCPP as examples. In February 2013, the *San Francisco Chronicle* published a front page story on concerns over flame retardants in building insulation. The report noted that a soon a legislative measure would emerge to update building codes in California so that use of thermal barriers could replace the need for flame retardant chemicals as practiced in Sweden and Norway.

## **7.6 NORWAY PLANS TO ELIMINATE BROMINATED FLAME RETARDANTS BY 2020**

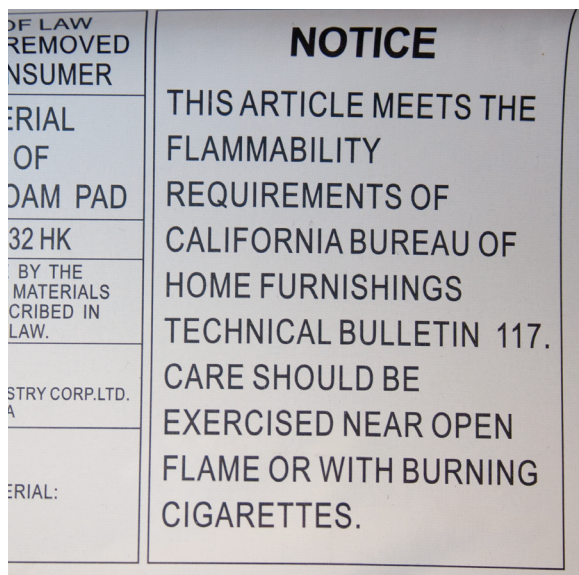
PentaBDE, OctaBDE, DecaBDE, and PBB are currently banned in Norway. The industry has voluntarily withdrawn HBCD-containing insulation from the market in Norway and Sweden since alternative construction techniques with the chemicals provided a safer alternative. Waste that contains 0.25% or more PentaBDE, OctaBDE, DecaBDE, HBCD or TBBPA is defined as hazardous waste. New flame retardants are currently under investigation. Norway has established a priority list for phase-out of all emissions and uses for the purpose of eliminating them by 2020. The list includes flame retardant chemicals such as PentaBDE, OctaBDE, DecaBDE, HBCD, and TBBPA. Other substances on the list include bisphenol A, DEHP, SCCPs, PFOA, PFOS, perchloroethylene, trichloroethylene, and triclosan.

## 7.7 THE EUROPEAN UNION (EU) HAS BANNED SOME FLAME RETARDANT CHEMICALS

PentaBDE, OctaBDE and hexabromobiphenyl are banned in the EU. The European Chemical Agency identified TCEP as a Substance of Very High Concern with a sunset date of 2015. DecaBDE is prohibited in electronics, but permitted in other uses. Other flame retardants used in electronics such as TBBPA are permitted. Electronic waste containing these flame retardants often finds its way to dump sites in Africa and Asia, often in the form of near-end-of-life products that rapidly become wastes after entry into the country.

## 7.8 A WEAK CHEMICAL REGULATORY POLICY PERMITS NEW TOXIC FLAME RETARDANTS TO BE ADDED TO CONSUMER PRODUCTS

The 1976 US regulatory law on chemicals is weak, outdated, and does not protect human health. However it is often used as a model for policy in developing and transition countries. The EPA admitted to the *Chicago Tribune* that "...it is largely powerless to do anything about chlorinated tris [carcinogen in children's products]. The agency cited industry's continued use of the chemical as a stark example of why it supports' much needed reform' of the nation's chemical safety law." The *Chicago Tribune* noted that the 1970s Toxic Substances Control Act (TSCA), "...allows manufacturers to sell products without proving they are safe and to treat the formulas as trade secrets. Once health effects are documented, the law makes it almost impossible for the EPA to ban chemicals...To ban a chemical already on the market, the EPA must prove that it poses an 'unreasonable risk'. Federal courts have established such a narrow definition of 'unreasonable' that the [US] government couldn't even ban



asbestos, a well-documented carcinogen that has killed thousands of people who suffered devastating lung diseases." As one top US EPA official noted, "EPA has not been living up to what the American public expects, but a good deal of that has to do with the challenges that the law creates for us." Due to these obstacles under TSCA, US EPA negotiated voluntary phase-outs of PentaBDE, OctaBDE, and DecaBDE with manufacturers. Electronic waste and other end of life products from the US containing these flame retardants often find their way to dump sites in Africa and Asia. Several US legislators have introduced the Safe Chemicals Act to improve chemical safety and remedy the problems under the current law.

