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SARA D. DAVIS/PHOTO FOR THE TRIBUNE

# Toxic roulette

## Flame retardants get a pass from regulators with little assessment of potential health risks

By MICHAEL HAWTHORNE | Tribune reporter

**B**y the early 2000s, the flame retardant known as penta had become a villain. Packed by the pound into couches and other furniture, the chemical was turning up in the blood of babies and in breast milk around the world. The European Union voted to ban penta after researchers linked it to developmental and neurological problems in children, and manufacturers pulled it from the market.

But the only U.S. company that made penta soon introduced a replacement, hailing it as the beginning of an eco-friendly era for flame retardants. The new product even had a heroic name: Firemaster 550.

The U.S. Environmental Protection Agency, whose mission is to safeguard America's health and environment, praised the withdrawal of penta as a "responsible action" and promised that the new flame retardant had none of the problems of the old one. Unlike penta, Firemaster 550 would neither stick around in the environment nor build up in people and wildlife, a top EPA official declared in a 2003 news release.

Not everyone at the EPA believed that rosy public assessment. Documents obtained by the Tribune show that scientists within the agency were deeply skeptical about the safety of Firemaster 550, predicting that its chemical ingredients would escape into the environment and break down into byproducts that would pose lasting health hazards.

Behind the scenes, agency officials asked the manufacturer to conduct basic health studies, citing the same concerns that forced penta off the market.

Today, in sharp contrast to the promises of

industry and government, chemicals in the flame retardant are being found everywhere from house dust in Boston to the air in Chicago. There also are signs the chemicals are building up in wildlife, prompting concern that Firemaster 550 or its byproducts could be accumulating in people.

The manufacturer's own health studies, obtained by the Tribune, add to that troubling picture. They found that exposing rats to high doses of Firemaster 550 can lower birth weight, alter female genitalia and cause skeletal malformations such as fused ribs and vertebrae.

The history of Firemaster 550, pieced together through records obtained under the Freedom of Information Act, highlights how EPA officials have allowed generation after generation of flame retardants onto the market without thoroughly assessing health risks.

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## Audit flunks college savings plan

College Illinois hit for conflicts, weak financial controls

By ANDY GRIMM AND JODI S. COHEN  
Tribune reporters

The underfunded College Illinois savings program was plagued by weak financial controls and conflicts of interest between top administrators and companies hired to invest

millions from the prepaid tuition fund, according to a report issued Wednesday by the state auditor general's office.

The report covers 2006 to 2011, a period when the commission that oversees the program approved a series of what some considered risky investments for the fund — including \$12.8 million that went to ShoreBank just two years before the bank collapsed. Administrative costs for

the fund soared over the same period, even as sales of the prepaid tuition program plummeted and managers made overly optimistic estimates on investment returns, the report said.

The scathing review from Auditor General William G. Holland is just the latest in a string of reports that have detailed problems with the popular program, said state Rep. Jim Durkin, R-Western Springs. "There have been red

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President Barack Obama's announcement follows a statement he made in late 2010 that his views were "evolving."

# Obama says he endorses gay marriage

Historic stance solidifies partisan divide on issue

By KATHLEEN HENNESSEY AND CHRISTY PARSONS  
Tribune Washington Bureau

WASHINGTON — President Barack Obama's decision to endorse same-sex marriage carries uncertain political risks but is one he said was rooted in the biblical admonition "to treat others the way you would want to be treated."

Obama's endorsement Wednesday, a milestone for the gay rights movement, was the first from a sitting president and a potentially powerful tail wind for a cause still struggling for electoral approval. It comes as the country remains divided over whether same-sex marriages should have the same recognition and

legal standing as traditional ones, and six months before an election expected to hinge on small slices of votes in a handful of key states.

His announcement was hastened by a similar declaration from Vice President Joe Biden on Sunday, which prompted calls for Obama to speak out or risk falling behind the curve.

