WELCOME

Promoting Safer Flame Retardants in Health Care

December 10, 2008
DR. ARLENE BLUM

- Visiting Scholar, UC Berkeley’s Department of Chemistry
- Executive Director, Green Science Policy Institute
- PhD, Biophysical Chemistry, University of California at Berkeley
- Winner of the 2008 Purpose Prize

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Fire Prevention, Human Health, and Environmental Protection

• To achieve fire safety, fire retardants are added to products.
• These chemicals slow, but do not stop fires.
• Halogenated fire retardant chemicals have been associated with health and environmental hazards.
• To protect human and environmental health, hospitals can demand safer fire retardant chemicals and alternatives which maintain fire safety.
Most halogenated Fire Retardants are PBT’s

Persistent
Bioaccumulative
Toxic
Halogenated Fire Retardants

- Being **persistent** means that they do not break down into safer chemicals in the environment over months or years.
- Being **bioaccumulative** means that they accumulate in plants and animals, becoming more concentrated as they move up the food chain.
Halogenated Fire Retardants

Many are CMR’s

Carcinogens
Mutagens
Reproductive Toxins
Polybrominated Biphenyls (PBBs)

209 theoretically possible congeners
Divided into ten homolog groups, mono to decabromo

PBBs were accidentally mixed with livestock feed in 1973 in Michigan. Million of animals (chickens, cattle, pigs, and sheep) that ate the contaminated feed had to be destroyed.

PBBs can cause nervous, immune, liver, kidney, and thyroid disease and are likely human carcinogens.

PBB production ceased in 1976
Polychlorinated Biphenyls (PCBs)

209 theoretically possible congeners
Divided into ten homolog groups, mono to decabromo

PCBs cause cancer and adverse immune, nervous, reproductive, and endocrine effects.
PCBs are probable human carcinogens. US EPA

PCBs banned in 1977
Brominated Tris Flame Retardant
Tris (2,3-dibromopropyl) phosphate

- Used to treat children’s sleepwear 1975 to 1977
- Up to 10% of fabric weight
- Padded on, not attached
- Absorbed in children’s bodies; metabolite found in their urine
CPSC Bans TRIS-Treated Children's Garments

FOR IMMEDIATE RELEASE

April 7, 1977
Release # 77-030
Most Chemicals in the U.S. are not Regulated

The U.S. Toxic Substances Control Act (1979)

- 62,000 chemicals in commerce “grandfathered”
  - Since then, EPA has restricted only five of these
- Burden of proof is on EPA to show toxicity
- 20,000 new chemicals have been introduced
  - No environmental or health data required
  - 85% have no health data; 67% no data at all
- EPA has six weeks to show cause for harm, often with no data
- Little protection for public health or environment

Courtesy of Michael Wilson Green Chemistry in California: A Framework for Leadership in Chemicals Policy and Innovation
http://coeh.berkeley.edu/news/06_wilson_policy.htm
PBDEs used in:

1. furniture and carpet padding foam
2. plastic housings for TVs and other electronics
3. fabric back-coating

Levels up to 20 % by weight
Since the 1980s:

**Technical Bulletin 117 (TB117)**

California Open Flame Furniture Standard

- Polyurethane foam in furniture must withstand a 12-second exposure to an open flame. No flammability requirement enforced for fabric.
- Only California has a furniture flammability standard.
- Only PentaBDE was added to furniture foam from 1980 to 2004. Used in amounts up to 10%.
Flame retardant found in breast milk

U.S. levels highest in the world, study says

By Elizabeth Weise
USA TODAY

A toxic chemical used to make furniture, foam and electronics fire resistant is turning up in high amounts in the breast milk of women in the USA.

Two studies, one out today, found that all of the women tested were contaminated with polybrominated diphenyl ethers. Their PBDE levels were the highest in the world: 10 to 20 times higher than those in Europe, where the chemicals are being phased out.