## 7.9 US STATES HAVE ACTED TO BAN CERTAIN TOXIC CHEMICALS MARKETED AS FLAME RETARDANTS

In the absence of federal regulation to assess or protect the public from dangers posed by toxic chemicals, US states have taken action. Twelve states have banned PentaBDE and OctaBDE including: California, Hawaii, Illinois, Maine, Maryland,

Michigan, Minnesota, New York, Oregon, Rhode Island, Washington, and Vermont. Six states have banned DecaBDE including: Hawaii, Maine, Maryland, Oregon, Vermont, and Washington. In 2012 the New York State Assembly unanimously passed a measure to prohibit chlorinated tris (TDCPP) and the New York State Senate Environmental Conservation Committee voted unanimously in favor of the same measure. So far in 2013, the Washington House and the Vermont House have passed measures to ban both forms of tris chemicals and several other states are considering similar legislation.

### **7.10 CERTAIN REQUIREMENTS SHOULD BE MET WHEN COMPANIES ASK FOR EXEMPTIONS TO PERMIT THE USE OF FLAME RETARDANT CHEMICALS IN PRODUCTS**

Often when use of a chemical is prohibited due to concerns about harms to human health and the environment, companies demand exemptions for as many uses as possible in order to preserve sales. These requests should be carefully examined to ensure that they are substantive and justified. In this process, governments would benefit from having some guidelines to justify requests for exemptions. The Stockholm Convention POPs Review Committee addressed this issue in a guidelines document on alternatives. As described in the San Antonio Statement, when seeking exemptions for certain applications of toxic chemicals, the party requesting the exemption should supply information indicating why the exemption is technically or scientifically necessary and why potential alternatives are not technically or scientifically viable; a description of potential alternative processes, products, materials, or systems that eliminate the need for the chemical; and a list of sources researched.

### **7.11 PRODUCT STEWARDSHIP AND EXTENDED PRODUCER RESPONSIBILITY SHOULD BE PART OF REGULAR PRACTICES FOR CONSUMER PRODUCTS**

More than 110 countries agreed on this aspect of corporate obligations in a formal decision taken at the Second International Conference on Chemicals Management in 2009. The focus of the decision was hazardous substances within the life cycle of electrical and electronic products. However, for flame retardant chemicals the issue extends to furniture and a whole host of other consumer products that can find their way into many countries as products and/or wastes. Developing and transition countries generally do not have the capacity to detect and separate these substances before disposal. In addition, developing and transition countries do not have proper hazardous waste disposal facilities for substances with POPs properties. Many products are simply mixed together and burned, creating and releasing dioxins, furans, and other toxic substances. Proper product stewardship and extended producer responsibility should include take back programs that relieve burdens on developing and transition country governments and prevent further emissions of toxic flame retardants and other byproducts during improper waste handling.

### **7.12 ACCESS TO INFORMATION ON CHEMICALS IN PRODUCTS NEEDS TO BE IMPROVED**

More than 110 countries agreed on this aspect of chemical safety in a formal decision taken at the Second International Conference on Chemicals Management in 2009. Delegates agreed on the need for information on chemicals throughout their life cycle and



that the information should be "...accessible, user-friendly, adequate and appropriate to the needs of all stakeholders." This is true for both developed and developing and transition countries. Information on chemicals in products should provide consumers with the information they are looking for, information which is transparent, available, accessible, clear, credible, up-to-date, comparable, appropriate to the needs of all stakeholders, and which considers substitution and alternatives. An information system on chemicals in products should help people make informed decisions about the products that they purchase, use or dispose of. For more than 170 countries that are Parties to the Stockholm Convention, the treaty requires dissemination of information on relevant flame retardant chemicals and their health and environmental effects to policy and decision-makers, the wider public, and especially women, children, and the least educated as outlined in Article 10 of the Stockholm Convention.

### **7.13 CONSUMERS CAN PLAY A ROLE IN THE ADOPTION OF ALTERNATIVES IF PRODUCTS ARE LABELED**

If consumers are made aware of the presence of substances in products they can be empowered to make alternative choices. Labeling can play a key role in this process. This is the conclusion of the Stockholm Convention POPs Review Committee, an expert committee of the Convention that approved a guidance document on considerations relating to alternatives and substitutes. Labels should be clear and understandable to all consumers and include safety information with the product.