"At a certain point, I've just concluded that for me, personally, it is important for me to go ahead and affirm that I think same-sex couples should be able to get married," Obama told ABC News' Robin Roberts in an interview hastily arranged by the White House. Ending a prolonged period of flux on the issue, Obama said he arrived at the decision by talking to gay friends, staff members, his two daughters and his

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## Hudson case now in jury's hands

Panel will continue deliberations Thursday to decide fate of William Balfour, accused of killing three members of actress Jennifer Hudson's family. **Chicagoand**, Page 4



Paula Deen talks about diabetes, cooking & more  
Interview in Dining

## 3 attractions will close doors NATO weekend

The Alder Planetarium, Shedd Aquarium and the Art Institute of Chicago announce they'll be closed May 19-21 because of the NATO summit and the accompanying street closings. **Chicagoand**, Page 4

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# Toxic roulette

Flame retardants get a pass from regulators  
with little assessment of potential health risks

*Thursday, May 10, 2012*

**BY MICHAEL HAWTHORNE**

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Not everyone at the EPA believed that rosy public assessment. Documents obtained by the Tribune show that scientists within the agency were deeply skeptical about the safety of Firemaster 550, predicting that its chemical ingredients would escape into the environment and break down into byproducts that would pose lasting health hazards.

Behind the scenes, agency officials asked the manufacturer to conduct basic health studies, citing the same concerns that forced penta off the market.

Today, in sharp contrast to the promises of industry and government, chemicals in the flame retardant are being found everywhere from house dust in Boston to the air in Chicago. There also are signs the chemicals are building up in wildlife, prompting concern that Firemaster 550 or its byproducts could be accumulating in people.

The manufacturer's own health studies, obtained by the Tribune, add to that troubling picture. They found that exposing rats to high doses of Firemaster 550 can lower birth weight, alter female genitalia and cause skeletal malformations such as fused ribs and vertebrae.

The history of Firemaster 550, pieced together through records obtained under the Freedom of Information Act, highlights how EPA officials have allowed generation after generation of flame retardants onto the market without thoroughly assessing health risks.

The previously unreleased documents also show how the nation's chemical safety law, the 1976 Toxic Substances Control Act, gives the government little power to assess or limit dangers from the scores of chemicals added to furniture, electronics, toys, cosmetics and household products.

At a time when consumers clamor for more information about their exposure to toxic substances, the chemical safety law allows manufacturers to sell products without proving they are safe and to treat the formulas as trade secrets. Once health effects are documented, the law makes it almost impossible for the EPA to ban chemicals.

A growing list of critics — including the nation's leading group of pediatricians and the Government Accountability Office, the investigative arm of Congress — are

calling for a sweeping overhaul of the law. Some compare the situation to Whac-A-Mole, the carnival game where plastic moles keep popping out of holes even after a player smacks one down.

“By the time the scientific community catches up to one chemical, industry moves on to another and they go back to their playbook of delay and denial,” said Deborah Rice, a former EPA toxicologist who works for the Maine Center for Disease Control and Prevention.

Chemtura Corp., the Philadelphia-based company that makes Firemaster 550, said in a statement that the flame retardant is safe for use in polyurethane foam, the kind often used in furniture. The company also said the studies that found Firemaster 550’s chemical ingredients in homes and wildlife don’t prove that those compounds came from its product.

Introducing Firemaster 550 “was an early example of our strategy of Greener Innovation and the success it could have, even under significant EPA scrutiny,” the company said.

Nevertheless, the EPA is now concerned enough that in February it targeted two of Firemaster 550’s key ingredients for a “high priority” review, citing potential health hazards and widespread exposure from household products.

“We didn’t think it would bioaccumulate, but it turns out that prediction isn’t borne out by reality,” Jim Jones, the EPA’s top chemical safety official, said in an interview. “We want to make sure we understand it and that nothing bad is going to happen.”

### Solving a mystery

When Firemaster 550 replaced penta, its chemical makeup was a mystery to all but the manufacturer and a select group of EPA employees who were sworn to secrecy. That made it difficult for outside scientists to identify its ingredients in the environment and determine if they are harmful.

Not until two young, independent chemists revealed the formula of Firemaster 550 did it become clear how far the flame retardant had spread in just a few years’ time.

One of the chemists, Duke University researcher Heather Stapleton, was among the first scientists to figure out that most human exposure to flame retardants comes



ALEX GARCIA/TRIBUNE PHOTO

Chemtura, which says its tests show that Firemaster 550 is “acceptable for use in the applications for which it was intended,” makes the flame retardant at an El Dorado, Ark., plant.



from ingesting surprisingly large amounts of contaminated household dust, rather than from people's diet or what they absorb through their skin.

Young children are exposed to significantly higher levels than adults, the EPA has since concluded, primarily because they spend so much time playing on the floor.

Stapleton's interest in the chemicals started during graduate school in the late 1990s, when she was sent to Lake Michigan to monitor water pollution. Her discoveries in the Great Lakes helped document how penta and related flame retardants were spreading around the world, just like the banned pollutants DDT and PCBs.