The Environmental Working Group, a nonprofit environmental research organization, tested the milk of 20 women. Its PBDE levels ranging from 9.5 to 137 parts per billion. The women were recruited via EWG's Web site.

It is not yet known how this chemical affects people; no studies have been done on what a lifetime exposure would be. But “this is wake-up call,” says Linda Birnbaum, director of the Environmental Protection Agency's national toxicology program.

PBDEs in humans are doubly toxic: The fire retardants found in American mothers' breast milk.

Mothers’ Milk
Record levels of toxic fire retardants found in American mothers' breast milk
Halogenated Flame Retardants Are Ubiquitous and Believed to Impact Health of Wild Animals
Halogenated FRs not Recognized by Cellular Defense Mechanisms

ATP binding cassette, efflux transporters, etc in cell membranes do not keep Halogenated Flame Retardants our of cells

Cellular bouncers Cellular detoxification

Courtesy, David Epel, Stanford University
Routes of Fire Retardant Exposure

- Found in house dust and dryer lint --82% of dose from inhalation of contaminated dust particles. Matthew Lorber, *Review: Exposure of Americans to polybrominated diphenyl ethers*, Journal of Exposure Science and Environmental Epidemiology 11 April 2007

- Ingestion from food, especially meat and fish
- For fetuses and infants, absorption across the placenta or ingestion from breast milk.
- Occupational Exposure (manufacturing, processing and recycling/recovery)
Firefighters oppose BRFS and CFRs in electronic housings

- Firefighters have significantly elevated rates of multiple myeloma, non-Hodgkin’s lymphoma, prostate, and testicular cancer.

- These four types of cancer can all be related to exposure to dioxins and/or furans.

- Dioxins and furans are produced at high levels when BFRs and CFRs burn.

Reproductive Effects of PBDEs in Rodents

- Penta-BDE exposure causes abnormal gonadal development in rats. The number of ovarian follicles are reduced in female rat and sperm count decreased in males.

- Exposure delays the onset of puberty in males and females rats.

- Deca-BDE exposure is associated with abnormal sperm and increased pregnancy resorption rates.
Neurobehavioral Impacts from PBDES

- Exposure to PBDE fire retardants during brain development results in neurological deficits including decreased memory, learning deficits, and altered motor behavior.

- Penta-BDE exposure in utero is associated with hyperactivity.
Interference with Thyroid Action

• PBDEs fire retardants bind to thyroid hormone receptors.

• PBDE exposures correlated with decreased thyroid hormone levels (serum T4) in mice, rats, kestrals, and frogs.

• One study of manufacturing workers exposed to PBDEs and PBBs found an increased incidence of hypothyroidism.

2003; van der Ven, 2006)
Carcinogenicity

- DecaBDE has been associated with an increase in liver tumors and thyroid tumors in rodent studies
- HBCDD has been associated with liver tumors
- Brominated and chlorinated tris are carcinogens
Possible Human Health Impacts

• Exposure to PBDEs in utero was significantly associated with adverse birth outcomes such as decreased birth weight, length, and chest circumference. Chao et al, 2006

• Cryptorchidism or undescended testicles increases with maternal PBDE exposure. Main et al, 2007

• Human health studies of PBDEs and conditions such as autism, hyperactivity, reduced fertility, etc. are underway with more results expected in 2008.
August 9, 2003

California Bans Penta and Octa-BDE

November 3, 2003

Great Lakes Chemical Co. agrees to voluntarily cease Penta-PBDE production.

Replacements: Firemaster 550 Chlorinated Tris
My Cat Midnight has thyroid disease & a high PBDE body burden
BDE-99 fire retardant concentration in household dust

From: Zota et al., 2007 ISEA annual meeting.
Silent Spring Institute
Elevated House Dust & Serum Concentrations of PBDEs in California

- Penta-BDE in CA dust at 4 to 10 times the levels found elsewhere in the U.S.
- 200 times higher in CA dust than in Europe.
- California residents have two times the nationwide average in their blood.

Is this an Unintended Consequence of the CA Furniture Flammability Standard?