### **7.14 ALTERNATIVES TO TOXIC CHEMICALS DO NOT HAVE TO BE CHEMICALS**

Alternatives can include innovative changes in the design of products, industrial processes, and other practices that do not require the use of any flame retardant. This is the conclusion of the Stockholm Convention POPs Review Committee, an expert committee of the Convention that approved a guidance document on considerations relating to alternatives and substitutes. For example, non-chemical alternatives in furniture can include synthetic fabrics or inherently flame retardant barriers that both resist smoldering sources of ignition. Electronics can be re-designed to separate high-voltage parts from outer casings or shielded with metal instead of plastic. Fire-resistive construction techniques can eliminate the need for flame retardant chemicals in insulation along with alternative materials such as natural fiber-based materials. The Stockholm Convention alternatives guidance document states that alternative chemicals should not "...have hazardous properties that raise serious concern, such as mutagenicity, carcinogenicity or adverse effects on the reproductive, developmental, endocrine, immune or nervous systems" and that "Non-chemical alternatives include alternative industrial processes and innovative practices." To identify these alternatives, the Stockholm Convention alternatives guidance suggests that, "End-users of products that contain listed persistent organic pollutants or candidate chemicals are essential sources of information on alternatives because they are in the best position to select alternatives that do not contain those chemicals. End-users constitute a broader category than industrial users and include farmers, hospitals, retailers, Governments and original equipment manufacturers."

## 8. PUBLIC INTEREST RECOMMENDATIONS AND ACTIONS

A wide variety of public interest recommendations and actions can help reduce the harms of toxic chemicals to human health and the environment. Examples for toxic flame retardant chemicals include:

- Disseminate the *Chicago Tribune* series and the San Antonio Statement widely to raise awareness among civil society groups, legislators, health professionals, scientists and others across the globe
- Strengthen chemical regulatory policies based on the precautionary principle that provide information on chemicals as a condition for sale; implement a publicly available pollutant release and transfer registry; permit rapid removal of harmful chemicals from the market; provide incentives for safer non-chemical and chemical alternatives; and incorporate the polluter pays principle so that responsible parties pay the costs of chemical pollution
- For Stockholm Convention Parties, disseminate information on relevant flame retardant chemicals and their health and environmental effects to policy and decision-makers, the wider public, and especially women, children, and the least educated as outlined in Article 10 of the Stockholm Convention
- Immediately eliminate toxic flame retardant chemicals in products that are not a fire risk and promote safe alternatives. For example, breast feeding pillows do not need to be flame retarded.
- Implement a fire safety standard in furniture that requires upholstery to resist smoldering sources of ignition such as cigarettes, not a standard based on ignition of foam
- Change building codes and fire safety laws to eliminate use of flame retardant chemicals in building insulation behind a thermal barrier and update policies based on unrealistic scenarios such as candle flames on televisions to achieve authentic fire safety benefits
- Increase transparency in the operation of codes and standards-setting bodies that make decisions regarding the use of flame retardant chemicals in products
- Implement state and federal policies that require companies seeking exemptions for certain uses to indicate why potential alternatives are not viable, sources researched, and a description of potential alternative processes, products, and materials

- Implement regulatory policy, authentic product stewardship and extended producer responsibility that prevents dumping of electronic wastes and other waste products containing flame retardant chemicals in developing and transition countries and places responsibility on manufacturers to take financial responsibility for electronic wastes
- Improve access to information on chemicals in products, including through labeling
- Ensure substitution processes that promote green design and safe alternatives
- Enact public procurement policies that avoid products containing toxic flame retardant chemicals
- Implement a separation process for wastes to remove flame retardant chemicals before recycling spreads them to other consumer products
- Require labeling of products containing flame retardant chemicals to facilitate environmentally sound waste management



**ELIMINATE TOXIC FLAME RETARDANTS  
IN PRODUCTS AND PROMOTE SAFE  
ALTERNATIVES.**



- Promote proper waste management practices such as waste minimization and zero waste policies and avoidance of waste dumps and inappropriate burning
- Close loopholes in the Basel Convention that allow waste traders to dump electronic wastes in developing and transition countries by claiming that the practice is a legitimate form of recycling
- Implement industry take-back programs that are transparent, free to the public, and provide increasing recycling rates over time
- Advocate and implement protective health-based standards for workers that provide equal protection to community residents and workers.