She knew that many flame retardants in the U.S. are made with bromine or chlorine, chemicals known as halogens that take the place of oxygen and slow the combustible reaction that creates and spreads fire.

But other researchers have found that the way flame retardants are used in household furniture doesn't protect people from fire in any meaningful way. And because of their chemistry, some of the most popular flame retardants spread easily and widely, persist in the environment and build up in the food chain.

In 2006, Stapleton discovered two mystery chemicals with high levels of bromine while analyzing dust samples from homes in Boston. The chemical structures didn't show up in standard databases.

Around the same time, Susan Klosterhaus, a friend of Stapleton's, got a job studying environmental contamination in San Francisco Bay. Mindful that Californians have some of the world's highest recorded levels of flame retardants in their bodies, Klosterhaus wanted to know if Firemaster 550, the penta substitute promoted by the EPA, was showing up in the bay.

Like others at the time, Klosterhaus had no way to test for it because its formula was secret.

To solve the puzzle, she did two things: She sent Stapleton a small piece of foam from her new couch, and she called Chemtura to ask for a sample of Firemaster 550. To her surprise, the company sent a half-liter bottle containing an oily mixture the same color and thickness as maple syrup.

Stapleton analyzed the substance and confirmed the two chemists' suspicions. The foam from the couch and the Boston dust samples both contained ingredients of Firemaster 550.

The scientists had identified a new pollutant. Without more study, though, there was no way to determine if it was dangerous.

"We end up finding a chemical mixture that's produced in large volumes, yet there was next to nothing available in the public scientific literature about whether or not it might be harmful," Klosterhaus said.



Heather Stapleton, one of the nation's leading experts on flame retardant chemicals added to consumer products, seals liquid samples of foam in bottles before testing them at Duke University.



SARA DAVIS/PHOTO FOR THE TRIBUNE

***"It's ridiculous that they would keep saying this isn't migrating from couches and other products. We know this chemical is out there, and we know kids are chronically exposed to it."***

*— Heather Stapleton, Duke University, above, with her family at home in North Carolina*

In May 2010, at a conference where Stapleton was speaking to foam manufacturers about her dust studies, Chemtura distributed a letter to the audience. It acknowledged that one of the company's own animal studies had shown that Firemaster 550 had "some effects" on prenatal development.

Even so, the letter said, there was nothing to worry about because the company had found that the fire retardant doesn't escape from treated products, indicating that "the risk of exposure ... is negligible."

The Tribune obtained a copy of the study Chemtura cited in the letter. It involved researchers placing saline-soaked filter papers on a cotton-covered block of foam and observing whether Firemaster 550 leached out during the following eight days.

"The study was designed to simulate potential migration from direct skin contact with the foam, and also oral contact, such as a person chewing on the foam," the company said in a statement.

The study, the company said, "showed no detectable migration from the foam."

Independent scientists say the Chemtura study was flawed. Other research has found that flame retardants escape from products over periods of time far longer than eight days.

Moreover, Firemaster 550's brominated chemicals have turned up not only in common household dust but in sewage sludge around San Francisco Bay, polar bears in the Arctic, harbor seals off the coast of Maine, mollusks in North Carolina and porpoises in the South China Sea.

Indiana University researchers reported in November that airborne concentrations are rising in Chicago and other cities around the Great Lakes as well as in more remote areas, such as Michigan's Upper Peninsula.

So far, little is known about whether Firemaster 550 is building up in people. Early research suggests that its brominated compounds quickly break down into other chemicals in the body, so scientists are studying if they can track those byproducts in blood or breast milk.

"It's ridiculous that they would keep saying this isn't migrating from couches and other products," Stapleton said. "We know this chemical is out there, and we know kids are chronically exposed to it."

## **Few health studies**

EPA officials acknowledge they know little, if anything, about the safety of not only Firemaster 550 but most of the other 84,000 industrial compounds in commercial use in the U.S.

Unlike Europe, where companies generally are required to prove the safety of their chemicals before use, U.S. law requires manufacturers to submit safety data only if they have it. Most don't, records show, which forces the EPA to predict whether chemicals will pose health problems by using computer models that the agency admits can fail to identify adverse effects.

The EPA can require studies of new chemicals that it anticipates could affect people's health — as it did with Firemaster 550 — but this step is rare, and the research doesn't need to be completed before the chemicals are sold.

To ban a chemical already on the market, the EPA must prove that it poses an "unreasonable risk." Federal courts have established such a narrow definition of "unreasonable" that the government couldn't even ban asbestos, a well-documented carcinogen that has killed thousands of people who suffered devastating lung diseases.