- Zota, Ami R., Rudel, Ruthann A., Morello-Frosch, Rachel A., and Brody, Julia Green
WWF Body Burden Study of Three Generations

• Professor Jacqueline McGlade, Executive Director of the European Environmental Agency (EEA), and her daughters had highest PBDE levels.

• Lived in the U.S. and Canada for eleven years
PentaBDE in furniture is slowly “bleeding” into the outdoor environment.

Due to atmospheric transport and persistence, it will be magnified in food chains.

Our main exposure route will shift from indoor air and dust to diet.
Daily PBDE dietary intake of U.S. population by age and food group (pg/kg body weight)
Food Web Implications

- Benthic organisms accumulate PCBs from sediment
- PCBs biomagnify to high levels in fish
- Adverse health effects in humans who eat fish

Graphics: USGS
No Data to show a Reduction in Fire Deaths from FR chemicals in Furniture

National Fire Protection Association fire analysts concur that U.S. fire data is not detailed or complete enough to show whether adding fire retardant chemicals to furniture foam in California since 1980 has made a measurable difference in fire deaths in that state.
New Standard For Furniture Flammability

December 2007
Based on health and environmental concerns, the Consumer Product Safety Commission (CPSC) has proposed a national flammability standard that can be met without fire retardant chemicals in foam.

“No one wants to trade fire risks for chemical toxicity risks."

CPSC Commissioner Thomas Moore
Good News About Fire Safety

USA Home Fire Deaths down 42% 1981-2004

Source: National Center for Health Statistics

1980: 4,956 deaths
1984: 2,810 deaths

Source: National Center for Health Statistics
Reducing Ignition Sources is More Effective than Fire Retarding the Fuel

22 states require fire-safe or reduced ignition propensity, (RIP) cigarettes beginning with NY in 2004.

CPSC & candle industry fire safety standards addressing four root causes of candle fires introduced in 2004.
Reynolds American Inc. announces product-wide switch to fire-safe cigarettes.

“If cigarette manufacturers had begun producing only fire-safe cigarettes 20 years ago,” said Jim Shannon, NFPA’s president, “an estimated 15,000 lives could have been saved by now.”
Once potentially toxic materials enter the global environment, it is impossible to recall them

- PBBs
- PCBs
- Brominated Tris
- Halon
- Asbestos
- PBDEs
- Firemaster 550 and chlorinated Tris again
- What are the new fire retardant materials?
- Should they be tested in advance for toxicity and environmental effects?
Fire Prevention, Human Health, and Environmental Protection

• Flammability standards can be met by safer alternative chemicals and/or product redesign.

• This move to safer fire retardant or alternative technologies is an opportunity to increase human and environmental health.
Dr. Mark Rossi

- Research Director, Clean Production Action
- HCWH Steering Committee
- Research Fellow, University of Massachusetts at Lowell
- PhD in Environmental Policy, MIT

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Flame Retardants in Health Care & Safer Alternatives

HFR Webinar
December 10, 2008

Mark Rossi, PhD
Uses of Flame Retardants

Polybrominated Diphenyl Ether (PBDE)

Brₙ  n=1-10
Penta- and Octa-BDE End Uses

**Penta- and Octa-BDE banned in Europe in 2003 and voluntarily removed from U.S. market in 2004. However, many products with these chemicals remain in use.**

<table>
<thead>
<tr>
<th>Flame Retardant</th>
<th>Product Examples</th>
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<tbody>
<tr>
<td>Octa-BDE</td>
<td>Casings for fax machines, computers, other electronics; telephone handsets, small electronics parts</td>
</tr>
<tr>
<td>Penta-BDE</td>
<td>Egg crate mattresses; cushioned furniture; carpet padding; rigid insulation; textile backcoatings</td>
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</tbody>
</table>
DecaBDE: End Uses

