

# **INNOVATIVE APPROACHES TO TEACHING GREEN CHEMISTRY TO WORKERS**

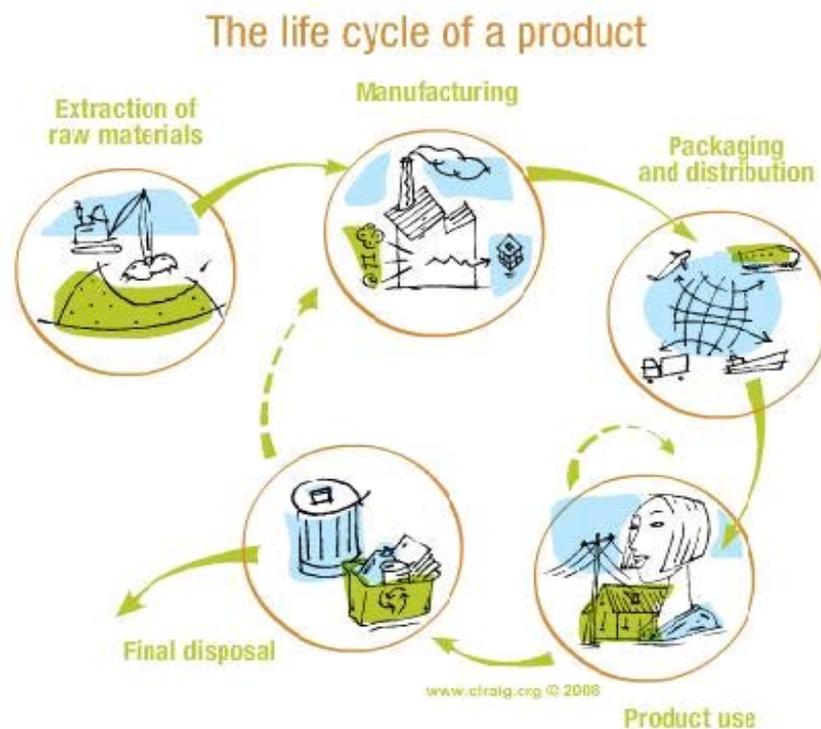
**Katy McNamara, CIH, UCLA-LOSH  
Valeria Velazquez, UCB LOHP**

**LOHP**  
LABOR OCCUPATIONAL  
HEALTH PROGRAM



# AGENDA

- Overview of Green Chemistry curriculum
- Module 5: Chemical Policy Framework
  - Regulatory programs & policy gaps
  - Case studies on chemicals of concern
- Module 7: What can I do?
  - Participation activity:  
Using the PLUM database
- Feedback

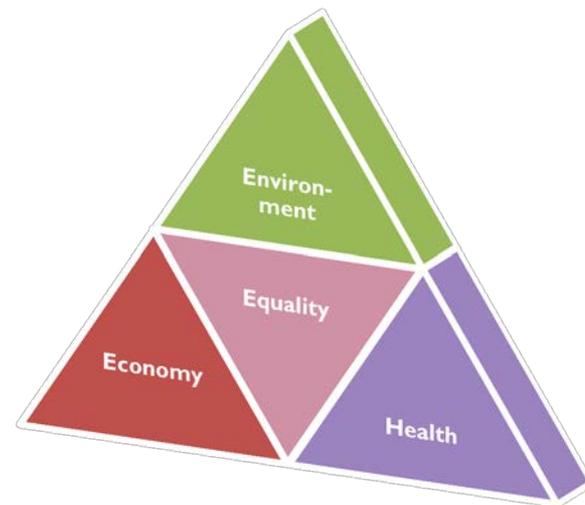


# ACKNOWLEDGEMENTS

This curriculum was developed with a grant from NIEHS and the American Reinvestment and Recovery Act (ARRA) and was jointly developed by LOHP and LOSH.



