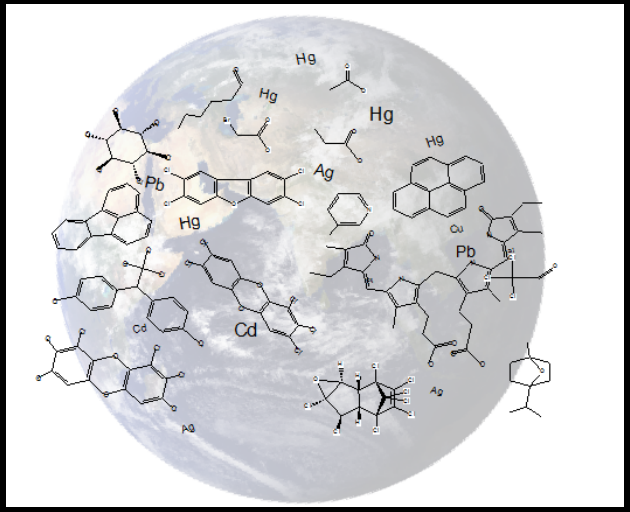
The Six Classes Approach for Healthier Products, People and Planet

Arlene Blum, Department of Chemistry
University of California, Berkeley

A Planetary Boundary for Chemical Pollution



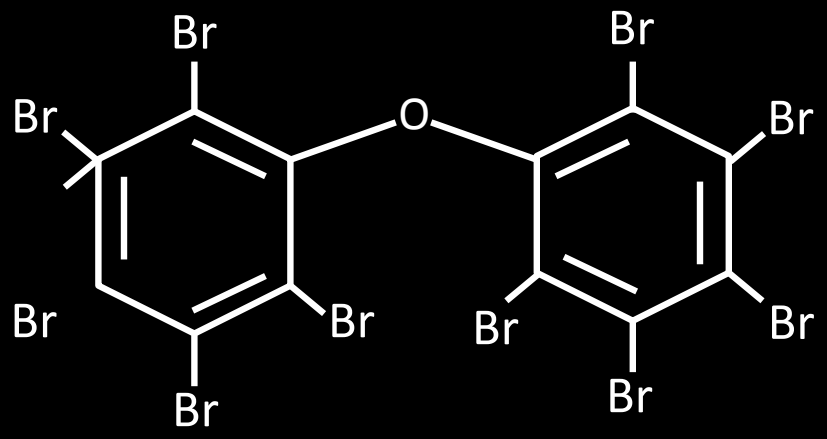
Chemical pollution is global:

- Rapidly increasing global production
- Persistence and long range transport
- Finite capacity of the earth to absorb toxics

Demands a globally coordinated response

Diamond et al, 2015, Environment International

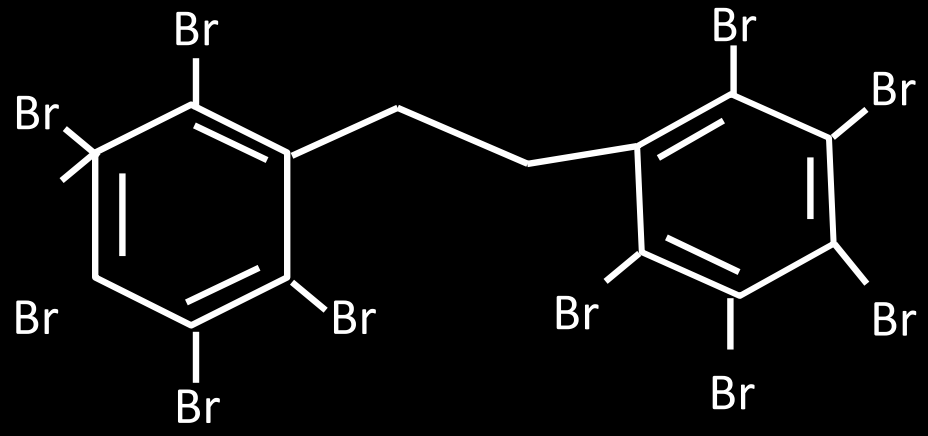
Regrettable Substitution



Decabromodiphenyl ether

Concerns:

