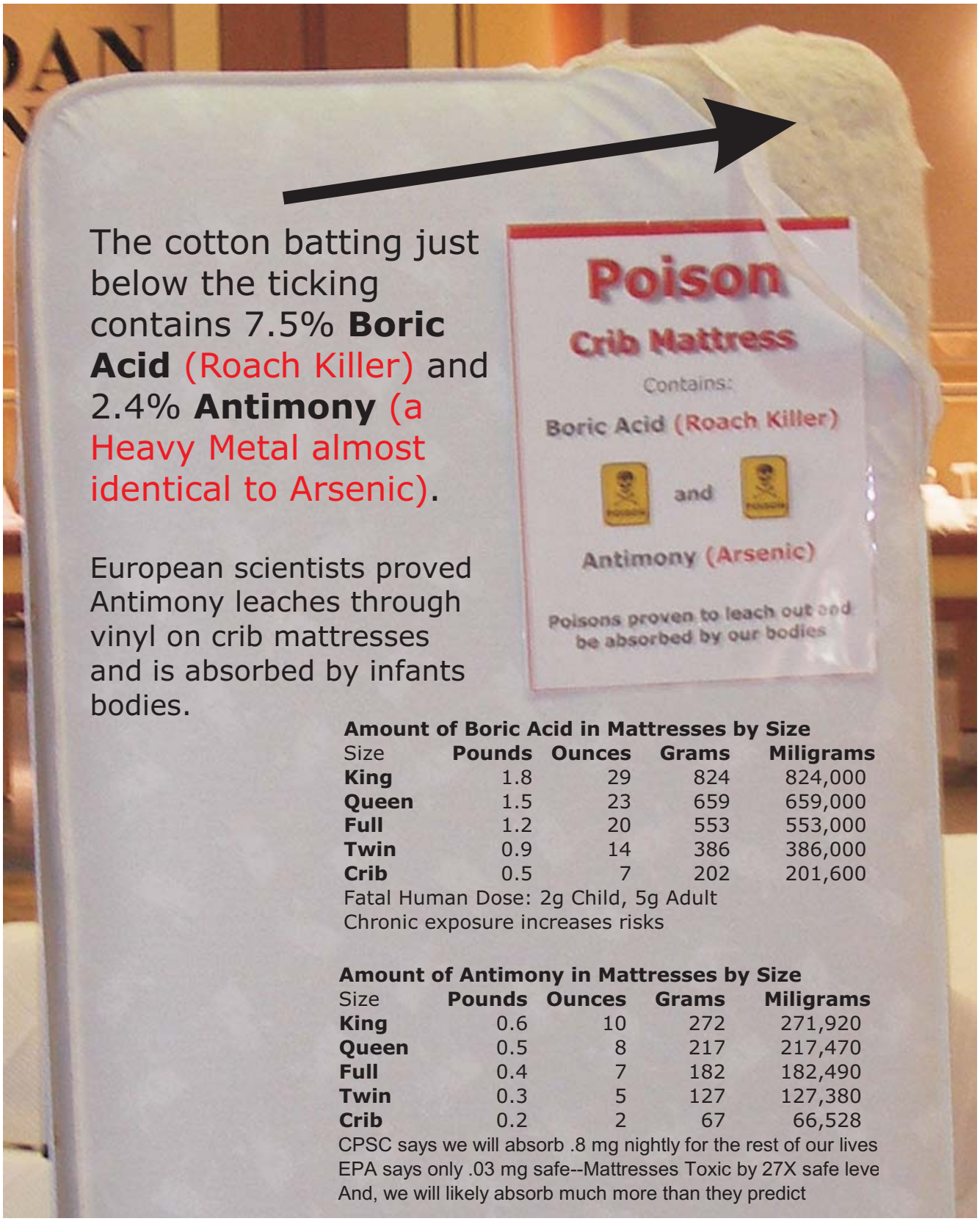
Even New Crib Mattresses Contain Poisons to Meet the New Fireproof Bed Regulation



The cotton batting just below the ticking contains 7.5% **Boric Acid** (Roach Killer) and 2.4% **Antimony** (a Heavy Metal almost identical to Arsenic).

European scientists proved Antimony leaches through vinyl on crib mattresses and is absorbed by infants bodies.

Amount of Boric Acid in Mattresses by Size

Size	Pounds	Ounces	Grams	Miligrams
King	1.8	29	824	824,000
Queen	1.5	23	659	659,000
Full	1.2	20	553	553,000
Twin	0.9	14	386	386,000
Crib	0.5	7	202	201,600

Fatal Human Dose: 2g Child, 5g Adult
Chronic exposure increases risks

Amount of Antimony in Mattresses by Size

Size	Pounds	Ounces	Grams	Miligrams
King	0.6	10	272	271,920
Queen	0.5	8	217	217,470
Full	0.4	7	182	182,490
Twin	0.3	5	127	127,380
Crib	0.2	2	67	66,528

CPSC says we will absorb .8 mg nightly for the rest of our lives
EPA says only .03 mg safe--Mattresses Toxic by 27X safe leve
And, we will likely absorb much more than they predict

www.PrescriptionBeds.com

Percent of Toxic Chemicals in Mattresses

Table from U.S. Consumer Products Safety Commission:

H3BO3 is Boric Acid

SB2O3 is Antimony

Table 1. Barrier ID and FRC Load

Barrier ID	Type/FRC content	Density (mg/cm^2)	FRC Percentage (%) Determined by CPSC				
			H_3BO_3	Sb_2O_3	DBDPO	Melamine	VC
1	Cotton Batting/ H_3BO_3, Sb_2O_3	34.4	7.5	2.4			
2	Nonwoven modacrylic-visil/ Sb_2O_3, PVDC, Si	15.4		3.8			ND
3	Nonwoven visil/ Si, PVDC	21.4					ND
4	Nonwoven visil/ Si, PVDC	21.7					ND
5	Visil knit/ Si, PVDC	21.6					ND
6	Modacrylic knit/ Sb_2O_3, Si, PVDC	16.2		4.5			ND
7	Coated fiberglass/ DBDPO	17.4			7.5		
9	Coated Foam/ Melamine, H_3BO_3, Sb_2O_3	61.5	4.1	4.1		4.9	
10	Coated Poly-Cotton Ticking/ Melamine, H_3BO_3, Sb_2O_3	32.1	3.5	2.7		2.9	
11	Coated Poly-Cotton/ Melamine, H_3BO_3, Sb_2O_3	21.7	4.0	3.1		4.1	
12	Coated Knit/ Melamine, H_3BO_3, Sb_2O_3	28.1	4.0	4.4		6.6	
13	Melamine Resin					ND	
14	Melamine Resin					ND	
15	Melamine Resin					ND	
16	Melamine Resin					ND	
17	Melamine Resin					ND	
18	Melamine Resin					ND	
19	Melamine Resin					ND	

Note: ND – not detected. The limit of detection (LOD) for VC in the barrier samples is 30 ppm. The LOD for melamine in the barrier samples is 0.002%.

Melamine Systems also contain free Formaldehyde, but they did not test for it. Formaldehyde concentrations of 10 to 15 parts per million have been found to cause nasal cancer in rats, and in June 2004 the International Agency for Research on Cancer reclassified formaldehyde as a known human carcinogen.

This is the table of chemicals used and percentages in flameproof mattresses from CPSC tab-h p. 17. H3BO3 is Boric Acid, SB2O3 is Antimony. 5 of the systems contain Boric Acid and 7 contain Antimony. All the Boric Acid systems also contain Antimony. Melamine Resin systems are made from the reaction of Melamine and Formaldehyde, and contain free Formaldehyde. But they did not test for Formaldehyde content. Also there are other omissions of chemicals they did not test.

FORMALDEHYDE MSDS: "POISON! DANGER! SUSPECT CANCER HAZARD. MAY CAUSE CANCER. Risk of cancer depends on level and duration of exposure. VAPOR HARMFUL. HARMFUL IF INHALED OR ABSORBED THROUGH SKIN. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. STRONG SENSITIZER. MAY BE FATAL OR CAUSE BLINDNESS IF SWALLOWED. CANNOT BE MADE NONPOISONOUS." http://www.jtbaker.com/msds/englishhtml/F5522.htm

Si is Silicon, which was not tested for either. It also has health risks: "Silicon may cause chronic respiratory effects. … Inhalation will cause irritation to the lungs and mucus membrane. Several epidemiological studies have reported statistically significant numbers of excess deaths or cases of immunologic disorders and autoimmune diseases in silica-exposed workers. These diseases and disorders include scleroderma, rheumatoid arthritis, systemic lupus erythematosus, and sarcoidosis. Recent epidemiological studies have reported statistically significant associations of occupational exposure to crystalline silica with renal diseases and subclinical renal changes. Crystalline silica may affect the immune system, leading to mycobacterial infections (tuberculous and nontuberculous) or fungal, especially in workers with silicosis Occupational exposure to breathable crystalline silica is associated with bronchitis, chronic obstructive pulmonary disease (COPD) and emphysema. … **Lung cancer** is associated with occupational exposures to crystalline silica http://www.lenntech.com/Periodic-chart-elements/Si-en.htm#Health%20effects%20of%20silicon

Ammonium Polyphosphate is the only other chemical used to flameproof mattresses not listed above. Not as much is know of how toxic this chemical is to sleep in, but it is doubtful sleeping in and absorbing this fertilizer could be good for us. The CPSC has shown large amounts of this chemical leach from mattresses.