80% Electronics: mostly TV casings

10-20% Textiles / Furnishings

0-10% Other
Tetrabromobisphenol A (TBBPA): End Uses

**Printed wiring boards** (95% of consumption), office equipment housings, adhesive coatings in paper and textiles
Hexabromocyclododecane (HBCD): End Uses

Foam insulation board (buildings), textile backcoating, electronic casings
HFR-containing Products in Health Care

Foams(410,352),(845,414): egg crate pads, chair cushions, insulation board, carpets

(266,758),(728,820)

(266,780),(728,842)

(266,801),(728,863)

(266,823),(728,885)

(266,845),(728,907)

(266,866),(728,928)

(266,888),(728,950)

(266,909),(728,971)

Textiles: curtains, chair covers

Electronic Equipment: TVs, computers, faxes, patient monitors, IV pumps, ventilators, dialysis machines, etc.
Safer Alternatives are often Available
**DecaBDE**: Safer, Cost Competitive, Alternatives are Available

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<tbody>
<tr>
<td>Electronic casings (TVs)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>Furniture applications</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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Washington State estimates that "about 57% of TVs and 95% of computer products are PBDE-free"
**DecaBDE in TVs**: a Safer Alternative is Available

<table>
<thead>
<tr>
<th>Chemical</th>
<th>Benchmark Achieved</th>
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<tbody>
<tr>
<td><strong>DecaBDE and its breakdown products</strong></td>
<td>Benchmark 1: Avoid - Chemical of High Concern</td>
</tr>
<tr>
<td><strong>RDP and its breakdown products</strong></td>
<td>Benchmark 2: Use but Search for Safer Substitutes</td>
</tr>
</tbody>
</table>
DecaBDE in Textiles:
Safer Alternatives are Available

Textiles on Furniture

-- Textile backings coated with phosphate material

-- Inherently flame resistant materials used as fire barrier (aramides, melamine, glass fibers, etc.)

Source: LCSP, 2005

Notes

Very few manufacturers label their products as BFR-free
DecaBDE in Curtains:
Safer Alternatives are Available

<table>
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<th>Curtain Alternatives</th>
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<tr>
<td>-- Natural fibers (wool, cotton, linen) or natural/synthetic blends treated with phosphates</td>
</tr>
<tr>
<td>-- Inherently flame resistant materials or polymers w/phosphates</td>
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</tbody>
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<table>
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<tr>
<td>-- Natural/synthetic fiber blends are common</td>
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<tr>
<td>-- Higher % natural = better treatment results</td>
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</tbody>
</table>

Source: LCSP, 2005
BFR or Deca Phase-Outs: Businesses

- Dell: All BFRs by 2009
- LG Electronics: All BFRs by 2010
- Samsung: All BFRs by 2010
- Sony & Philips: No Deca use in any product
- Panasonic: No DecaBDE in TVs
Apple …

• “The greatest challenge facing our industry today is the presence of arsenic, brominated flame retardants (BFRs), mercury, phthalates, and PVC in products. In keeping with our philosophy over the last decade, Apple is not waiting for legislation to ban these substances. Not only are we targeting BFRs and PVC, but we are also eliminating all forms of bromine and chlorine wherever technically possible.”

• “BFR-free and PVC-free: Apple is on track to eliminate BFRs and PVC from all new product designs by end of 2008.”
Resources

Flame Retardants: Alarming Increases in Humans and the Environment

What Health Care Purchasers Can Do to Reduce Flame Retardants

noharm.org

cleanproduction.org

Decabromodiphenylether: An Investigation of Non-Halogen Substitutes in Electronic Enclosure and Textile Applications

Lowell Center for Sustainable Production

sustainableproduction.org
Rachael Baker

- Environmental Supply Chain Manager at Kaiser Permanente
- M.S. in Environmental Policy from the Bard Center for Environmental Policy, New York

rachael.a.baker@kp.org
Kaiser Permanente – Environmentally Preferred Purchasing and Halogenated Flame Retardants