## 9. CONCLUSION

Toxic chemicals marketed as flame retardants pose a threat to human health and the environment. These substances are widely incorporated into our consumer products but do not provide a fire safety benefit. Instead, they increase the toxicity of a fire through greater release of smoke, soot, carbon monoxide, and highly toxic substances such as dioxins and furans. Surprisingly, companies incorporate toxic flame retardant chemicals into products without knowing or providing comprehensive safety information about them. The current data shows substances resembling PCBs in furniture and other substances in products that are carcinogens, endocrine disruptors, and harmful in many other ways. Toxic flame retardant chemicals are released over time and contaminate our homes, our bodies, and our environment, even in places far from production and use. For decades, the chemical industry has responded to government and public concerns by removing one toxic flame retardant chemical only to replace it with another toxic flame retardant chemical. In addition, the industry has strongly lobbied for fire regulations and codes that protect sales, not lives. Toxic flame retardant chemicals are not a necessary evil. Sensible fire safety codes exist and safer alternatives are available; many of them are not even chemicals. The key to a healthier future lies in public awareness about this harmful class of substances and public interest actions to reform how chemicals are produced, used, and substituted so that harms from toxic chemical exposure can ultimately be eliminated.

## 10. ABBREVIATIONS

**TBP-AE** or **ATT**: 2,4,6-tribromophenyl allyl ether; CAS 3278-89-5

**BTBPE**: 1,2-Bis(2,4,6-tribromophenoxy)ethane; CAS 37853-59-1

**BEHTBP**: bis(2-ethylhexyl) tetrabromophthalate; CAS 26040-51-7

**BTBPIE**: 1,2-Bis(tetrabromophthalimido) ethane; CAS 32588-76-4

**DBDPE**: Decabromodiphenylethane; CAS 84852-53-9

**DBHC-TCTD** or **HCDBCO**: 5,6-Dibromo-1,10,11,12,13,13-hexachloro-11-tricyclo[8.2.1.0<sub>2,9</sub>] tridecene; CAS 51936-55-1

**DP**: Dechlorane Plus, Bis (hexachlorocyclopentadieno) cyclooctane; CAS 13560-89-9

**TBP-DBPE**: 2,4,6-Tribromophenyl 2,3-dibromopropyl ether; CAS 35109-60-5

**HBB**: Hexabromobenzene; CAS 87-82-1

**HBCDD1** or **HBCD**: Hexabromocyclododecane; CAS 3194-55-6; Major isomers are:  $\alpha$ -,  $\beta$ - and  $\gamma$ -HBCDD

**PBEb**: Pentabromoethylbenzene; CAS 85-22-3

**PBT**: Pentabromotoluene; CAS 87-83-2

**POPs**: Persistent Organic Pollutants

**SCCP**: Short-chain chlorinated paraffins; CAS 85535-84-8 and 71011-12-6

**EH-TBB** or **TBB**: 2-Ethylhexyl-2,3,4,5-tetrabromobenzoate; CAS 183658-27-7

**TBBPA**: Tetrabromobisphenol A; CAS 79-94-7

**TBBPA-DAE**; Tetrabromobisphenol A diallyl ether; CAS 25327-89-3

A photograph of two young girls sitting on a yellow couch. The girl on the left is wearing light blue pajamas with the word 'Adventure' printed on the chest. The girl on the right is wearing white pajamas with a colorful polka-dot pattern. They are both smiling and looking towards the camera. The background shows a window with white blinds. A dark grey banner with white text is overlaid across the middle of the image.

**TOXIC FLAME RETARDANT CHEMICALS  
ARE NOT A NECESSARY EVIL.**

TBBPA-DBPE: Tetrabromobisphenol A bis(2,3-dibromopropyl) ether; CAS 21850-44-2  
TBECH: 1,2-Dibromo-4-(1,2-dibromoethyl) cyclohexane; CAS 3322-93-8  
DEHTBP or TBPH: Di(2-ethylhexyl) tetrabromophthalate; CAS 26040-51-7  
TCEP: Tris(2-chloroethyl) phosphate; CAS 115-96-8  
TDCPP or TDCP: Tris(1,3-dichloroisopropyl) phosphate; CAS 13674-87-8

## 11. REFERENCES

### Building insulation and flame retardants

- <http://saferinsulation.greensciencepolicy.org/>
- <http://www2.buildinggreen.com/blogs/flame-retardant-used-polystyrene-be-banned-eu>
- <http://saferinsulation.greensciencepolicy.org/wp-content/uploads/2012/11/Babrauskas-et-al-2012.pdf>
- [http://saferinsulation.greensciencepolicy.org/wp-content/uploads/2012/11/2012-11-8-AlternativeInsulationChart\\_Nov\\_2012\\_Levitt\\_Wilson.pdf](http://saferinsulation.greensciencepolicy.org/wp-content/uploads/2012/11/2012-11-8-AlternativeInsulationChart_Nov_2012_Levitt_Wilson.pdf)
- <http://albany.patch.com/articles/new-skinner-bill-opposes-flame-retardant-in-building-insulation>
- <http://www.sfgate.com/health/article/Flame-retardants-now-seen-as-health-risk-4248112.php>