As you can see above 7 of the barriers contain Antimony and 5 contain Boric Acid. It is no wonder there are no labeling requirements for the FR chemicals used in mattresses. Which of the above systems would you choose to sleep in? We don't think any of these systems are safe, they all have risks.

Cotton Batting barriers contain 10% poison, 7.5% Boric Acid plus 2.4% Antimony. Melamine Resin barriers contain Formaldehyde. Silicon and Formaldehyde were not studied.

We keep hearing about **inherently flame resistant fibers** from mattress manufacturers. These inherently flame resistant fibers have chemicals blended with the fiber as the fiber is made. Modacrylic fibers contain Antimony. Melamine resin fibers contain Formaldehyde. The only true inherently flame resistant fiber is fiberglass, and even that is blended with chemicals to make a barrier as you can see in the table above.

Antimony: Quote from College Chemistry Textbook: **"Antimony resembles Arsenic very closely;** the difference in its behavior being almost entirely accounted for by the fact that antimony is slightly more metallic." This helps explain why it is so poisonous. Quotes from ATSDR a division of the CDC on Antimony: "An increase in the number of spontaneous abortions, disturbances in menstruation, failure to conceive, May cause heart to beat irregularly or stop. … Chronic Exposure: Prolonged or repeated exposure may damage the liver and the heart muscle." "In long-term studies, animals that breathed very low levels of antimony had eye irritation, hair loss, lung damage, and heart problems. Problems with fertility were also noted." "Two studies reported lung tumors in rats exposed to relatively low levels of antimony trioxide." Antimony tends to accumulate in the liver and gastrointestinal tract." The CDC cannot determine a safe level of Antimony exposure because: "At the lowest exposure levels tested, the adversity of the effects was considered to be serious." On cancer risks of Antimony even the CPSC admits: **"The cancer effects are cumulative. Every exposure contributes to the overall lifetime risk of developing cancer."**

Boric Acid, also used as Roach Killer, is a known reproductive and developmental toxin, a known respiratory irritant, Demonstrated injury to the gonads and to the developing fetus. high prenatal mortality, Neonatal children are unusually susceptible. There are already 6,463 U.S. cases of Boric Acid poisoning each year. One human exposure study showed reduced sperm counts and reduced sexual activity in humans.

DBDPO, Deca, is in the family of PBDE's being found in women's breast milk, is known to bioaccumulate, is linked to cancer, and groups are trying to get it banned.

EPA Proves Flameproof Mattresses Toxic: The EPA says it is safe to absorb only .03 mg Antimony for the average adult. The CPSC says we will absorb .8 mg Antimony from flameproof mattresses every night, even with low skin absorption assumptions. Mattresses Toxic by 27 times safe level!

People Sick from Flameproof Mattresses

Phil Fleming, Seattle WA 98166
The new Serta I bought at Costco this spring is giving me huge headaches and joint pain. I went back to a 8 yr old bed and immediately felt better.
****

Kirsten Surratt, BS, Peoria IL 61615, Friend had similar problem
"Bought a chemical treated mattress, broke out in a rash/itchy skin, have sore throat and increased frequency of my migraines and sinus problems."
****

Robert L Chavoya, BA, Lockhart TX 78644,
My wife and I purchased a Serta mattress (Pillow top)a month ago. The first was soiled and was exchanged. The second and our current third mattress has a caustic odor that permeates the house and causes our eyes to water and throats to itch. The Serta folks advised us to air it out. I've sealed off the bedroom and had a heavy duty fan blowing directly on the mattress (the second mattress for 7 days) the third mattress for 3 days. The odor is not going away. Our master bedroom is completely sealed off from the rest of house with windows open.

"We are both in our senior years; we've had a few mattresses in our life times. But this is the first that is fire retardant and the first that has caused us extreme physical discomfort with allergic/cold type symptoms. **I'm currently in contact with Serta management,** but I believe that this treated mattress will not be part of our household much longer. **They insist that the mattress itself is not treated with any chemicals,** but that the different materials that are used to patch the mattress together have fire-retardant features. "

[Serta has previously admitted they use chemicals including Boric Acid to the Washington Post and others. Kevlar is used in the yellow thread you see on the perimeter of the mattress to hold it together, but this is not the flameproofing system. The CPSC report table 1 proves the cotton batting flameproofing system contains 7.5% Boric Acid and 2.4% Antimony. With no labeling requirements, it is typical for mattress makers to deny using chemicals!]
****

Dr. Donald Stone, Ph.D., Oakland CA 94618
I have fairly regular tolerance to a variety of toxic chemicals but demonstrated chemical sensitivity to formaldehyde. For instance when rugs used greater concentrations in the backing glues I would last about 2 minutes in a carpet store before I got faint. I now can last a half an hour. "A recently purchased mattress has given me the familiar symptoms of **formaldehyde poisoning**. When I did a little research into the new requirements for flame retardants, I was appalled at what is going into mattresses, and without any adequate labeling. People buying flame retardant mattresses should be paid for participating in an experimental trial of an inadequately tested product. Not required by law to get a Dr's prescription to have the privilege of paying huge sums to purchase expensive mattresses without flame retardants. "
****

Ann Natale, BS, Rockford IL 61107
"I am currently suffering severe allergic reactions to my new Sealy mattress. The store, Slumberland and its rep deny any problems from the Boric acid. I am excited to find this site that will help ban boric acid." Thank you for your work.
****

Linda Merrill, Columbia TN 38401
My good friend acquired asthma after prolonged exposure to boric acid. (carpet treatment) Subsequently, she died from an asthma attack. This happened over a period of two years!!!
I DO NOT WANT MICROPARTICLES OF BORIC ACID FLOATING OUT FROM MY MATTRESS EVERY TIME I LAY DOWN OR MOVE AND THE MATTRESS COMPRESSES!!
****

Some people are called Canaries because they are more sensitive than others. The real risk is long term. The original comment log with more people reporting flameproof mattresses making them sick and full contact information is available on request.

Are new flameproof mattresses safe?

Does the risk outweigh the benefit?

Even though mattresses already will not ignite from cigarettes, the new national flameproof mattress regulation requires all new mattresses to resist ignition from open flame. Mattresses must withstand a two foot wide blowtorch open flame test for 70 seconds.

Some things are clear: New Mattresses, including Crib Size, contain known acutely toxic and cancer causing chemicals including Boric Acid (yes, the Roach Killer), Antimony Trioxide, Silicon, Decabromodiphenyl Oxide, Ammonium Polyphosphate, Melamine, and Formaldehyde, to meet the severe open flame test. Scientists have proven these chemicals leach from flameproof mattresses in large quantities, and they have measured how much leaches to the surface. Scientists have also proven these chemicals are absorbed by our bodies. Manufacturers are free to choose any untested chemicals they wish to use in mattresses to pass the test. There are no labeling requirements for the flame retardant chemicals in mattresses, and you will never know which chemicals you and your children are sleeping in and absorbing every night.

It is not proven safe to sleep in any of these chemicals: Quoting the US Consumer Products Safety Commission (CPSC),

> "Comment
> Some individuals commented that the "precautionary principle" should be applied to FR chemicals, that is, they should not be used until proven safe.
>
> Response
> All of the statues that provide regulatory authority to the CPSC explicitly require risk-based decision making, thus precluding application of the "precautionary principle.""

There are no scientific studies that say it is safe to sleep in these chemicals.

It is not clear if it is safe to sleep in and absorb these chemicals on a chronic basis for all 300 million Americans with all our individual sensitivities and special populations, especially for pregnant woman and young children. Many MD's say it is unsafe for anyone.

The only document which examines the safety of sleeping in some, but not all, of the most commonly used chemicals in flameproof mattress is a short review internally generated by CPSC employees in January 2006. This is the document proponents point to as proof flameproof mattresses are safe. Ironically, the document proves known acutely toxic and cancer causing chemical leach from flameproof beds in large quantities, and are absorbed by our bodies. If you will look at only a few highlighted lines of this report linked off www.PrescriptionBeds.com you will see it has a variety of problems, errors, and omissions. It becomes clear the report is designed to reach a preexisting conclusion.

First, they excluded children under age five from the analysis by assuming all these children will sleep on vinyl sheets due to bedwetting problems, and that this will protect them from absorbing the toxic chemicals in their mattresses. A lot of recent research has shown that even remarkably low level toxin exposure can harm young children. Even new Crib Mattresses contain Boric Acid and Antimony to meet the regulation. European scientists proved Antimony leaches through vinyl on crib mattresses, and linked it to SIDS.