- Persistence
- Bioaccumulation
- Toxicity

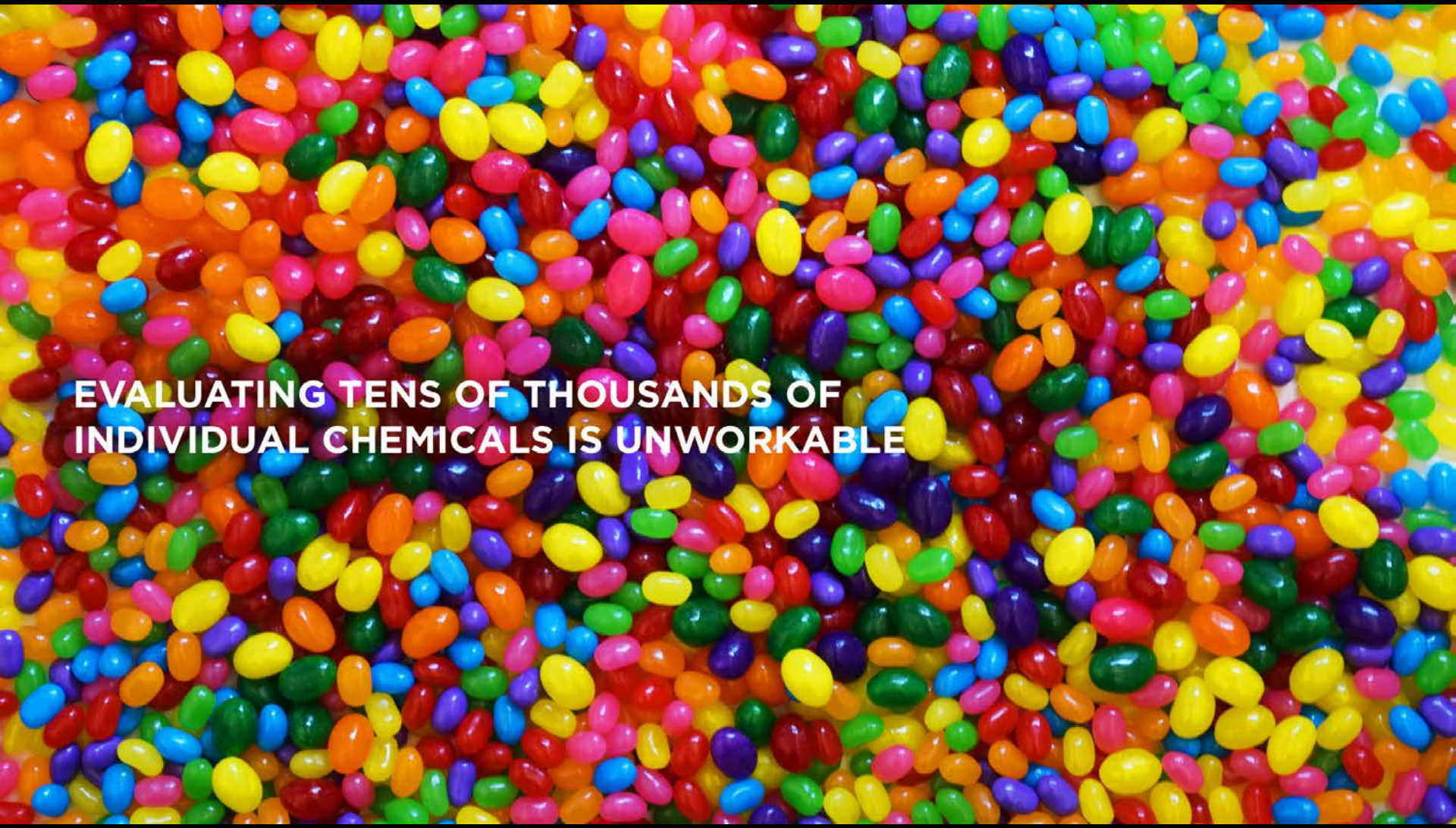


Decabromodiphenyl ethane

Concerns:

- Persistence
- Bioaccumulation
- Toxicity

One definition of insanity: "doing the same thing over and over again and expecting different results"


EVALUATING TENS OF THOUSANDS OF
INDIVIDUAL CHEMICALS IS UNWORKABLE



BUT ADDRESSING SIX GROUPS OF CHEMICALS OF CONCERN IS MANAGEABLE



The Six Classes

1. Highly fluorinated chemicals (PFASs)
   stain and water repellants
2. Chlorinated antimicrobials
   triclosan and triclocarban
3. Flame retardants
   brominated, chlorinated, phosphate
4. Bisphenols and phthalates
   phthalates, BPA, BPS, etc.
5. Organic solvents
   benzene, methylene chloride, xylene, etc.
6. Certain metals
   lead, mercury, chromium, cadmium, arsenic, etc.

Is it necessary?

Is it worth it?

Is there a safer alternative?

The Six Classes Challenge

Can the use of the Six Classes in consumer products be reduced by 50% in five years?

SixClasses.org
15-minute webinars on Six Classes containing chemicals of concern

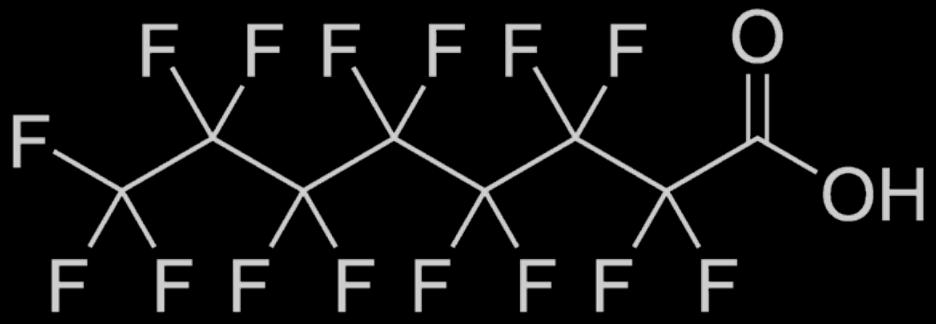
GREEN SCIENCE POLICY INSTITUTE
www.GreenSciencePolicy.org

Classes 1 to 3

Class 1: Highly Fluorinated Chemicals

Carbon-Fluorine bond strength:

- Leads to oil and water repellency
- Lasts for geologic time!



Adapted from slide by Dr. Jennifer Field


OUTDOOR GEAR


RECREATIONAL PRODUCTS


FURNISHINGS


BUILDING MATERIALS


PROTECTIVE COATINGS


CARPETS


CLOTHING


CARSEATS


NON-STICK COOKWARE


COSMETICS


FOOD PACKAGING


FIREFIGHTING FOAM

May 2015 The Madrid Statement on Highly Fluorinated Chemicals

"We call on the international community to cooperate in limiting the production and use of PFASs and in developing safer non-fluorinated alternatives."

Signed by 230 scientists from 40 countries

2015: Environmental Health Perspectives

In the news

The Opinion Pages | OP-ED COLUMNIST

The New York Times

Chemicals in Your Popcorn?

JUNE 4, 2015

Nicholas Kristof

What do a pizza box, a polar bear and you have in common?

All carry a kind of industrial toxicant called poly- and perfluoroalkyl substances, or PFASs, that do two things: They make life convenient, and they also appear to increase the risk of cancer.