When the EPA approved Firemaster 550, the agency knew that it contained two brominated compounds, known as TBB and TBPH. Both are structurally similar to a plastic-softening phthalate that Congress has banned in children's products. Called DEHP, the phthalate is listed in California as a known carcinogen and devel-

opmental toxin.

EPA scientists also have known since the mid-1990s that burning products containing TBB could release highly toxic dioxins, records show.

The only health studies of Firemaster 550 conducted to date are two Chemtura-funded papers that the company submitted in 2008 at the EPA's request, five years after the agency declared it was safe.

The effects seen in some of the test rats, such as low birth weight and skeletal malformations, often lead to more serious health problems later in life. Yet the industry researchers repeatedly dismissed those effects as “spurious,” “unclear” or “incidental,” saying the problems weren't seen in all of the animals or when different doses were tested.

The company said its animal tests found no harmful effects at levels “expected to be seen in the environment” and proved that Firemaster 550 is “acceptable for use in the applications for which it was intended.”

Stapleton and Heather Patisaul, a toxicologist at North Carolina State University, now are researching whether low doses of the brominated chemicals in Firemaster 550 could cause harm. Scientists increasingly are finding that the body can mistake tiny amounts of certain chemicals for hormones.

Based on earlier findings about such endocrine disrupters, including penta, Stapleton and Patisaul are looking for signs that Firemaster 550 could mimic or block hormones during critical stages of development.

“This is not a case where we are looking for missing arms and legs,” said Linda Birnbaum, director of the National Institute of Environmental Health Sciences and a veteran government scientist who has raised concerns about toxic chemicals for years. “We're looking at reduced ability to learn, altered behaviors, decreased sperm count, premature ovarian failure — things that are more difficult to pick up in the standard studies.”

EPA officials said they still think penta is more toxic than Firemaster 550, but they acknowledge missing some of the early warning signs about the newer flame retardant. They blamed the agency's delayed response on a lack of sufficient staff and funding to assess hundreds of new chemicals introduced by industry every year.

“We are always learning,” said Jones, the EPA's acting assistant administrator for chemical safety and pollution prevention. “We want to make sure we have a better understanding of the human health and ecological risks before we commit to any course of action.”

### **‘Why do we not learn?’**

Last year, Stapleton was back in her lab testing for flame retardants, this time in baby products.

About a fifth of the nursing pillows, car seats, highchairs, diaper-changing pads and other products made with polyurethane foam contained Firemaster 550, she found. But the most common flame retardant detected was another chemical: chlorinated tris, also known as TDCCP.

Of all the flame retardants used over the years, chlorinated tris is one of the most notorious. Manufacturers voluntarily took it out of children's pajamas more than three decades ago after it was linked to cancer.

Scientists and regulators thought chlorinated tris had all but disappeared from the marketplace. But because it wasn't banned, companies could legally use it in other consumer products without informing government officials or the public.

After penta was pulled from the market, chlorinated tris joined Firemaster 550 as the most widely used flame retardants in household furniture.

Chemical companies say chlorinated tris is safe. The American Chemistry Council, the industry's leading trade group, declined to answer specific questions but

emailed a link to its position paper, which states that a 2008 risk assessment by the European Union found “no concerns for consumers in relation to carcinogenicity from potential inhalation or exposure to children via the oral route.”

But several other major health and regulatory agencies have identified the flame retardant as a cancer risk, including the World Health Organization, National Cancer Institute and National Research Council.

In 2006, researchers at the U.S. Consumer Product Safety Commission cautioned that adding chlorinated tris to furniture would expose children to nearly twice the daily dose deemed acceptable by the federal agency. The cancer risk for children during the first two years of life would be seven times higher than what most physicians, scientists and regulators consider acceptable, according to the safety commission’s report.

“Industry has had years to come up with safer alternatives,” said Arlene Blum, a University of California at Berkeley chemist whose 1977 study helped pressure manufacturers to take chlorinated tris out of children’s sleepwear. “They can’t do better than this?”

In a statement, the EPA said it is largely powerless to do anything about chlorinated tris. The agency cited industry’s continued use of the chemical as a stark example of why it supports “much needed reform” of the nation’s chemical safety law.

Jerome Paulson, a George Washington University pediatrician who last year wrote a stinging critique of the law for the American Academy of Pediatrics, said the system especially fails to protect children. The group wants safety standards for industrial chemicals to be more like those governing pharmaceuticals and pesticides, with chemicals being approved only if a “reasonable certainty of no harm” can be verified.