In a 2004 CPSC Report the same authors of the 2006 CPSC Report wrote:

> "Melamine is reacted with formaldehyde and other non-FR compounds to form fibers that are used to construct a barrier. Formaldehyde is a known sensitizer, and is also regarded as a carcinogen. Data are needed to determine the conditions for, and potential releases of, formaldehyde from barriers made with melamine/formaldehyde resin fibers."

In the 2006 report these same authors do not test for or consider formaldehyde absorption, they only tested this system for melamine release. Formaldehyde is not mentioned anywhere in the report. They knew about Formaldehyde, and omitted it.

Formaldehyde concentrations of 10 to 15 parts per million have been found to cause nasal cancer in rats, and in June 2004 the International Agency for Research on Cancer reclassified formaldehyde as a known human carcinogen. Millions of Americans will have their nose right next to these mattresses for 1/3 of their lives, 10 to 15 parts per million is a very small number, plus skin absorption.

An independent review is required by law, but you will see it basically failed the review as they rebutted and ignored the recommendations. The reviewer complained repeatedly and strongly that their assumptions of safe levels of toxin absorption do not agree with other agencies, and that they changed the rules of the National Academes of Science 'Child Sucking Test' and then did not even apply it to one year old children who the test was designed to protect. If they had used the EPA number for Antimony safe absorption it would have proved mattresses toxic by 27.5 times, even with their low skin absorption assumptions. They admit uncertainty and that they have no comparison data for skin absorption for Antimony, while we know one to a few skin applications kills rabbits, and yet they assume we will absorb only 2/1,000's of the Antimony that has leached to the surface and contacts our body. Any one of these things, if done properly, would have stopped this regulation.

Now, every American, all three hundred million of us will be eventually forced to unknowingly sleep in absorb toxic and cancer causing chemicals for the rest of our and our children's lives. All to avoid a one in 1.111 million mattress fire risk.

We have made toxic mistakes in the past. What will we learn 10 or 20 years from now? If any one of these systems proves toxic, how many millions of people will be harmed or killed? You may agree the risk outweighs the benefit.

Our only option now is a prescription mattress free of toxic chemicals for those lucky few who learn the truth.

ingentaconnect

Antimony leaching from cot mattresses and sudden infant death syndrome (SIDS)

Authors: Jenkins R.O.[1]; Craig P.J.[1]; Goessler W.[2]; Irgolic K.J.[2]

Source: Human & Experimental Toxicology, Volume 17, Number 3, 1998, pp. 138-139(0)

Publisher: SAGE Publications

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Abstract:

1 Polyvinyl chloride (PVC) cot mattress covers from SIDS cases were investigated as potential sources of soluble (potentially ingestable) antimony in the cot environment. 2 Body fluids (urine, saliva) and proprietary domestic detergents/sterilizing fluids markedly enhanced leaching of antimony from PVC. Release of antimony was also enhanced at both low and high pH and by elevated temperature. The extent of antimony leaching did not correlate well with PVC content of this element. 3 These data do not support the assumption that postmortem analysis of antimony content proves exposure to gaseous antimony trihydride from mattress PVC. 4 Ingestion of antimony released from PVC could account for the high variability associated with reported detectable levels of antimony in liver from both SIDS and other infants. It could also explain suspected additional postnatal exposure to this element, which gives rise to elevated levels of Sb in the hair of some healthy infants.

Keywords: antimony; SIDS; infant death; cot mattress; PVC

Language: English

Document Type: Original article

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Flame retardant found in breast milk

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 Tuesday, 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. (**Related story:** Breast milk can protect baby)

The Environmental Working Group, a non-profit environmental research organization, tested the milk of 20 women. It found levels ranging from 9.5 to 1,078 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 safe level would be. But "this is another wake-up call," says Linda Birnbaum, director of the Environmental Protection Agency's experimental toxicology lab. Levels of PBDEs in humans are doubling every two to five years, she says.

What are PBDEs?

Polybrominated diphenyl ethers are among the most common flame retardants in the USA. Starting next year, they will be banned in Europe. In 2008, they will be banned in California.

-Houston study by Arnold Schecter, professor of environmental sciences, and Birnbaum found levels in breast milk from 5 to 418 parts per billion in 47 American women. It was published last month in *Environmental Health Perspectives*. Breast milk is tested because it's the least invasive way to test fat, where PBDEs are stored.

In mice and rats, studies show PBDEs may cause cognitive and behavior changes during development; it also may lead to higher cancer rates. Peter O'Toole, of the Bromine Science and Environmental Forum, says human effects can't be extrapolated from rodents.

Though the USA has the world's toughest flame retardancy standards, 3,000 people die in fires each year. The Chemical Manufacturers Association estimates the number would be up to 960 higher without such flame retardants.

PBDEs may enter the environment during manufacturing or when products break down, though no one yet knows for sure. Some experts say the major source is animal fat in food. One study found them in house dust.

Schecter advocates using less toxic alternatives: "These are our babies. Do we want them to be dumber than we are because their brains are being attacked by these toxic chemicals?"

Find this article at:
http://www.usatoday.com/news/health/2003-09-22-breast-milk_x.htm

Check the box to include the list of links referenced in the article.

POSTED AT 12:25 AM EDT ON 30/05/06

Ottawa plans to snuff out flame retardants

MARTIN MITTELSTAEDT
FROM TUESDAY'S GLOBE AND MAIL

For the past 30 years, flame retardants have been found in every Canadian home, added liberally as a safety precaution to everything from mattresses and carpets to stereos, televisions and computers.

Now Canada is poised to add flame retardants — or polybrominated diphenyl ethers (PBDEs) — to its toxic-substances list.

If a draft proposal it is circulating is any guide, the federal government is expected to virtually eliminate some varieties of the chemical and place tight controls on others.

Regulators are considering drastic action because laboratory studies using animals have linked the chemicals to behaviour changes that bear an uncanny similarity to attention-deficit and hyperactivity disorders common in children. Some researchers believe PBDEs could offer a clue for the sudden rise of these childhood disorders in recent years.

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The animal findings on their own would not be a major concern, except for a second disturbing discovery: Flame retardants are not staying put in consumer products. They have been migrating from mattresses and computers, in ways that are not completely understood, into the environment and into people.

It's been a strange odyssey for flame retardants — from lifesaver to possible health hazard.

When the chemicals, known as polybrominated diphenyl ethers, were tested in the 1980s, they seemed to have few drawbacks. They weren't excessively toxic because huge exposures were needed to kill test animals. They also didn't appear to be a cancer risk and were given a clean bill of health for such uses as preventing TV sets, computers and mattresses from catching fire.

It took nearly two decades of their widespread use before scientists began conducting new tests on chemicals, checking whether they had hormone-like properties — a field of science that only started to develop in the mid-1990s after discoveries that many industrial compounds once deemed safe exhibited this unusual attribute.

This new research has found that flame retardants have an ability to mimic thyroid hormones; it is thought that by following that hormonal route, the chemical plays havoc in laboratory animals, where exposures have been linked to hyperactivity, impaired learning and decreased sperm counts.

Society has been "blindsided by product decisions that were made before this new science started to come out," said Pete Myers, co-author of *Our Stolen Future*, a book that describes how many everyday chemicals behave like hormones.

Researchers are finding that flame retardants don't obey traditional rules of toxicology, shedding light on the novel ways that some chemicals may still hold dangers, even though they aren't outright poisonous or don't trigger cancer.

The traditional mantra of toxicologists has been that the dose makes the poison, or that exposures have to be large to have an effect, with larger exposures packing more punch than smaller ones.

In experiments with rodents, effects have been noted on the offspring of rats given only one exposure of 60 parts per billion, an amount that a few decades ago scientists would have dismissed as too low to have an impact. To get an idea of the amount involved, a part per billion equals a single drop of water in a gasoline tanker truck.

The pups born to exposed rats were found by motion sensors to be 24 per cent more active in their cages than unexposed control animals.

When researchers upped the dose to 300 ppb, there was hardly any increase in activity; it went up only 27 per cent compared with the controls, despite the fivefold increase in exposure.

The amounts used in the rat experiment, the lowest seen to produce effects, are approaching levels seen in some people in North America, and were thousands of times smaller than the amounts found to kill test animals.

"There was a lot of surprise that these compounds could produce some effect at concentrations like that," said Dr. Thomas Zoeller, a biologist at the University of Massachusetts who is studying flame retardants for the U.S. Environmental Protection Agency.

What is more, the behaviour effects persisted as the animals aged, indicating that whatever the chemicals did was permanent. "It means that you can't go back and fix it," Dr. Zoeller said. "You either prevent these [effects] or you cope with them."

In another experiment, using newborn mice, researchers found another unusual property. Sometimes it isn't the size of the dose that makes flame retardants harmful, but the point in an animal's life when the exposure was given.

Young male mice given traces of the chemicals four and 10 days after birth exhibited behavioural abnormalities, but the same dose given to 19-day-olds caused no changes at all, compared with control animals.

Scientists theorize that the flame retardants had their effect by interfering with hormones during the period of rapid brain growth in the rodents in the first two weeks of life. In humans, this brain growth spurt lasts from the

final part of pregnancy through the first two years of life.