These Chemicals in Pizza Boxes and Carpeting Last Forever

More than 200 scientists around the world document the threats of perfluorinated compounds and call for more government control.

By **Lindsey Konkel**, National Geographic

PUBLISHED MAY 01, 2015

NATIONAL GEOGRAPHIC

The Intercept_

THE TEFLON TOXIN

DuPont and the Chemistry of Deception

Sharon Lerner

Aug. 11 2015, 3:35 p.m.

133

Home

The New York Times Magazine

The Lawyer Who Became DuPont's Worst Nightmare

Rob Bilott was a corporate defense attorney for eight years. Then he took on an environmental suit that would upend his entire career — and expose a brazen, decades-long history of chemical pollution.

By NATHANIEL RICH JAN. 6, 2016

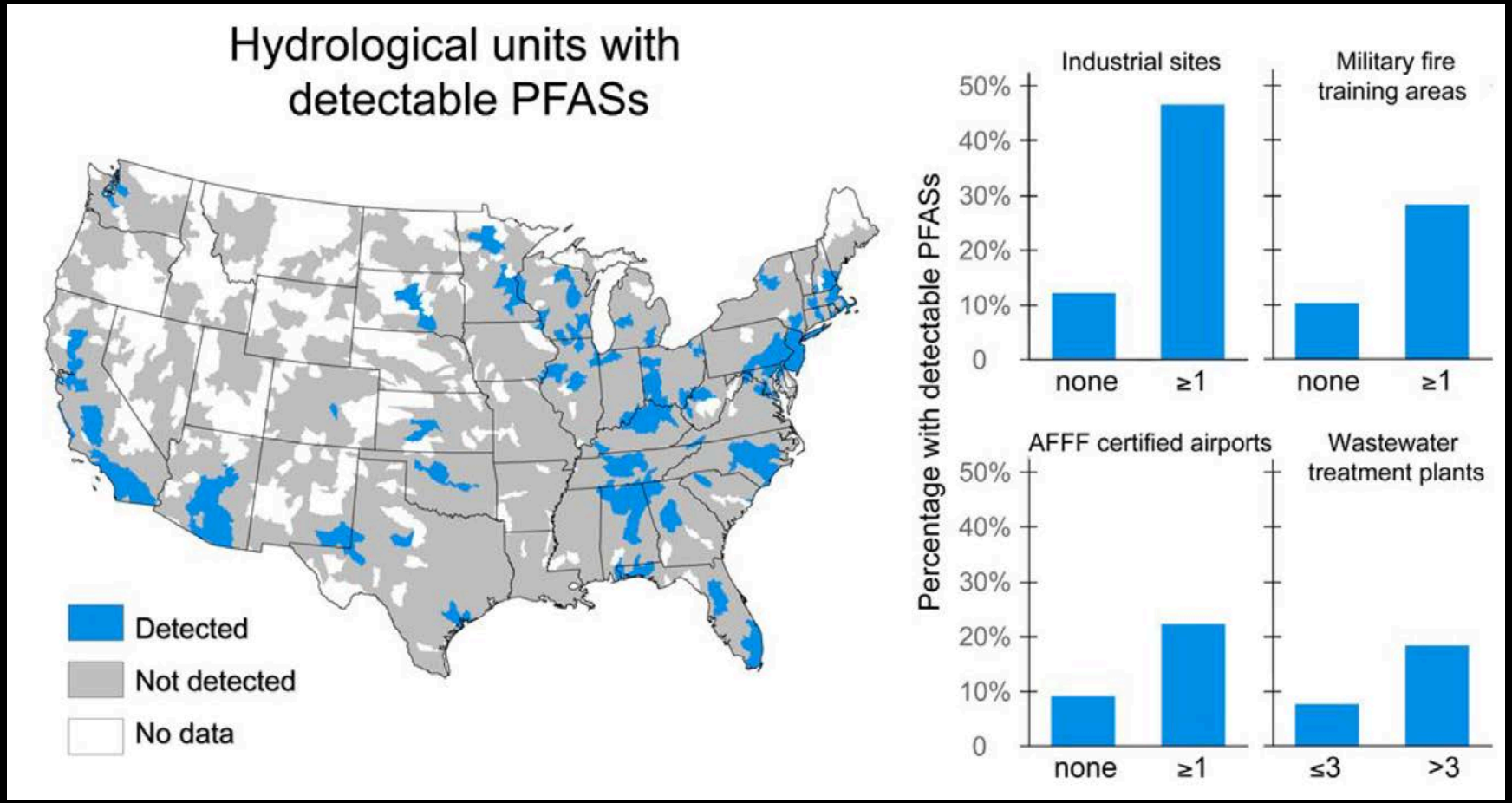
November 2015
Highly Fluorinated Chemicals

November 2015:

Scientific Guidance Panel votes unanimously to add entire class of Highly Fluorinated Chemicals (PFASs) to priority list of chemicals.

http://biomonitoring.ca.gov/sites/default/files/downloads/SGPMeetingSummaryNovember2015.pdf