# GREEN CHEMISTRY CURRICULUM

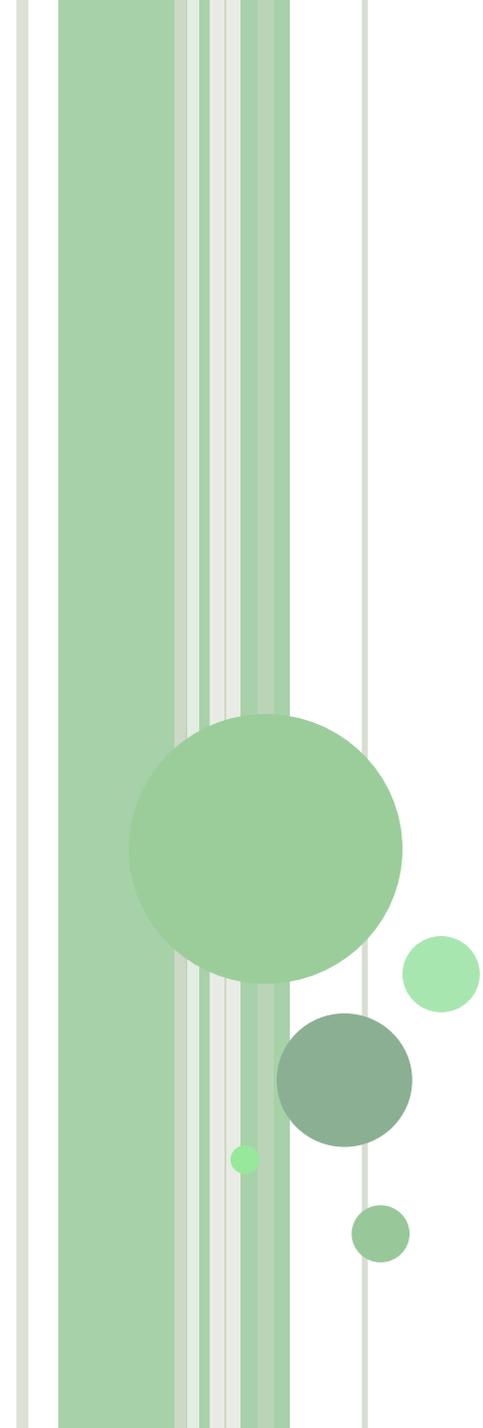


1. How this applies to me
2. Timeline of chemical production & policy
3. Sustainability: environment, economy & health
4. Chemical hazard awareness: case study, MSDSs
5. How chemicals are regulated: TSCA, HazCom, CA green chemistry initiatives
6. Green Chemistry: product life cycle, hierarchy of controls, the precautionary principal, success stories
7. Green chemistry and workers: what can I do?

# LEARNER GOALS AND TRAINING OUTCOMES

- Ownership → connect with first hand experience
- Awareness → protect self
- Authority → protect others
- Speak out → tell personal story
- Participation → get involved in policy process





# **MODULE 5: CHEMICAL POLICY FRAMEWORK**

# GOVERNMENT REGULATION OF CHEMICALS: HOW IT WORKS

## OSHA Workers

- Workplace exposures

## EPA Env. & HH

- Toxic Substances Control
- Pesticide Safety

## FDA Consumers

- Food additives
- Drugs
- Cosmetics  
PCPs

## CPSC Consumers

- Product safety

# GOVERNMENT REGULATION OF CHEMICALS: HOW IT **DOESN'T** WORK

OSHA	EPA	FDA	CPSC
<ul style="list-style-type: none"><li>• Workplace exposures</li></ul>	<ul style="list-style-type: none"><li>• Toxic Substances Control</li><li>• Pesticide Safety</li></ul>	<ul style="list-style-type: none"><li>• Food additives</li><li>• Drugs</li><li>• Cosmetics</li><li>• PCPs</li></ul>	<ul style="list-style-type: none"><li>• Product safety (recalls)</li></ul>

**Exposures from consumer products?**

**Household Workplaces?**

**Workplace exposures  
to new chemicals?**

**Chemicals in food containers?**

# EPA 'GATEKEEPER' PROGRAMS: TOXIC SUBSTANCE CONTROL ACT

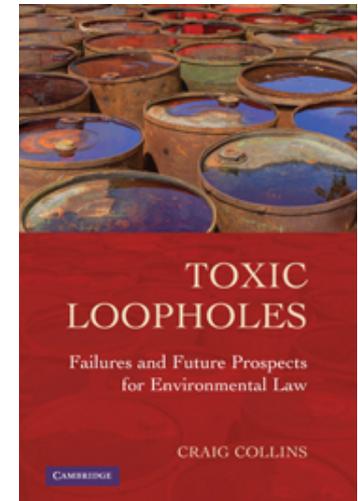
- New chemical review process:  
Pre-Manufacture Notice
  - ~15,000 new applications/year
  - 90 day review period
  - 15% have toxicity testing: any H&S data is allowable
- Substance specific rules:
  - PCBs – effective market ban; detailed rule
  - Asbestos – limited ban, overturned

EPA

- **TSCA review**
- Pesticide Safety

# WHAT HAPPENED TO TSCA?

- TSCA product ban for asbestos in progress
- Corrosion Proof Fittings v. EPA (1991)
  - Asbestos brake pad manufacturers sued EPA for their alternatives assessment methods
  - Contested:
    - more traffic related deaths with non-asbestos brake pads
    - EPA had no methodology to evaluate the safety of alternatives.
- Outcome: House Committee Report on TSCA
  - Burden placed on EPA to “balance the probability, magnitude and severity of harm against the effectiveness of control”
  - EPA never developed model for evaluating alternatives