The amounts of flame retardants given to the mice was low, in the parts per million range, but what is more remarkable is that the quantity that made its way into brain tissue was the scientific equivalent of almost nothing, only 10 parts per trillion. A part per trillion is the equivalent of a grain of salt in an Olympic-size swimming pool.

Medical Doctors Comments,

Hippocrates left us with the admonition: **"First do no harm."**

****

Dr. Mayer-Proschel, Ph.D.
Rochester, NY 14534

Dr. Mayer-Proschel is a professor and scientist at a major US Medical School, and has published 18 scientific studies in neurotoxicology.

After doing my own literature research it is quite incredible that law makers are willing to risk the health of thousands of people. According to available scientific data it is NOT clear whether the levels of chemicals one is exposed to on a chronic basis by sleeping on treated mattresses is safe, especially for children and pregnant women. I have yet to find a single scientific study that supports the use of these chemical in mattresses and labels them as "safe". It is another example of an ignorance beyond reason and one begins to questions the true motivation of the individuals pushing for a national law to include these chemical in all mattresses. Maybe one should start to ask who would financially benefit from such a law to get the true motivation?

In light of the information available, I support your quest for caution and agree that the potential danger far outweighs the benefits of fire prevention (you might want to add to your reasoning that prevention of fire is far more effective and safe by enforcing a non-smoking policy in a house and mandatory fire alarms).
As an additional suggestion, I would also include more up-to-date scientific article citations in your website that directly address the issue of fire retardants. I have included a sample list of original scientific publications I have read, which make the point quite clearly.
Thanks for fighting a "nonsense law" that seems dangerous and agenda driven.

Sincerely
M. Mayer-Proschel

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Dr Lawrence A. Plumlee, MD
Chemical Sensitivity Disorders Association
Dallas, TX 75220-3757

The benefits do not outweigh the risks. I know many chemically sensitive people who do not tolerate treated mattresses. And how many are intolerant who don't know why they can't sleep or feel bad? This law is premature, and just a measure by mattress manufacturers to avoid liability for fires. Why not address this directly?
****

Dr. Susan Toron, D.C.
106 E. Ridgewood Ave.
Paramus, NJ 07652

I was forced to purchase an organic cotton bed for my son after learning **he was being poisoned by the chemicals in his mattress. In testing, he had 3x the level of Antimony in his system,** which was causing significant health and behavior problems (he was 4 at the time). Within 6 months of getting him out of the chemical bed and into the organic one, his antimony levels went back to normal, and his health and behavior problems stopped. Bottom line is that we do not deserve to be poisoned by chemicals we are unaware of, especially when it comes to our mattresses. How many of us have health problems we are dealing with that are from the chemicals we are being exposed to from our mattresses? As someone who lived through the horror of watching her son deal with chronic health and behavior problems at 4 years old, only to find out it was from his mattress, I feel these chemicals definitely do not belong in our homes. We should have a choice, don't you think. Unfortunately, most of us do not have the knowledge to make the choice, because this information is not readily available. Let's fight for change.
****

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92 EAST BROAD ST
BERGENFIELD, NJ 07621

IT IS MY PERSONAL OPINION (AS A PHYSICIAN), THAT, IF WE HAVE DOUBTS REGARDING THE EFFECTS OF ANY PARTICULAR SUBSTANCES TO HUMAN BODY, WE CANNOT PUT ANYBODY IN THAT PARTICULAR RISK; THIS IS ETHICALLY UNACCEPTABLE. MAY BE THERE ARE BIG INTERESTS IN THAT LAW, BUT, FOR ME, THE MOST IMPORTANT IS THE HUMAN BEING AND ITS HEALTH.
****

Dr. Elizabeth Vaughan, MD
Vaughan Medical Center
1301 W. Wendover Ave. Suite A
Greensboro, NC 27408

I am a physician who treats patients with many debilitating illnesses that other physicians can't figure out. I practice environmental medicine and integrative medicine.

People are already exposed to an inordinate number of chemicals in our environment that our ancestors never had to detoxify or eliminate from their bodies.

We are seeing more autism, more neuro-degenerative diseases, more asthma and allergies, more "irritable bowel syndrome", more early dementia, etc. Many of these patients get better when they are detoxed and avoid the chemicals that are triggering the symptoms and illnesses.

Didn't we already learn this lesson in the 50-60's with cigarettes?

There is ample scientific and epidemiological evidence right now that these chemicals can be very dangerous for humans.
The CPSC needs to protect us from these chemicals, not throw more at us.

The vision of people experiencing a vibrant and vigorous retirement will be eroded by untreated toxicities of chemicals and heavy metals.

The least we can ask for is a safe bedroom.

If the CPSC pushes this law forward, they need to change their name.
****

Dr. Stuart Kossover, MD
Greensboro, NC 27410

This is a joke, right? Wouldn't we be better off requiring a fire/smoke alarm directly over the mattress? Or, how about a sprinkler system? In a nutshell, we are going to make roaches/other pests resistant to boric acid and humans sick from it at the same time. Maybe we need a controlled study before we commit. Good luck finding volunteers. Class action law suit, here we come (just as feasible as people sueing the tobacco companies, yikes).
****

Dr. Rapp, MD, F.A.A.A., F.A.A.P., made the following statement:

"The world has gone completely crazy. Until the powers that be can prove that what they propose for protecting mattresses against fire will not harm a pregnant woman, an unborn baby, an infant, a child, the elderly or a normal male or female they should **UNQUESTIONABLY NOT EVEN CONSIDER PUTTING CHEMICALS INTO EVERY MATTRESS.**
What can we do to stop the nonsense!!! "

Doris J. Rapp, MD, F.A.A.A., F.A.A.P. Is a board-certified environmental medical specialist and pediatric allergist. She was a clinical assistant **professor of pediatrics at the State University of New York at Buffalo**. Dr. Rapp is the founder of the Practical Allergy Foundation and is a past **President of the American Academy of Environmental Medicine**. **She is also the author of several books.**

• 1421 Colvin Blvd • Buffalo, New York 14223 Phone 716-875-0398 • Fax 716-875-5399 • Website: www.drrapp.com Email drrappmd@aol.com

****

Dr. Liberman, M.D., F.A.A.E.M., made the following statement:

"We live in a very technologically advanced world, which advocates the advantages of these technologies but rarely ever considers the disadvantages or potential harm. Everything in life must be considered on a cost/effectiveness ratio basis.

It seems ill advised to expose hundreds of millions of people to a potential health hazard in order to protect a very few. …. **I am absolutely opposed to adding the proposed toxic chemicals to mattresses.** I render my opinion based on my education, training and experience in the field of occupational and environmental medicine."

Sincerely,

Allan D. Lieberman, MD
Consultant in Occupational and Environmental Medicine**"**

ALLAN D. LIBERMAN, M.D., F.A.A.E.M.
Diplomate, American Board of Environmental Medicine
Member, American College of Occupational & Environmental Medicine

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Website: www.coem.com E-mail: allanl@coem.com

****

Other Doctors Comments

Dr. Sher K. Malik, Ph.D. Chemistry
Stockton, CA 95205
Phone: 209-943-1197

As a chemist, I am quite concerned that products like Boric Acid and Antimony Oxides are being used in bedding materials that we spend 6-8 hr. every day. These chemicals are toxic and will affect the human health if in contact with over a long period which the case in a bed.
****

Dr. Anja Sturm, PhD
Newark, DE 19711

I have followed some of the mounting evidence that flame retardants are highly toxic and possibly a significant pollutant in our homes with far reaching effects on our health.

I know that other countries are moving away from their use and are considering bans. I am simply baffled that at such a time the US legislature moves to pass a law that would make their use mandatory in all mattresses, thereby even robbing people of their free choice.

I sincerely hope that this campaign to stop such irresponsible legislature will be successful! Thanks.
****

Dr. Kenward Vaughan, Ph.D. (Chemistry)
Bakersfield, California 93305

I am not interested in spending a third of my life lying against and exposed to a chemical I use to kill cockroaches and other insects in my home.

Why buy such a product??
****

Dr. Rachel Smook, Psy.D.
Boston, MA 02171

This is terrifying legislation. I can't imagine putting my child to sleep on poison every night!
****

Please see the highlighted lines on the following selected pages from this document

Quantitative Assessment of Potential Health Effects From the Use of Fire Retardant (FR) Chemicals in Mattresses

January 9, 2006

Treye A. Thomas, Ph.D. and Patricia M. Brundage, Ph.D.
Directorate for Health Sciences
U.S. Consumer Product Safety Commission
4330 East-West Highway
Bethesda, MD 20814

2. Cancer Endpoints

In the case of antimony trioxide, in which the cancer risk is based on the airborne concentration, the lifetime average daily exposure (LADE) by the inhalation route is calculated by:

$$LADE_I = \frac{ADE \cdot N_Y \cdot Y}{365.25 \cdot Y_E} \quad (1.10)$$

where: $LADE_I$, lifetime average daily exposure by inhalation, mg/m^3; ADE, average daily exposure, mg/m^3; N_Y, number of days per year that the product is used, d/y; Y, number of years of product exposure, y; 365.25, number of days per year, d/y; Y_E, average life expectancy, y.