Watersheds with point sources have higher detection frequencies for PFASs



Air Force to stop using AFFF foam in training exercises

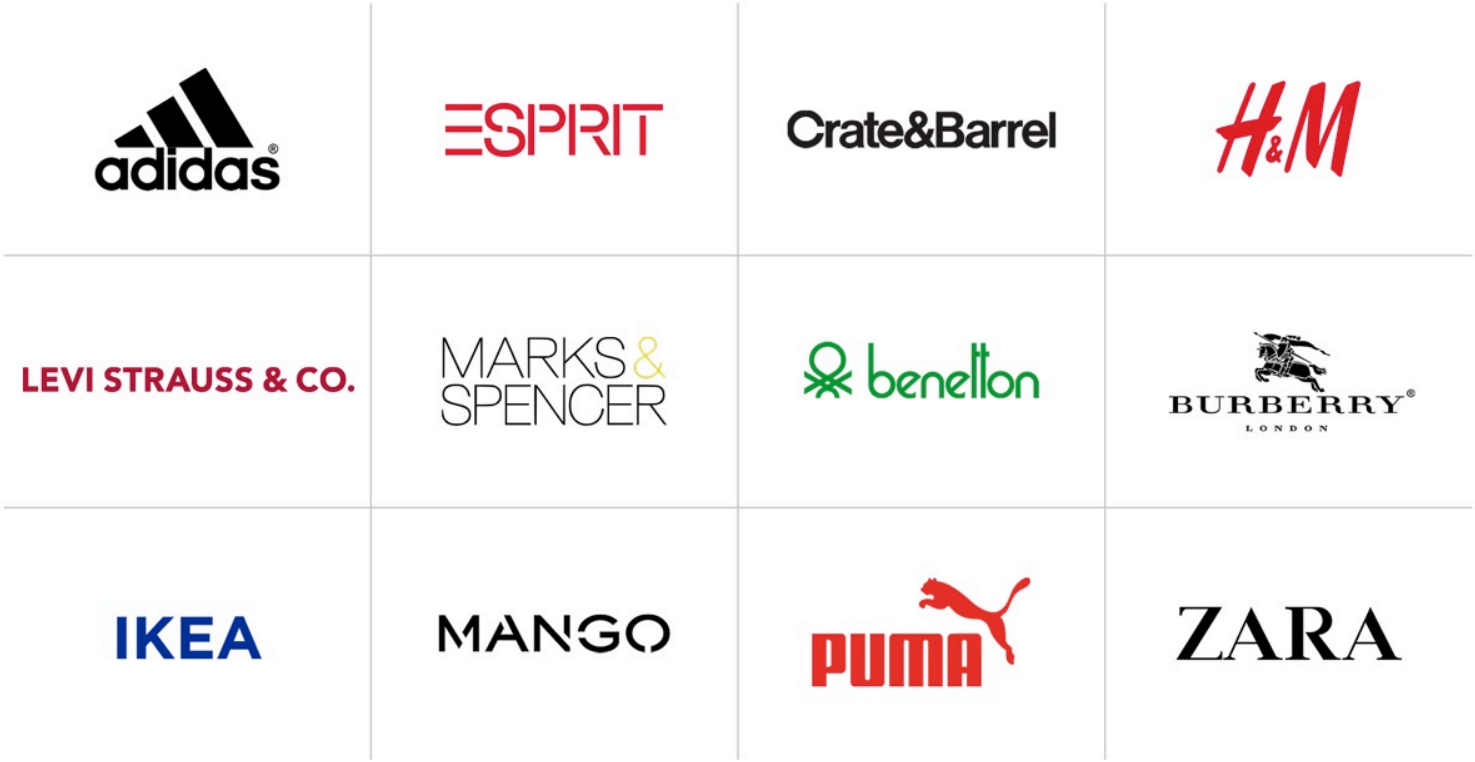
- Drinking water of six million Americans contaminated with PFAS
- AFFF firefighting foams used in training are a major contributor
- Air Force, on 19 August 2016, said:
  - "will stop using foam in training exercises"
  - "will replace all C8 foam with C6 by the end of this year"

Are short chain safer than long?

- Industry Knowledge Foundation: "…short chain fluorinated chemicals have a favorable environmental, health and safety profile, rapid bioelimination and are not bioaccumulative… they are safe for workers, consumers and the environment …"

- DuPont filed 16 reports to the EPA between April 2006 and January 2013 citing similar adverse health effects in animal studies from short chain exposure as found from long including cancer of the liver, pancreas, and testicles as well as kidney disease, liver degeneration, and uterine polyps. (Sharon Lerner, *The Intercept*)

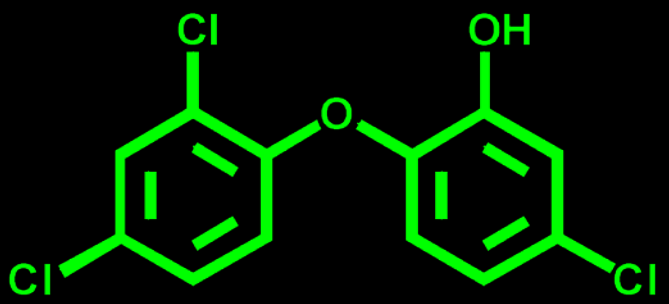
BRANDS ARE ELIMINATING HIGHLY FLUORINATED CHEMICALS



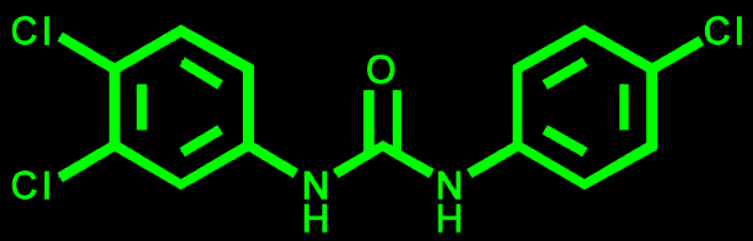
source: http://www.greenpeace.org/international/en/campaigns/detox/fashion/detox-catwalk