# WHAT ABOUT OSHA?

- Hazard Communication Standard requires manufacturers to provide:
  - MSDS with health hazard info
    - Acute symptoms from over exposure
    - Long term (cancer) risk
  - Warning language on label
- New PELs are reviewed for 'economic feasibility'
  - Only 16 new PELs since 1971
  - Healthy worker bias: risk model less protective than EPA's

## OSHA

- Workplace exposures

# WORKPLACE EXPOSURES & CHRONIC DISEASE

Deaths in US from occupational disease: 60,000/yr



Usage	No. on the Market	No. w/ PELs
High production volume chemicals (>1M lbs/yr)	3,000	193 (6%)
Chemicals used in qty's >10,000 lbs/yr	8,300	453 (5%)



# HUMAN AND ECONOMIC COSTS OF OCCUPATIONAL DISEASE

**FIGURE 1. DISEASE CASES AND COSTS ATTRIBUTABLE TO CHEMICAL EXPOSURES IN THE WORKPLACE, CALIFORNIA 2004**

	Cases			Costs (\$millions)	
	Disease	Hospitalizations	Deaths	Direct medical	Indirect
Cancer	113,999	8,700	3,845	\$617.2	\$620.5
COPD	42,606	1,145	361	\$42.6	\$42.8
Asthma	45,856	460	11	\$25.4	\$7.5
Pneumoconioses	1,710	171	132	\$15.3	\$21.0
Chronic renal failure	2,854	128	21	\$4.9	\$5.7
Parkinson's disease	699	27	37	\$1.1	\$1.3
<b>Total</b>	<b>207,724</b>	<b>10,631</b>	<b>4,407</b>	<b>\$706.5</b>	<b>\$698.8</b>
				<b>TOTAL</b>	<b>\$1,405.3</b>

# EXPOSURES THAT AFFECT EVERYONE

## Consumer Products

- Informal workplaces
- Domestic workers
- Light industry

## Home environment

- Families
- Children
- Where we spend most of our time

### FDA

- Food additives
- Drugs
- Cosmetics  
PCPs

### CPSC

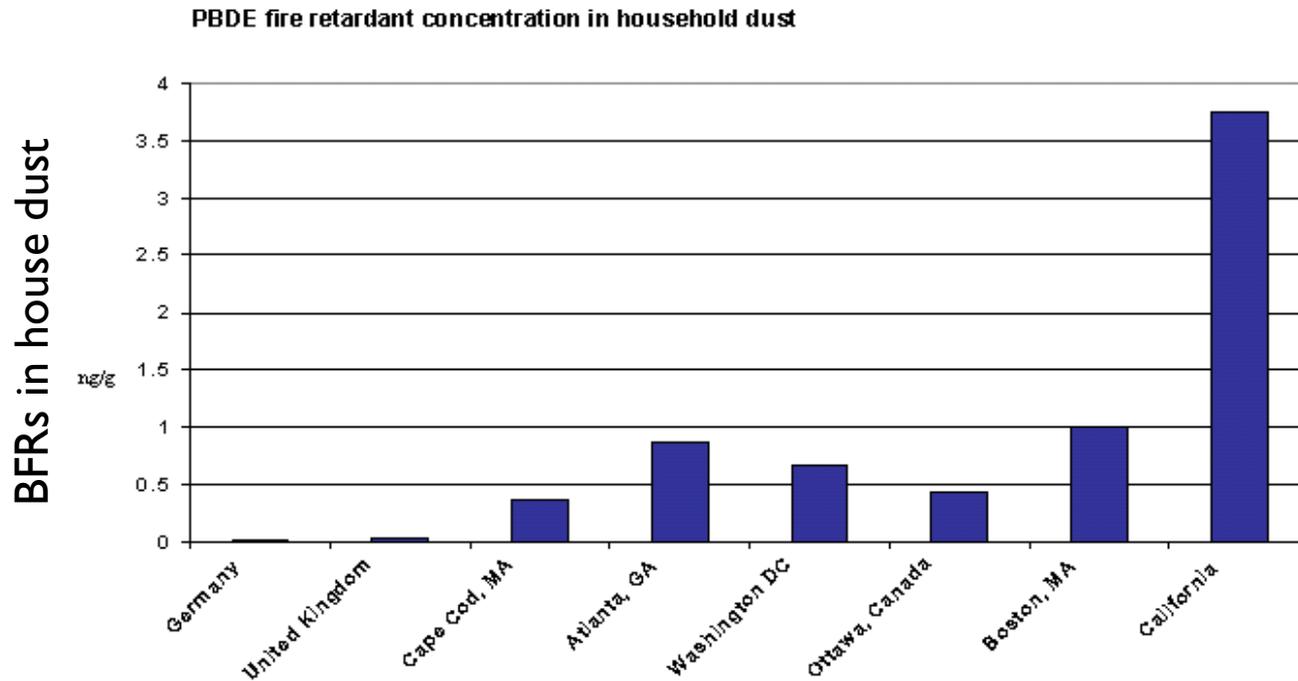
- Product safety (recalls)