Then, the lifetime individual excess cancer risk is:

$$R_I = Q_I \cdot LADE_I \quad (1.11)$$

where: R_I, lifetime individual excess cancer risk; Q_I, unit cancer risk, or cancer potency, by the inhalation route, $(mg/m^3)^{-1}$; and $LADE_I$, lifetime average daily inhalation exposure, mg/m^3.

D. Input Parameters

1. General Parameters

General parameters are those that are applicable to multiple exposure scenarios. The average lifetime of a mattress is estimated to be 10 years[10] (Midgett, 2005). The average life expectancy of a person is 75 years (EPA, 1997a). Staff estimates a person is exposed to a FR-treated mattress for 70 years, which was derived by subtracting five years from the average life expectancy. This assumes children under the age of five sleep on mattresses protected with vinyl or plastic covers (Midgett, 2005), which would be expected to reduce FR chemical exposure to negligible levels during the first five years of life. The body weight for adults (45-54 years old) is 72.25 kg. For 5 year old children, the body weight is 19.2 kg. The body weight is the average of males and females in the 50th percentile for both adults and children (EPA, 1997a).

[10] The ASTM F1566 (part 9) method, on which CPSC staff based their physical impaction protocol, is assumed to approximate the typical use of a mattress during 10 years. Therefore, HS staff chose to use the conservative estimate of 10 years for the expected average lifetime of a mattress.

to calculate the unit cancer risk. Of the FR chemicals considered, only antimony trioxide is considered a probable carcinogen. Cancer estimates were only made for inhalation exposure to airborne antimony trioxide particles, which caused tumors only at the site of exposure (lung) in rats (reviewed in Hatlelid, 1999a). For calculating the cancer risk for antimony trioxide, the cancer risk for adults and children represents the risk from a cumulative exposure to a FR-treated mattress of 70 years (Table 4). Previously staff calculated an inhalation cancer potency for antimony trioxide of 0.51 $(mg/m^3)^{-1}$ (Babich and Thomas, 2001).

Table 8. Risk and Toxicological Parameters

Parameter			Antimony	Boric Acid (Boron)	DBDPO	Vinylidene Chloride
ADI	Acceptable daily intake	mg/kg-d	2.3	0.1	3.2	0.3
ADI_I	Inhalation ADI	mg/m^3	$9x10^{-6}$	NA	NA	NA
Q_I	Inhalation cancer potency	$(mg/m^3)^{-1}$	0.51	NA	NA	NA
k_T	Percutaneous absorption rate	h^{-1}	0.002	$9x10^{-5}$	0.01 or 0.001	NA

DBDPO = Decabromodiphenyl Oxide
NA = not applicable

6. Upper Bound Exposure Parameters

Upper bound, or worst-case, exposure parameters are used to estimate the possible maximum exposure to consumers (Appendix 5). In the 95th percentile, the body weight for adults (45-54 years old) is 100.7 kg and 26 kg for 5 year old children. The body weight is the average of males and females for both adults and children (EPA, 1997a). For estimating maximal dermal exposure, the skin surface is estimated to be 2.19 m^2 (21,900 cm^2) for adults and 0.935 m^2 (9,350 cm^2) for 5 year old children. For both adults and children, this is an average of males and females in the 95th percentile (EPA, 1997a). To estimate the upper bound exposure due to bed wetting (an intermittent exposure), the estimated skin surface area exposed to the urine is approximately 13 percent of the total skin surface of a 5 year old child in the 95th percentile, or 1,215.5 cm^2 (Midgett, 2005).

To estimate upper bound oral exposure to FR chemicals, staff applied an additional 5-fold factor to the 13 cm^2 mouthing area estimated for children increasing the mouthing area to 65 cm^2. For adults, the mouthing area was also increased by a 5-fold factor giving a total mouthing area of 30 cm^2 to estimate possible maximal oral exposure.

the mini-mattress, but considerably lower than migration amounts observed in the beaker experiments.

Staff recently became aware of the use of ammonium polyphosphate barriers in mattresses. Therefore, CPSC laboratory staff also measured the migration of ammonium polyphosphate from a commercially available twin mattress containing an ammoinium polyphosphate barrier, as described above. Although a substanial amount of ammonium polyphosphate was released from the barrier, ammonium polyphosphate is not expected to result in any health effects in consumers because it is not considered "toxic" under the FSHA.

In migration tests where samples are placed in beakers and wetted, the amount of FR chemical migration was higher compared to the full-scale and mini-mattresses where there was believed to be less moisture per unit area. The amount of moisture applied to the mini- and full-scale twin mattresses is believed to be slightly excessive compared to what may be expected in a typical consumer sleep scenario (Appendix 4). However, the excess moisture applied to the barrier samples does account for situations where individuals will typically experience elevated sweat production, such as during febrile illness, sexual activity, perimenopause, and in high temperature, high humidity climates where cooling devices are not available.

When there was minimal migration of certain FR chemicals (antimony and DBDPO) in the aggressive tests, additional testing was not performed (Appendix 2). If more than minimal migration of an FR chemical was observed in the early tests, additional testing representing more realistic dermal exposure scenarios in mattresses was conducted. These results were then used in the risk models to estimate the potential health risk that may result from these dermal and oral FR chemical exposures.

Inhalation Tests

The inhalation of FR chemicals that are released to the surface of the mattresses could be a route of exposure in some scenarios. Consumer use scenarios including forceful play by children on the bed and other activities that occur prior to, or during actual sleep, may agitate the mattress, resulting in releases of FR chemical to the surface. In order to estimate the amount of FR chemicals released into the air, CPSC Directorate of Laboratory Sciences, Division of Mechanical Engineering staff developed a device that subjected mini-mattresses to physical abuse. The impaction device design was based, in part, on the impactor described in the ASTM F1566 (part 9) and is described in the laboratory memorandum by Cobb, 2005 and in an earlier section of this memo. The impaction device subjects the mini-mattress to approximately 3 psi of vertical pressure for 100,000 cycles. The ASTM F1566 method was interpreted by CPSC staff to suggest that this amount of physical impaction serves as a rough approximation of the amount of stress that would occur during 10 years of mattress use.

LSC staff used the impaction device to physically stress artificially aged and unaged mini-mattresses in an enclosed chamber. The 100,000 cycle impaction was completed in 28 hours. The total amount of respirable FR chemical released during the impaction

correction factor of 20 was also applied to the result to account for the non-respirable fraction.

B. Risk Assessment

1. Review of Models and Input Parameters

A previous section of this report summarizes the input parameters used to calculate the potential risk of health effects from the FR chemicals reviewed in this report. The models estimate the risks for a 72.25 kg adult and 19.2 kg child. Sleeping in a room with a breathing zone of 1.85 m^3 for 8 and 11 hours per day, respectively, it is assumed that the adult and child sweat heavily and that this moisture penetrates through the sheets and ticking into the barrier. The dermal migration test results estimate the amount of FR chemical that migrates to the surface and comes in contact with the skin. The results have been conservatively extrapolated with the assumption that the entire surface area of the adult (18,200 cm^2) and child (7,900 cm^2) will be covered with the FR chemical in the amounts observed in the surrogate skin in the dermal migration tests.

For children about 5 years old, it is also assumed that additional FR chemical will migrate from the barrier as a result of urination, which is expected to occur for 2 days each month. If urination is more frequent, it was assumed that caretakers would use some type of barrier such as a plastic cover to prevent mattress soiling. This would also minimize FR chemical migration and contact with the skin. FR migration from urine is estimated to cover approximately 1,092 cm^2 (~13%) of a child's skin surface area.

The amount of FR chemical that is deposited on the skin may also be ingested orally. It is assumed that adults and children will mouth 6 cm^2 and 13 cm^2, respectively, of body and mattress (children only) surface, which includes the face and the hands, during the course of the night and during the early morning after the sleep episode before being washed (Midgett et al., 2005).

FR chemicals may also be inhaled. It is assumed that an adult and child will inhale 0.6 and 0.4 m^3/h, respectively, while sleeping. For antimony and boric acid the amount of FR chemical released into the air and available for inhalation was estimated from the impaction of aged mini-mattresses and DBDPO of a new mini-mattress in an enclosed chamber. A certain portion of the airborne particles is assumed to be of respirable size. A correction factor (20) is applied to the final result to account for non-respirable particles entering the body. The particles are assumed to be released at a constant rate and they are expected to be uniform with respect to FR content. The particles are assumed to remain airborne in a confined breathing zone of 1.85 m^3.

2. Estimation of Average Daily Dose

The models and assumptions used to estimate the average daily dose from each route of exposure, dermal absorption, inhalation, and ingestion are described in a previous section of this report. The average daily doses of these compounds are presented in Tables 16 and 17. The average daily dose from each route of exposure was summed to estimate the

total amount of each FR chemical that is expected to enter the body as a result of sleeping on a mattress containing the FR-treated barrier.