Birnbaum and Ake Bergman, a Swedish researcher who was one of the first to sound alarms about penta building up in mothers and babies, wrote a 2010 editorial in the journal *Environmental Health Perspectives* that summed up the scientific community’s frustration with the lack of oversight.

“Why do we not learn from the past?” they asked.

With the federal government failing to take action, more than a dozen states are considering legislation that would ban chlorinated tris in children’s products. This spring, Washington state legislators rejected such a ban amid heavy lobbying from the Citizens for Fire Safety Institute, a front group for the world’s largest makers of flame retardants.

Last year, however, California added chlorinated tris to its Proposition 65 list of cancer-causing chemicals.

That means consumers shopping for furniture and baby products might soon be confronted with two labels: one meant to reassure them that the product meets the state’s flammability standards and another to warn them about a chemical linked to cancer.

Aware that new warning labels might scare away customers, Chemtura already is marketing an alternative flame retardant called Emerald NH-1. The company’s website describes the chemical as a member of its “new family of high-performing, greener fire safety solutions.”

The company says the polymer-based substance doesn’t contain bromine or chlorine, the troublesome chemicals in other flame retardants.

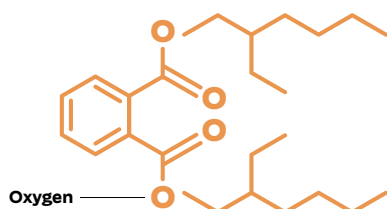
But the ingredients remain a trade secret.

*Tribune reporter Patricia Callahan contributed.*



# A suspicious similarity

Some researchers are concerned about a flame retardant known as Firemaster 550 in part because one of its chemical ingredients, TBPH, is structurally similar to a phthalate called DEHP that is linked to health problems.

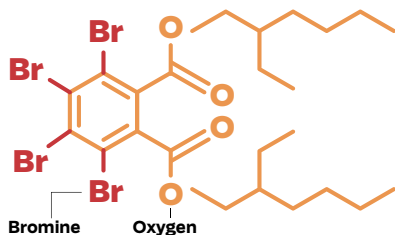


## DEHP

$C_{24}H_{38}O_4$

**BANNED IN CHILDREN'S PRODUCTS**

Congress has banned bis(2-ethylhexyl)phthalate, or DEHP, in children's products. California lists it as a carcinogen and developmental toxin.



## TBPH

$C_{24}H_{34}Br_4O_4$

**ALLOWED**

Firemaster 550, a flame retardant commonly used in furniture foam, is made with bis(2-ethylhexyl)tetrabromophthalate, or TBPH. The chemical is structurally identical to DEHP except for four bromine atoms that take the place of four hydrogen atoms.

## New risks replace old ones

Records show that the U.S. government has allowed generation after generation of flame retardants onto the market without thoroughly assessing the potential health risks. Many of the chemicals remain in use today.

### PCBs (1920s to mid-1970s) and PBBs (1970-76)

#### Full name: Polychlorinated and polybrominated biphenyls

These chemicals were widely used as flame retardants, coolants and lubricants until scientists found they can build up in the environment and pose health hazards. U.S. production of PBBs ended in 1976 and PCBs in 1977.

### Chlorinated tris (1962 to present)

#### Full name: tris(1,3-dichloro-2-propyl) phosphate, or TDCCP

Voluntarily taken out of children's sleepwear in 1977 after studies linked it to cancer, this chemical is widely used today in furniture foam and baby products. The World Health Organization, National Cancer Institute, National Research Council and Consumer Product Safety Commission call it a health hazard.

### PBDEs (1970s to present)

#### Full name: polybrominated diphenyl ethers

Production increased rapidly as PBBs were phased out of use. Chemical companies stopped making two PBDEs, penta and octa, after Europe banned the chemicals in 2004 over health concerns. When states moved to ban another PBDE called deca, manufacturers agreed to stop making it by the end of 2013.

### Firemaster 550 (2004 to present)

#### Contains TBB or 2-ethylhexyl-2,3,4,5-tetrabromobenzoate and TBPH or 2-ethylhexyl-2,3,4,5-tetrabromophthalate

Both ingredients have been detected in household dust and in wildlife since the product was introduced as a replacement for penta in furniture foam. The U.S. Environmental Protection Agency is now making those ingredients part of a "high priority" chemical review, citing widespread exposure and potential health risks.

SOURCES: EPA, California EPA, CPSC, peer-reviewed research

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