Class 2: Antimicrobials

Triclosan



Triclocarban



Courtesy: Dr. Gary Ginsberg


PERSONAL
CARE PRODUCTS


PAINTS


FOOD STORAGE
CONTAINERS


EXERCISE MATS


FLOORING


APPAREL


TOOTHPASTE


HOME TEXTILES


ELECTRONICS


KITCHENWARE

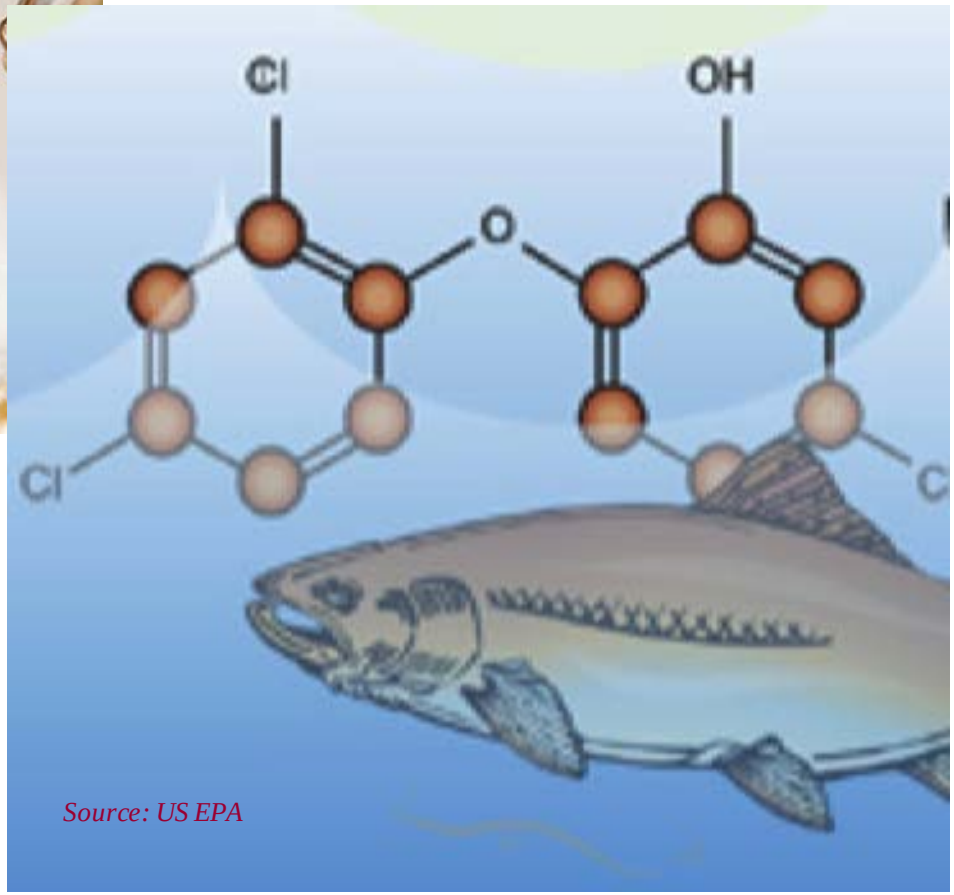

HANDLES/RAILS


COUNTERTOPS

TCS/TCC in Soap Could Work, But Don't

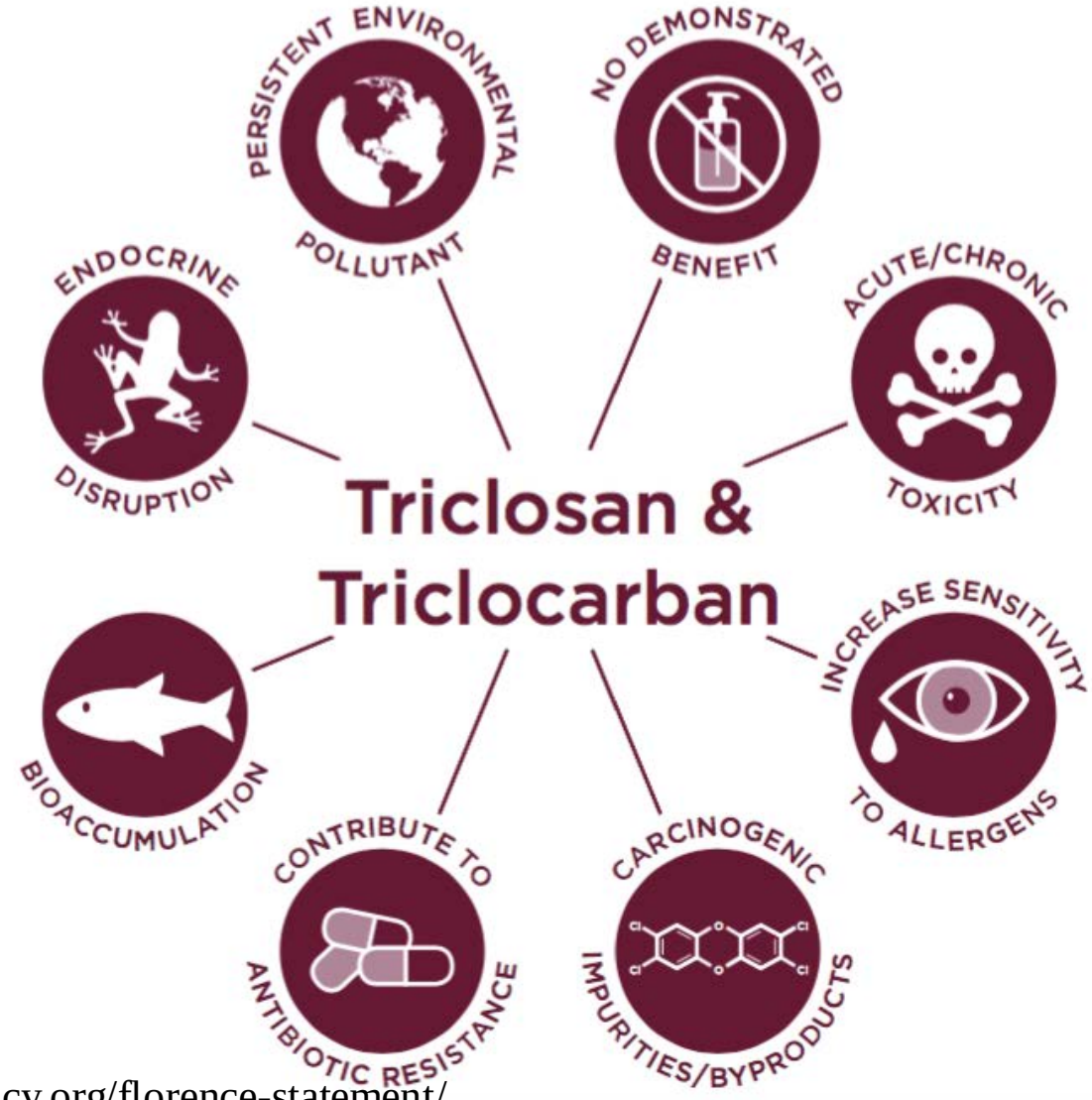
Why: Contact Time!