The average daily dose is then compared to the ADI. The acceptable daily dose is based on doses that enter through the oral route. However, the entire amount of FR chemical entering the body from all routes of exposure, is compared to the ADI due to the lack of exposure-specific ADIs for these compounds (Tables 16 and 17). If the quotient of the ADD/ADI (referred to as the hazard index (HI)) is greater than one, the product or exposure scenario under consideration is considered to present a hazard to consumers.

3. Inhalation Effects of Antimony

a) Chronic Inhalation Effects

An inhalation-specific ADI does exist for antimony and it was also the only compound that is believed to have any carcinogenic effects. These effects are observed only through inhalation of antimony. The effects are seen in the deep lung and are not cumulative, thus an exposure duration of 10 years was assumed for children and adults. The amount of antimony released during the 100,000 cycle chamber test was extrapolated over the 10 year mattress lifetime to estimate that average daily dose (ADD).

b) Carcinogenic Effects

In calculating cancer risks, which depend on cumulative exposure, the cancer risk in adults represents the risk from a lifetime of exposure, 75 years. The cancer risk in children represents the contribution to the lifetime risk from exposure during 70 years of product use. It was conservatively assumed that after the ten year lifespan of a mattress, the consumer would purchase another mattress containing an antimony-treated barrier, and this purchasing trend would continue for the duration of their lifetime. This conservative assumption of continuous use of a treated mattress throughout the 75 year consumer lifetime (70 years of product use; 75 - 5 years that a child sleeps on a mattress protected with fluid-resistant ticking or mattress covers due to bed wetting) is applied only to antimony since exposures are cumulative with regards to the increased risk of developing cancer later in life.

4. Results

a) Ammonium Polyphosphate

Ammonium polyphosphate is not considered to be "toxic" under the FHSA and, therefore, it is not considered "hazardous." The National Academy of Sciences' (NAS) National Research Council (NRC) also concluded that ammonium polyphosphates are probably not potent toxicants. Because ammonium polyphosphate is not classified as "toxic," an exposure assessment was not needed to determine whether it may be hazardous. However, limited migration data were developed for this compound, where significant quantities were released from treated barriers. Regardless of the amount of exposure, ammonium polyphosphate is not expected to result in any health effects in consumers because it is not considered "toxic".

assessment were based primarily on animal studies. Only chronic health effects were considered. The exposure assessment was accomplished by evaluating a series of dermal, oral, and inhalation exposure scenarios. Input data for the exposure assessment included migration (leaching) data, *in vivo* or *in vitro* percutaneous absorption data, and assumptions regarding consumer behavior. Due to the complexity of the exposure assessment, only point estimates of exposure were calculated. However, a variety of exposure scenarios were included. As with any risk assessment, there are assumptions, limitations, and sources of uncertainty. These are discussed below.

Risk assessment is an iterative process. Data on carcinogenicity, developmental and reproductive toxicity, or neurotoxicity were not available for all chemicals. Furthermore, it should be noted that percutaneous absorption data were not available for antimony. In these cases, percutaneous absorption rates were assumed based on data obtained with surrogate compounds with similar physico-chemical properties.

The present risk assessment incorporates new data on liquid-mediated migration and inhalation exposure resulting from physical impaction of mini-mattresses. These data were used to estimate dermal, oral, and inhalation exposure and internal dose. However, data gaps remain that can be addressed with additional laboratory studies. Mini-mattress liquid-mediated migration data are available only for antimony and boric acid. Limited testing of full scale mattresses was completed for boric acid. Testing of full-scale mattresses for all chemicals may present an even more realistic estimation of possible consumer exposures.

6. Conclusions and Recommendations

Extensive migration data were available for antimony trioxide (AT), boric acid, and DBDPO. Based on this risk assessment, the CPSC staff concludes that AT, boric acid, and DBDPO are not expected to pose any appreciable risk to consumers who sleep on treated mattresses. Detectable concentrations of vinylidene chloride were not found in initial rigorous extraction studies, thus it is considered highly unlikely that significant quantities of this compound will be released from mattress barriers. The estimated HI values for these compounds are all less than one under all exposure conditions indicating that the compounds are not likely to present a risk to consumers. Since ammonium polyphosphate and melamine do not satisfy the FHSA definition of "toxic", these compounds also are not expected to pose any appreciable risk of health effects to consumers.

This risk assessment describes one approach that could be used to estimate exposure and risk from certain types of FR treatments. Based on the CPSC laboratory studies and assessments of exposure and risk for selected FR treatments described in this report, staff concludes that there are a number of FR treatments available including ammonium polyphosphate, antimony, boric acid, decabromodiphenyl oxide, melamine, and vinylidene chloride that are not expected to pose any appreciable risk of health effects to consumers who sleep on treated mattresses.

Table 15. Impaction Test Results – Unaged Mockups with DBDPO-Treated Barriers

Barrier ID	Mockup ID	Filter ID and (Type)	Time (hrs)	Air Volume (l)	DB µg	DB µg
7	2 Unaged	1 glass fiber	28	3360	0.4	0.4
		2 glass fiber	28	3360	<0.2	0.1[1]
		3 glass fiber	28	3360	<0.2	0.1[1]
		4 glass fiber	28	3360	<0.2	0.1[1]
		Total sampled/100,000 Cycles				0.7
1 one-half detection limit used for samples						

Table 16. Risk Assessment of FR Chemicals in Mattress Barriers - Conservative Best Estimate - Adults

Parameter	Antimony	Boric acid	DBDPO
ADD Sweat mediated dermal absorption (mg)	0.7862	0.056114	0.07280
ADD Oral Ingestion (mg)	0.016200	0.02460	0.00030
ADD Inhalation (mg)	0.0000161718	0.0006215661	0.0000435394
ADD Total (mg/d)	0.802	0.081	0.07314
ADD Total (mg/kg/d)	0.011	0.00113	0.00101
ADI mg/kg/d	2.3	0.10	3.20
Hazard Index, HI	**0.005**	**0.01**	**0.0003**
Hazard Index Inhalation, HI(i)	**0.006**	**N/A**	**N/A**
Cancer Risk	**2.7E-08**	**N/A**	**N/A**

Table 17. Risk Assessment of FR Chemicals in Mattress Barriers - Conservative Best Estimate - Children

Parameter	Antimony	Boric acid	DBDPO
ADD Sweat mediated dermal absorption (mg)	0.46926	0.033491	0.04345
ADD Urine mediated dermal exposure (mg)	0.00392	0.000290	0.00026
ADD Oral Ingestion, (mg)	0.03510	0.053300	0.00065
ADD Inhalation (mg)	0.000014824	0.000569769	0.000039911
ADD Total (mg/d)	0.50829	0.08765	0.04440
ADD Total (mg/kg/d)	0.026	0.005	0.002
ADI mg/kg/d	2.3	0.10	3.2
Hazard Index, HI	**0.01**	**0.05**	**0.001**
Hazard Index Inhalation, HI(i)	**0.009**	**N/A**	**N/A**
Cancer Risk	**3.7E-08**	**N/A**	**N/A**

Table 18. Effect of Parameter Uncertainty and Variability for Selected Parameters

FR Chemical	ADI 50th percentile		ADI 95th percentile	
	Children	Adults	Children	Adults
Antimony	0.01	0.005	0.01	0.004
Boric acid	0.05	0.01	0.20	0.03
DBDPO	0.001	0.0003	0.001	0.0003

Appendix 5: Uncertainty and Variability of Selected Risk Assessment Model Parameters

Many of the values used in the parameters in the risk models are based on experimental results, published literature, or expert judgment. Although these values may be used to estimate the risk for a significant portion of the population, it may not represent the full range of possible values for the entire population. In general, the staff's analysis applied conservative assumptions in areas of scientific uncertainty, that is, assumptions that may overestimate, rather than underestimate exposure and risk. The laboratory experiments for the liquid-mediated release of FR chemicals from treated mattresses were conservative in nature, and are believed to be higher than would be experienced during most consumer use scenarios. These results were used to estimate the amount of FR chemical that would migrate to the mattress and skin surface and be either dermally absorbed, or ingested as a result of mouthing the skin or mattress surface. Estimates of body surface area and mouthing areas were determined using a combination of published literature and expert judgement. In the risk assessment calculations, values for body surface and mouthing area were selected to represent the typical consumer or "50th percentile". In the uncertainty analysis, values were selected to represent a consumer that would have much higher than average or 95th percentile values.