### California body burden studies

- <http://latimesblogs.latimes.com/greenspace/2011/08/high-levels-of-toxic-flame-retardant-pbde.html>
- <http://pubs.acs.org/doi/abs/10.1021/es200422b>
- <http://www.environmentalhealthnews.org/ehs/news/flame-retardants-in-california-kids>
- <http://ehp03.niehs.nih.gov/article/action?articleURI=info%3Adoi%2F10.1289%2Fehp.1002874>

### Carpet padding

- <http://ipen.org/cop5/wp-content/uploads/2011/04/IPEN-Brominated-Flame-Retardants-in-Carpet-Foam-press-release-25-April-2011.pdf>
- [http://www.nytimes.com/2011/05/19/garden/tests-on-carpet-padding-show-toxins.html?\\_r=1&ref=garden](http://www.nytimes.com/2011/05/19/garden/tests-on-carpet-padding-show-toxins.html?_r=1&ref=garden)

### Chicago Tribune Series, "Playing with Fire"

- <http://media.apps.chicagotribune.com/flames/index.html>

### CNN on flame retardants

- <http://www.cnn.com/video/#/video/health/2013/01/25/sgmd-gupta-flame-retardants.cnn>

### Couches and flame retardants

- <http://pubs.acs.org/doi/abs/10.1021/es303471d>

### Electronic waste

- [http://www.saicm.org/images/saicm\\_documents/iccm/ICCM2/meeting%20documents/ICCM2%20INF36%20ewaste%20background.pdf](http://www.saicm.org/images/saicm_documents/iccm/ICCM2/meeting%20documents/ICCM2%20INF36%20ewaste%20background.pdf)

### Electronics and International Electrotechnical Commission

- <http://www.greensciencepolicy.org/node/213>

#### Fire safety and TB117

- <http://www.bhfti.ca.gov/about/laws/propregs.shtml>
- <http://greensciencepolicy.org/sites/default/files/Babrauskas%20and%20Blum%20Paper.pdf>

#### Flame retardant companies and Responsible Care

- <http://www.saferchemicals.org/2012/05/chemical-industry-challenged-to-repudiate-unethical-members.html>
- <http://cen.acs.org/articles/90/i24/Legislators-Urge-ACC-Expel-Firms.html>

#### Flame retardants in chicken eggs

- [http://www.ipen.org/ipenweb/documents/egg/flame\\_eggs.pdf](http://www.ipen.org/ipenweb/documents/egg/flame_eggs.pdf)
- <http://www.ncbi.nlm.nih.gov/pubmed?term=Halogenated%20flame%20retardants%20in%20home-produced%20eggs%20from%20an%20electronic%20waste%20recycling%20region%20in%20South%20China%3A%20Levels%2C%20composition%20profiles%2C%20and%20human%20dietary%20exposure%20assessment>

#### Flame retardants in children's nap mats

- <http://ceh.org/what-we-do/eliminating-toxics/current-work/612>

#### Norway State of the Environment: Brominated flame retardants

- <http://www.miljostatus.no/Tema/Kjemikalier/Noen-farlige-kjemikalier/Bromerte-flammehemmere/>

#### San Antonio Statement

- <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3002202/>

#### San Antonio Statement Supplemental Material

- <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3002202/bin/ehp.1003089.s001.pdf>

#### San Antonio Statement Editorial

- <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3002201/>

#### Stockholm Convention

- <http://www.pops.int>

#### Stockholm Convention Risk Profile on hexabromocyclododecane

- <http://chm.pops.int/Convention/POPsReviewCommittee/Chemicals/tabid/243/Default.aspx>

#### Stockholm Convention Guidance on Alternatives

- <http://chm.pops.int/Convention/POPs%20Review%20Committee/Publications/tabid/345/Default.aspx>

#### Stockholm Convention announcement on POPRC recommendation to phase out HBCD

- <http://chm.pops.int/Convention/Media/PressReleases/HBCDcontrolunderglobal-chemicaltreaty/tabid/2895/Default.aspx>



**a toxics-free future**

[www.ipen.org](http://www.ipen.org)  
[ipen@ipen.org](mailto:ipen@ipen.org)  
[@ToxicsFree](https://www.instagram.com/ToxicsFree)

*Guide Design: Tim Warner/Clerestory.com  
Photo Credits: Cover (E-Waste), Page 17—BAN.org*