5 – 10 Seconds
(ineffective)



Lifetime exposure in aquatic organisms
(toxic)

The Florence Statement documents environmental & human health concerns



http://GreenSciencePolicy.org/florence-statement/

Adapted from: Halden, ES&T, 2014. 48(7):3603−3611

Class 3 Flame retardants

1970s Flammability Standards

- Children's sleepwear
- Furniture
- Foam plastic building insulation


FURNITURE FOAM


BUILDING INSULATION

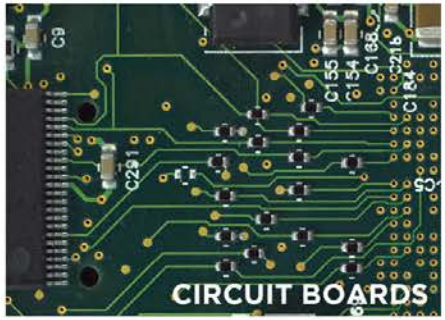

TEXTILES


CARSEATS


INFANT MATTRESSES


FABRIC BLINDS


REBONDED
CARPET PADDING


CIRCUIT BOARDS


WIRE AND CABLE
SHEATHING


TELEVISIONS

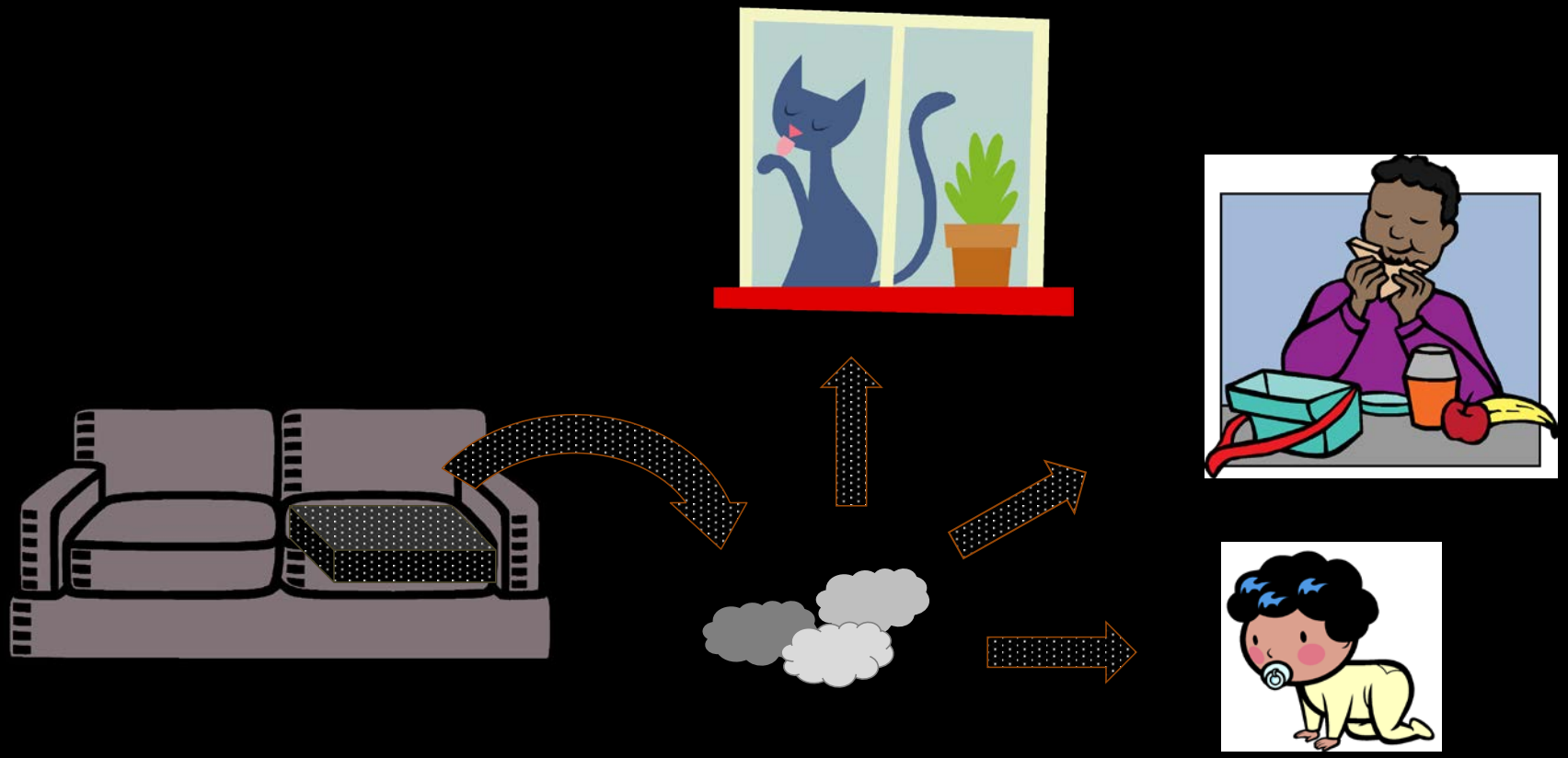

TRANSPORTATION
INTERIORS


PAINTS AND COATINGS

Technical Bulletin 117

- Required furniture foam to withstand a small open flame for 12 seconds
- No significant fire safety benefit (fires start in exterior fabric not filling)