Mouthing Area

The suggested mouthing rate and area (1 hour daily, 50 cm^2) originated with the NAS's NRC study of flame-retardant chemicals (2000) for use in upholstered furniture. That estimate assumed exposures of a 1-year old child to furniture designed for day-time use. The CPSC's mattress exposure estimate requires consideration of furniture designed for night-time use when children are primarily asleep, and therefore interacting less vigorously with their environment. Furthermore, CPSC staff has chosen to examine older children (5 year olds) because younger children's mattresses are more likely to be waterproofed due to their higher likelihood of bed wetting. This waterproofing, either with fluid-resistant ticking or mattress covers, could provide more containment of FR particles, and so would be inappropriate for an estimate of exposures at the high end of the range of possibility. Also, mouthing of non-body-part objects decreases across the lifespan, and notably after the age of 3 years. However, staff acknowledges that some mouthing of sheets and covers may occur in 5 to 15 year old children, but believes this event would be infrequent and slight. The NRC scientists state that the actual oral exposures that they used are "hard to imagine" and could be "100-fold less" (page 51) than their mouthing parameter (50 cm^2). Because mattresses have a different use pattern, and the CPSC estimates focus on an older child, it seems reasonable to include the NRC's estimate in a modified form. Assuming that the 50 cm^2 was 100-fold less than actual exposures, then the actual exposures would be about 0.5 cm^2. If this actual estimate were increased 10 times to be conservative, this would yield an oral exposure of 5 cm^2 a day. This estimate of actual mouthing of the mattress has been added to the current hand-to-mouth estimates for a total of 13 cm^2 of mattress and body surfaces that would be mouthed by children. An additional 5-fold factor was applied to the 13 cm2 mouthing area to estimate the 95th percentile mouthing area. The increased mouthing area of 65

H3BO3 is Boric Acid

SB2O3 is Antimony

Table 1. Barrier ID and FRC Load

Barrier ID	Type/FRC content	Density (mg/cm^2)	FRC Percentage (%) Determined by CPSC				
			H_3BO_3	Sb_2O_3	DBDPO	Melamine	VC
1	Cotton Batting/ H_3BO_3, Sb_2O_3	34.4	7.5	2.4			
2	Nonwoven modacrylic-visil/ Sb_2O_3, PVDC, Si	15.4		3.8			ND
3	Nonwoven visil/ Si, PVDC	21.4					ND
4	Nonwoven visil/ Si, PVDC	21.7					ND
5	Visil knit/ Si, PVDC	21.6					ND
6	Modacrylic knit/ Sb_2O_3, Si, PVDC	16.2		4.5			ND
7	Coated fiberglass/ DBDPO	17.4			7.5		
9	Coated Foam/ Melamine, H_3BO_3, Sb_2O_3	61.5	4.1	4.1		4.9	
10	Coated Poly-Cotton Ticking/ Melamine, H_3BO_3, Sb_2O_3	32.1	3.5	2.7		2.9	
11	Coated Poly-Cotton/ Melamine, H_3BO_3, Sb_2O_3	21.7	4.0	3.1		4.1	
12	Coated Knit/ Melamine, H_3BO_3, Sb_2O_3	28.1	4.0	4.4		6.6	
13	Melamine Resin					ND	
14	Melamine Resin					ND	
15	Melamine Resin					ND	
16	Melamine Resin					ND	
17	Melamine Resin					ND	
18	Melamine Resin					ND	
19	Melamine Resin					ND	

Note: ND – not detected. The limit of detection (LOD) for VC in the barrier samples is 30 ppm. The LOD for melamine in the barrier samples is 0.002%.

This is the table of chemicals used and percentages in flameproof mattresses from CPSC tab-h p. 17. H3BO3 is Boric Acid, SB2O3 is Antimony. 5 of the systems contain Boric Acid and 7 contain Antimony. All the Boric Acid systems also contain Antimony. Melamine Resin systems are made from the reaction of Melamine and Formaldehyde, and contain free Formaldehyde. But they did not test for Formaldehyde content. Also there are other omissions of chemicals they did not test.

This 10-04 CPSC Document shows they knew Melamine Resin Flame Barriers contained Formaldehyde, and that Formaldehyde is a known carcinogen and sensitizer. They say data is needed for the release of Formaldehyde

This risk assessment is focused on the potential chronic health effects of the FR chemical monomer although the compound is used in the polymeric form in barriers. In this latter case, melamine is reacted with formaldehyde and other non-FR compounds to form fibers that are used to construct a barrier. Formaldehyde is a known sensitizer, and is also regarded as a carcinogen. If melamine-containing products release formaldehyde, sensitization (induction and elicitation of symptoms) may result in some susceptible individuals. Data are needed to determine the conditions for, and potential releases of, formaldehyde from barriers made with melamine/formaldehyde resin fibers. Although the ethylene urea formaldehyde melamine polymer (EUMF) has been shown to be a contact sensitizer, this is primarily through direct contact with EUMF treated fabrics. Staff believes that the mattress ticking should provide a barrier that reduces the potential for contact sensitization.

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The 2006 CPSC Report makes no mention of Formaldehyde, and they did not test for it. The same authors wrote both the 2006 and 2004 report.

Formaldehyde concentrations of 10 to 15 parts per million have been found to cause nasal cancer in rats, and in June 2004 the International Agency for Research on Cancer reclassified formaldehyde as a known human carcinogen.

Millions of Americans will have their nose right next to these mattresses for 1/3 of their lives, 10 to 15 parts per million is a very small number, plus skin absorption.

Based on available data and staff judgment, the degree of concern for health effects for vinylidene chloride is moderate. Vinylidene chloride is used in a polymerized form in barriers, and is expected to have a low exposure potential. The overall potential risk for chronic health effects in the typical and worst-case scenarios is low.

SMOKE TOXICITY

As part of the upholstered furniture project, comments were raised by the public on the application of FR chemicals and the potential impact of irritant gases produced during combustion of these compounds. CPSC staff has previously reviewed the potential of irritant gases to impact egress in a home fire scenario (Thomas et al., 2003). Because of the dearth of data, very conservative estimates were used for application of FR chemicals to upholstered furniture and the resulting concentrations in air. It was estimated that FR chemicals would not significantly increase egress time for a normal healthy adult. These results can be qualitatively extrapolated to mattress fires to estimate the impact FR chemicals incorporated into mattresses may have on egress. If we assume an estimated 30 minute smoldering time from a mattress that meets the staff's draft proposed mattress flammability standard, staff does not expect that the combustion of FR chemicals that could be used in mattresses will significantly increase egress time during a typical fire

UNITED STATES
CONSUMER PRODUCT SAFETY COMMISSION
WASHINGTON, DC 20207

Memorandum

Date: January 9, 2006

TO : Margaret Neily, Project Manager for Mattresses and Bedding
Directorate for Engineering Sciences

THROUGH: Mary Ann Danello, Ph.D., Associate Executive Director for Health Sciences
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FROM : Treye A. Thomas, Ph.D., Toxicologist, Division of Health Sciences
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SUBJECT : Response to TERA Comments on Mattresses—Toxicity of Flame Retardant Chemicals

This memorandum provides the Directorate for Health Sciences staff responses to comments made to the U.S. Consumer Product Safety Commission (CPSC) staff on the CPSC staff risk assessment of selected flame retardant (FR) chemicals that may be used to meet a flammability standard for mattresses (CPSC 2004). In September 2005, CPSC contracted with Toxicology Excellence in Risk Assessment (TERA) to review the CPSC staff risk assessment and provide written comments. Included are written comments received from TERA.

General Comments

Comment 1. All calculations and algorithm details should be checked.

Answer. The authors have checked all calculations and spreadsheets. A Health Sciences staff person not associated with this risk assessment, but with expertise in using models in spreadsheets has checked all models and calculations.

Comment 2. A table of contents should be added. The risk assessment sections could be re-organized.

Answer. A table of contents has been added. CPSC staff is comfortable with the organization of the paper.

Comment 3. The worst case scenarios should be included (95^{th} percentile).

Answer. The worst case scenario has been addressed in the uncertainty analysis section of this report where the 95^{th} percentile and other potential factors were incorporated into the calculations. This is in addition to the already conservative nature of the exposure assessment.

Comment 4. Inhalation dose calculation for antimony versus boric acid should be re-calculated.

Answer. The calculations have been adjusted by the CPSC staff.

Comment 5. Data on the inhalation exposure to DBDPO should be included, or more explanation on the lack of experimental inhalation data.

Answer. DBDPO releases into the air from the impaction experiments have been quantified. The results have been included in the risk models for DBDPO.

Comment 6. Differences between PVC5 and Mixed Cellulose Ester Fiber (MCEF) are not accurately presented.

Answer. CPSC staff has made the appropriate changes regarding the discussion of the two filters.

Comment 7. The total mass of airborne particles should be included in the risk assessment rather than the respirable fraction. In the absence of data, a 5- or 30- fold correction should be made.

Answer. The staff has adjusted the estimate of the particle exposure by applying a 20-fold correction factor. The 20-fold factor was agreed upon during a telephone discussion with the expert reviewers.

Comment 8. The volume of air that will contain particles should be reduced.

Answer. The volume of air that contains the particles has been reduced to a considerably smaller volume that largely encompasses the breathing zone.

Comment 9. Mouthing area should be increased to include 50 cm^2 of direct mouthing of sheets.