Rachael Baker – Environmental Supply Chain Manager

December 10, 2008
KP and our Environmentally Preferred Purchasing Policy

Setting expectations with suppliers

Communicating to the marketplace

Policy Statement

Environmentally Preferred Purchasing Policy

In support of Kaiser Permanente’s (KP) mission to improve the health of our members and the communities we serve, the procurement and supply staff within KP are committed to applying guidelines and specifications of Environmentally Preferred Purchasing to all major, strategic, and critical purchasing decisions. KP’s Sourcing Core Groups, supported by purchasing and environmental stewardship staff, will evaluate the environmental impacts of products and services in their effort to select healthy and safe products and services that are also environmentally sound. KP personnel involved with product selection are required to communicate to the marketplace that KP expects suppliers to continuously develop price competitive products that conform to our EPP guidelines and specifications as defined in this policy.

Guidelines:

- Use greener chemicals, chemicals that are inherently less hazardous and release little to no toxic by-products across their lifecycle.
- Promote the use of renewable materials by increasing the use of sustainable, bio-based materials and reducing the use of fossil fuel-based materials.
- Support healthy food systems by sourcing food products that are local, seasonal, nutritious and produced in a way that minimizes degradation to human and environmental health and...
How Do We Know What is in Our Products?

Who owns the burden of proof?

How we shift the burden
Integrated and Category Specific Supplier Disclosure

Know your product category and relevant regulations and standards
Know relevant industry trends
Ask the right questions at the right time
- Fabrics
- IT Hardware

Use supplier responses to make sourcing decisions
Thank you
THE EUROPEAN UNION LEADS ON FLAME RETARDANT RESTRICTIONS

• 2003 PentaBDE and OctaBDE banned
2006: RESTRICTS

• Lead
• Mercury
• Cadmium
• Hexavalent chromium
• Polybrominated biphenyls
• Polybrominated diphenyl ether
  – includes decaBDE
Registration, Evaluation, Authorization and restriction of Chemicals (REACH) 2007

- Strictest law to date regulating chemical substances.
- REACH addresses the production and use of chemical substances, and their potential impacts on both human health and the environment

“No Data, No Market”
Other European Countries Restrict Certain Flame Retardants

Norway: TBBPA, HBCD restrictions (planned)

Sweden: DecaBDE restriction (textiles)
United States *Begin* to Act

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<th>DecaBDE Bans</th>
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A series of worldwide electronics industry standards would have required plastic enclosures for consumer electronics to resist external candle ignition - proposed in 2002 and voted on in 2008 - up to an estimated additional 1.7 billion pounds of fire retardant chemicals would have been required annually.

There are no fire deaths from candle fires in consumer electronics in the U.S.

Motivation from the fire retardant chemical industry.
Case against Candle Resistant Electronics
California TB604 Bed Clothing Standard

Filled bed clothing such as comforters, mattress pads and pillows must withstand open flame ignition

- No consideration of health or environmental impact
- No labeling for consumers
- Expected to have public comment hearings in early 2009
Since the 1980s:

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STANDARDS WHERE HOSPITALS CAN HAVE AN IMPACT

1) Computer, Monitor and Laptop Standard-updated version

2) Non-Medical Imaging Devices: copiers, scanners, printers, etc.

2) TVs

3) Servers

4) Mobile devices
LET YOUR VOICES BE HEARD-NO TOXICS IN OUR BEDDING
and
REVOKE FOAM FURNITURE STANDARD

1) Governor Arnold Schwarzenegger

2) Rick Fong,
   Bureau of Home Furnishings and Thermal Insulation

3) Rosario Marin,
   State and Consumer Services Agency
RAISING THE BAR FOR ENVIRONMENTALLY PREFERABLE ELECTRONICS

• Develop criteria ("points") for Halogenated Flame Retardant (HFR) free products

• Express purchasing preference for HFR free products

• Express interest in EPEAT Standard for Televisions
Question and Answer Period

- Please say your name and your organizational affiliation

- If we do not have time for your question, please email it to judy@ceh.org and we will respond to your question.

Thank you!