From Products to People



Human Health

Higher pentaBDE

associated with

lower birth weight
impaired attention
poorer coordination
lowered IQ

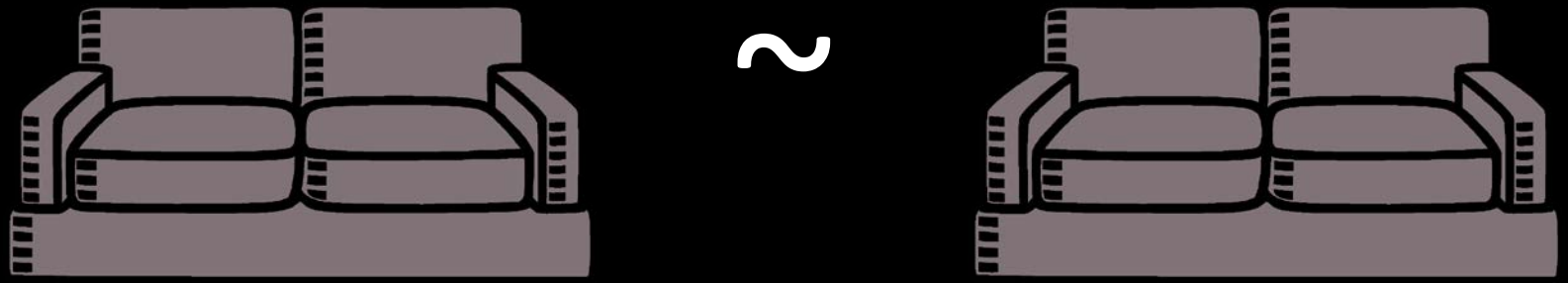
longer time to get pregnant
altered thyroid hormones

Eskenazi et al, 2010, 2011, 2012

Fire Safety Benefit?

Flame retardant treated foam

Non– treated foam



"No significant, consistent difference…"

(regarding California TB117)

Babrauskas et al. 2011; Talley 1995; Mehta (CPSC) 2012

San Antonio Statement on Brominated and Chlorinated Flame Retardants

- Signed by over 200 scientist's from 30 countries
- Documents health and environmental harm and lack of proven fire safety benefit

2010: Environmental Health Perspectives

Pulitzer Prize

Finalist

Goldsmith Prize

Investigative Reporting

Environmental Journalists Society

Environmental Reporting

Gerald Loeb Award

Business and Financial Journalism

National Press Club

Consumer Award

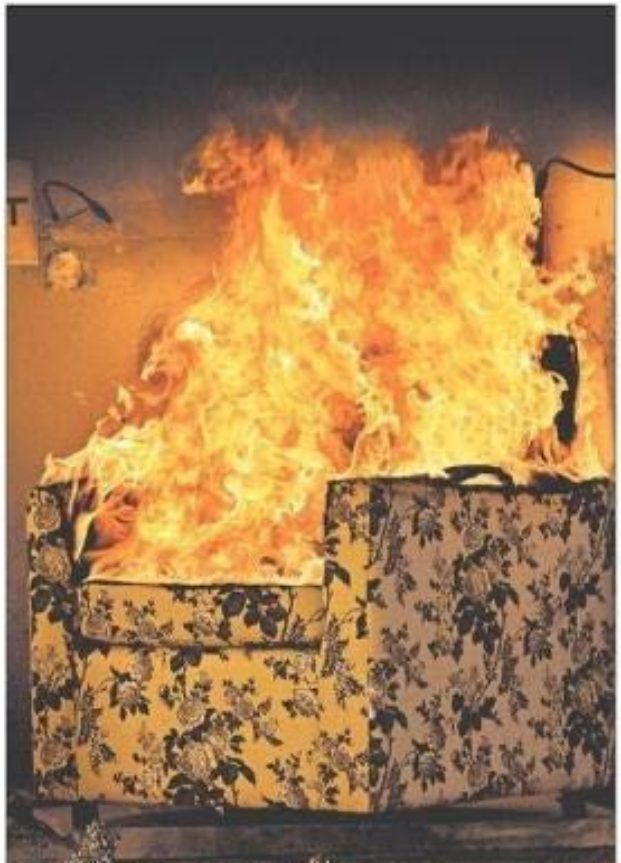
Chicago Tribune

QUESTIONS? CALL 1-800-TRIBUNE | SUNDAY, MAY 6, 2012 | BREAKING NEWS AT CHICAGOTRIBUNE.COM

TRIBUNE WATCHDOG

Playing with fire

A deceptive campaign by industry brought toxic flame retardants into our homes and into our bodies. And the chemicals don't even work as promised.



By Patricia Callahan and Sam Roe
Tribune reporters

Dr. David Heimbach knows how to tell a story.

Before California lawmakers last year, the noted burn surgeon drew gasps from the crowd as he described a 7-week-old baby girl who was burned in a fire started by a candle while she lay on a pillow that lacked flame retardant chemicals.

"Now this is a tiny little person, no bigger than my Italian greyhound at home," said Heimbach, gesturing to approximate the baby's size. "Half of her body was severely burned. She ultimately died after about three weeks of pain and misery in the hospital."

Heimbach's passionate testimony about the baby's death made the long-term health concerns about flame retardants voiced by doctors, environmentalists and even firefighters sound abstract and petty.

But there was a problem with his testimony. It wasn't true. Records show there was no dangerous pillow or candle fire. The baby he described didn't exist.