Answer. TERA's suggested mouthing rate and area (1 hour daily, 50 cm^2) originated with the National Academy of Sciences' (NAS) National Research Council (NRC) study of flame-retardant chemicals (2000) for use in upholstered furniture. That estimate assumed exposures of a 1-year old child to furniture designed for day-time use. However, CPSC staff's mattress exposure estimate requires consideration of furniture designed for night-time use when children are primarily asleep, and therefore interacting less vigorously with their environment. Additionally, CPSC staff has chosen to examine older children (5 year olds) because younger children's mattresses are more likely to be waterproofed due to their higher likelihood of bedwetting. This waterproofing, either with fluid-resistant ticking or mattress covers, is expected to reduce contact with FR chemicals, and so would be inappropriate for an estimate of exposures at the high end of the range of possibility. Also, mouthing of non-body-part objects decreases across the lifespan, and notably after the age of 3 years. Staff acknowledges that some mouthing of sheets and covers may occur in 5 to 15 year old

children, but believes this event would be infrequent and slight. The NRC scientists state that the actual oral exposures that they used are "hard to imagine" and could be "100-fold less" (page 51) than their mouthing parameter (50 cm^2).

Because mattresses have a different use pattern than upholstered furniture, and because the CPSC staff estimates focus on an older child, CPSC staff will include the NRC's estimate in a modified form. Assuming that the 50 cm^2 was 100-fold less than actual exposures, then the actual exposures would be about 0.5 cm^2. If this estimate were increased 10 times to provide a conservative estimate, this would yield an oral exposure of 5 cm^2 a day. This estimate of actual mouthing of the mattress has been added to the current hand-to-mouth estimates. The increased mouthing area of 50 cm^2 has been incorporated into the uncertainty analysis where more conservative assumptions and 95th percentile factors have been used in the models.

Comment 10. The rationale for extrapolating the aging results to a 10 year mattress lifetime should be substantiated or presented as indeterminate aging.

Answer. The mattresses that have been subjected to the aging process are classified as "aged" without regard to any specific time period.

Comment 11. CPSC staff should consider harmonizing methods of calculating ADI's with other organizations.

Answer. CPSC staff is obligated to assess the potential hazards of chemicals using the methodology outlined in the Federal Hazardous Substances Act (FHSA) and the supporting Chronic Hazard Guidelines (CPSC, 1992). While there are several methods for calculating an ADI[1], in many cases, the use of different methods does not ultimately result in substantial differences in risk. Pros and cons exist for the use of different methods. The method that the CPSC staff uses to calculate ADIs for the flame retardant chemicals that may be used with mattresses versus use of another methodology (e.g., benchmark dose methodology) does not result in substantial differences in risk as compared to that used by other organizations.

Comment 12. Comments on specific chemical assessments

Comment 12a. Derivation of the ADI for decabromodiphenyl oxide (DBDPO) should consider new studies.

Answer. CPSC staff reviewed the new studies on DBDPO. The new studies did not alter the DBDPO ADI.

Comment 12b. The possible carcinogenicity of DBDPO should be discussed.

Answer. CPSC staff previously determined that DBDPO is a possible carcinogen. Staff reviewed and discussed the evidence on the carcinogenicity of DBDPO and maintains

[1] The acceptable daily intake (ADI) is the amount of a compound that one may be exposed to on a daily basis without posing a significant risk of health effects.

that DBDPO is a possible carcinogen in humans according to the CPSC's Chronic Hazard Guidelines based on the minimal evidence of carcinogenicity in animals, along with the lack of genotoxicity. This means that DBDPO is not considered "toxic" by virtue of its carcinogenicity under the FHSA.

Comment 12c. Chemical specific adjustment factors could be applied to the ADI derivation for boric acid.

Answer. In accordance with the CPSC's Chronic Hazard Guidelines, chemical specific adjustment factors (i.e., safety factors) are not applied. For the derivation of the ADI for boric acid, CPSC staff followed the Chronic Hazard Guidelines and applied a 100-fold safety factor to account for possible differences between animals and humans, and for differences in the sensitivity among individuals.

Comment 12d. An inhalation ADI for boric acid should be calculated.

Answer. An inhalation ADI for boric acid was not calculated by CPSC staff. ADIs are calculated when a given chemical is considered "toxic" due to its chronic effects and sufficient toxicity information is available. In accordance with the guidance provided in the CPSC's Chronic Hazard Guidelines on how to evaluate toxicity studies, the CPSC staff determined that there is not sufficient evidence of systemic toxicity in humans caused by chronic inhalation exposure. Thus, staff only developed an oral ADI for which there was sufficient evidence of developmental toxicity due to oral exposure.

Comment 12e. Slow clearance of antimony from the lung could be considered, but it is unlikely to have a major impact on systemic exposure.

Answer. The impact of the slow clearance of antimony from the lung was considered by CPSC staff in its assessment of the health effects of antimony trioxide.

Comment 12f. The derivation of the vinylidene chloride ADI should be reconsidered.

Answer. No adjustments to the vinylidene chloride ADI were made. CPSC staff based its ADI on a study conducted by National Toxicology Program (NTP) (1982). Staff did not use the Quast et al. study (1983) chosen by other organizations. However, recalculation of the ADI using the Quast et al. study (1983) would not significantly affect the risk characterization as no vinylidene chloride monomer was extracted in detectable concentrations from the barriers in the aggressive migration studies.

Comment 12g. An inhalation ADI for vinylidene chloride could be developed since the compound is volatile.

Answer. Inhalation exposure to vinylidene chloride is expected to be negligible and staff concludes that it would not be sufficient to result in an unreasonable risk of health effects.

Comment 13. An expanded risk calculation including an uncertainty analysis would be useful.

Answer. An uncertainty analysis section has been added to the risk assessment. Values that represent the 95th percentile were used in the calculations in addition to the already conservative estimates of exposure.

Comment 14. Exposures from other sources (e.g., upholstered furniture) and their potential impact on risk should be mentioned.

Answer. CPSC staff estimates the potential risks resulting from the exposure from a specific consumer product. Aggregate exposures resulting from the use of other products that may contain the same FR chemical are not considered.

Comment 15. Please explain the statement (P. 33, in the context of the inhalation-specific ADI and related risk) that the effects of antimony (trioxide) inhalation are "not cumulative," particularly in light of the long half-life described above. This appears to be a non-conservative assumption.

Answer. There was a misinterpretation of the text by the reviewers which was addressed in a telephone discussion with the reviewers.

The inhalation effects of antimony are assessed by CPSC staff based on daily exposures. An inhalation average daily exposure (ADE) is calculated, and exposures are estimated to determine whether they would exceed the acceptable daily exposure. The cancer effects are cumulative. Every exposure contributes to the overall lifetime risk of developing cancer.

Comment 16. Information on the ADE for antimony and comparison to ADI and cancer risk should be included in the summary tables.

Answer. This information has been added to the tables.

Comment 17. The logic regarding the exposure to vinylidene chloride is not clear. While the volatility of the monomer would minimize the oral and dermal exposure, one might expect the volatility to increase the inhalation exposure to this chemical, particularly for a new mattress.

Answer. The volatile phase of this compound is not detectable and therefore was not measured. However, CPSC staff believes that inhalation exposure to vinylidene chloride would be negligible based on the other data collected on vinylidene chloride. CPSC staff does not consider the potential exposure to be sufficient enough to result in an unreasonable risk of health effects.

Comment

Some individuals commented that the "precautionary principle" should be applied to FR chemicals, that is, they should not be used until proven safe (7, 26, 44, 47, and 51).

Response

All of the statues that provide regulatory authority to the CPSC explicitly require risk-based decision making, thus precluding application of the "precautionary principle."

Comment

Several commenters recommended including in the standard a requirement that mattresses provide a label listing FR chemicals used or a statement warning of health risks (37, 38, 52, 92, 112, 130, 145, 312, 477, 504, 530, S. Baldwin). These comments included: "it will allow the consumer to make a decision regarding whether the potential hazard is a factor to be considered when purchasing these products," mattresses should be treated similar to food items, where ingredients are required to be listed, and "It is the consumer's right to have a warning label of health risks on a mattress. . . . deserves as much attention as the tobacco industry."

Response

The staff has found that numerous FR materials are available that will enable mattresses to meet the draft standard without posing any appreciable risks of health effects to consumers. Moreover, the FHSA itself would require a hazard warning label if a mattress were a "hazardous substance", as that term is defined in the FHSA. The potential health hazard associated with any chemical depends on both toxicity and exposure. A label stating the names of any FR chemicals used in the mattress would not likely provide useful information to the consumer because the mere presence of an FR chemical is not an indication that the mattress containing that chemical poses any health risk.


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A number of commenters were specifically concerned about the toxicity of boric acid, which is used to treat cotton batting (3, 18, 19, 21, 24, 28, 35, 99, 123, 135, 163, 166, 168, 170, 172, 198, 199, 204, 208, 220, 221, 225, 226, 235, 262, 327, 362, 373, 390, 432, 446, and 487). Some of these commenters also cited the use of boric acid as an insecticide as purported proof of its toxicity. As above, many of these comments are associated with one particular manufacturer and non-governmental organization.

Other commenters, including manufacturers of mattresses, mattress components, and chemicals, noted that boric acid has been used in mattresses for many years and that their employees have not suffered any ill effects (9, 502, 526, 527, S. Wolf, and T. Wolf). Some of these commenters also pointed out that the EPA recently increased their reference dose (RfD) for boric acid. (This means that a greater daily exposure to boric acid would be considered acceptable by EPA.)