Neither did the 9-week-old patient who Heimbach told California legislators died in a candle fire in 2009. Nor did the 6-week-old patient who he told Alaska lawmakers was fatally burned in her crib in 2010.

Heimbach is not just a prominent burn doctor. He is a star witness for the manufacturers of flame retardants.

His testimony, the Tribune found, is part of a decades-long campaign of deception that has loaded the furniture and electronics in American homes with pounds of toxic chemicals linked to cancer, neurological deficits, developmental problems and impaired fertility.

The tactics started with Big Tobacco, which wanted to shift focus away from cigarettes as the cause of fire deaths, and continued as chemical companies worked to preserve a lucrative market for their products, according to a Tribune review of thousands of government, scientific and internal industry

stoked the public's fear of fire and helped organize and steer an association of top fire officials that spent more than a decade campaigning for their cause.

Today, scientists know that some flame retardants escape from household products and settle in dust. That's why toddlers, who play on the floor and put things in their mouths, generally have far higher levels of these chemicals in their bodies than their parents.

Blood levels of certain widely used flame retardants doubled in adults every two to five years between 1970 and 2004. More recent studies show levels haven't declined in the U.S. even though some of the chemicals have been pulled from the market. A typical American baby is born with the highest recorded concentrations of flame retardants among infants in the world.

People might be willing to accept the health risks if the

June 18, 2012

Governor Brown Directs State Agencies to Revise Flammability Standards

‘We must find better ways to meet fire safety standards by reducing and eliminating - wherever possible - dangerous chemicals.”

Press release, CA Office of Gov. Edmund G. Brown, Jr.

California Flammability Standard TB117-2013

Mandatory January 1, 2015

Flame retardants not needed, but can still be used

Product Labels Required

NOTICE

THIS ARTICLE MEETS THE FLAMMABILITY REQUIREMENTS OF CALIFORNIA BUREAU OF ELECTRONIC AND APPLIANCE REPAIR, HOME FURNISHINGS AND THERMAL INSULATION TECHNICAL BULLETIN 117-2013. CARE SHOULD BE EXERCISED NEAR OPEN FLAME OR WITH BURNING CIGARETTES.

The upholstery materials in this product:
____contain added flame retardant chemicals
__X__contain NO added flame retardant chemicals

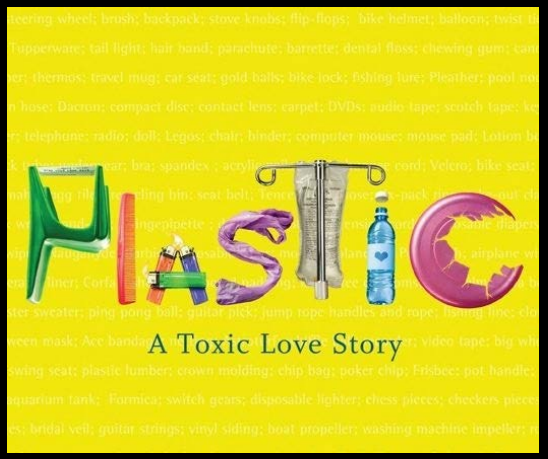
The State of California has updated the flammability standard and determined the fire safety requirements for this product can be met without adding flame retardant chemicals. The State has identified many flame retardant chemicals as being known to, or strongly suspected of, adversely impacting human health or development.

www.bearhfti.ca.gov/about_us/sb_1019_faq.pdf

Class 4: Bisphenols and Phthalates

Uses:

- Bisphenols: plastics,
- cash register receipts, adhesives, can linings



http://www.susanfreinkel.com/books_Plastic.html

- Phthalates: plasticizers, lubricants, solvents, emulsifiers, fragrances

Courtesy: Dr. Miriam Diamond

Class 5: Organic Solvents
(aliphatic, aromatic, halogenated, oxygenated)

- Hydrocarbon solvents
  - Aliphatic organic solvents (petroleum-based)
  - Aromatic organic solvents (toluene, xylene, benzene)
- Chlorinated solvents
  - E.g., Methylene chloride, perc, TCE
- Oxygenated solvents
  - Acetone, glycol ethers, alcohols

Courtesy: Dr. Liz Harriman

Class 6: Certain Metals
(arsenic, cadmium, chromium, lead, mercury etc.)

Courtesy: Dr. Graham Peaslee

“DO WE REALLY NEED THIS FUNCTION?”

“IS IT WORTH THE POTENTIAL FOR HARM?”

The Six Classes Challenge

Can the use of the Six Classes in consumer products be reduced by 50% in five years?

"Tackling Toxics" in *Science*

Scientists can:

- Develop safer chemistries
- Evaluate impacts across lifecycle
- Translate research to catalyze action among users and regulators
- Contribute to policy recommendations
- Collaborate on scientific consensus statements

Purchasers can ask:

"Do we need this chemical, given the potential for harm?"

11 MARCH 2016 • VOL 351 ISSUE 6278
DOI: 10.1126/science.aaf5468

How can I help reduce legacy and new exposure to harmful chemicals?

1. Responsible disposal of foam and plastic mixed with flame retardants?

2. Food contact materials without fluorinated chemicals?

3. Furniture without fluorinated chemicals, antimicrobials and flame retardants?

4. Alternative fire-fighting foams at airports without fluorinated chemicals?


For monthly e-newsletters
www.greensciencepolicy.org
Questions:
Arlene@arleneblum.com

WITH THANKS TO:

The Green Science Policy Institute Team:

Avery Lindeman
Sara Petty
Caroline Clarke
Veronica Chin
Zoe Laventhol
Eileen Kramer
Anna Soehl
Gretta Goldenman

By reducing use of Six Classes

We can have a healthier world.

For more information
Google: Green Science Policy
www.greensciencepolicy.org