# CHEMICALS OF CONCERN IN CONSUMER PRODUCTS



## Brominated Flame Retardants:

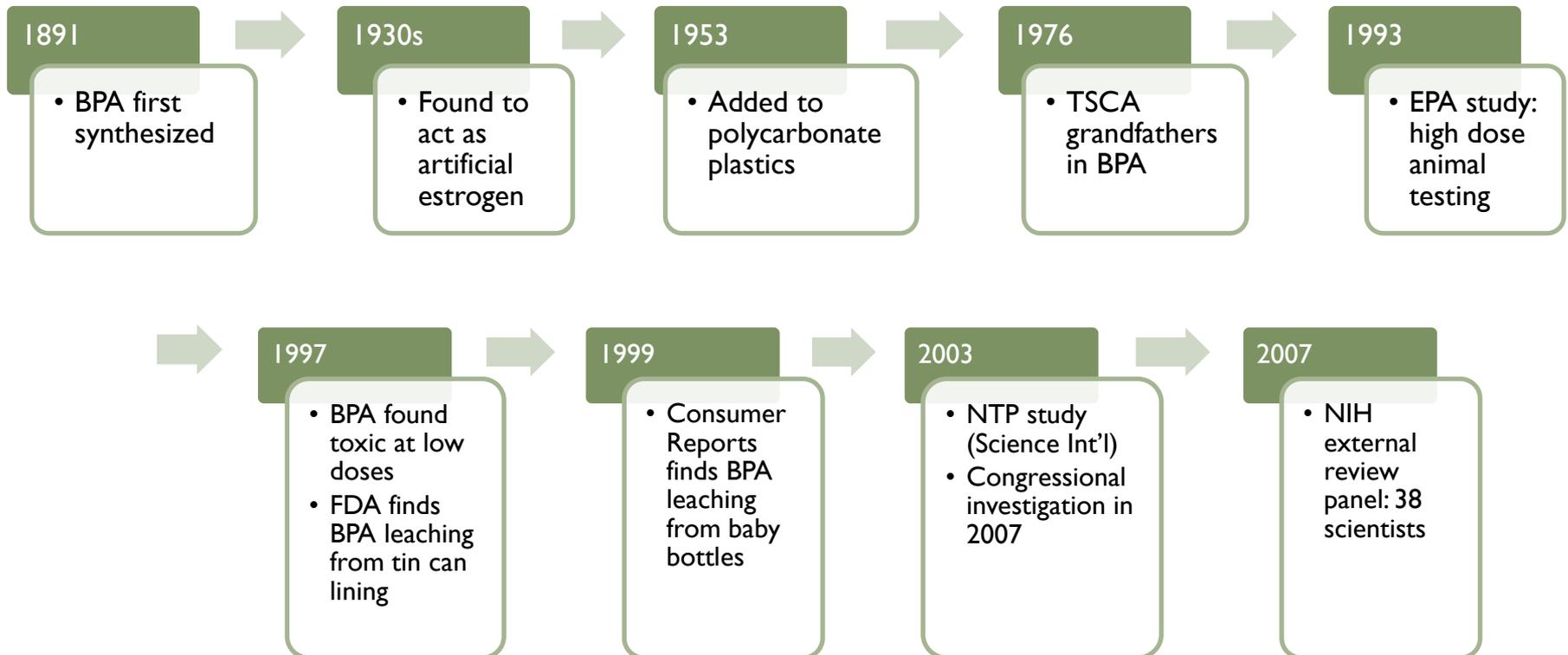
- Reproductive toxin, neurotoxin
- Voluntary ban from mattresses in 2004 (following ban in Europe)
- Still manufactured in hard plastics, furniture foam, electronics
- Detectable in house dust and human blood



# CHEMICALS OF CONCERN IN CONSUMER PRODUCTS: BIS-PHENOL A



## Timeline



# BPA RISK ASSESSMENT: CONCLUSIONS

Authority	Recommendation
NIH external science panel	'Clear risk'
NTP (Science International)	'Some concern' neurotoxin, reproductive toxin
FDA	'Adequate margin of safety'

2009: House Committee urges FDA to re-examine BPA

## The Washington Post

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### Studies on Chemical In Plastics Questioned

Congress Examines Role Of Industry in Regulation

By Lyndsey Layton  
Washington Post Staff Writer  
Sunday, April 27, 2008

Despite more than 100 published studies by government scientists and university laboratories that have raised health concerns about compound that is central to the multibillion-dollar plastics industry, the Food and Drug Administration has deemed it safe largely bec

# BPA: POLICY ACTIONS

## Banned in baby products

- Canada –2008
- Minnesota –2009
- City of Chicago – 2009
- Connecticut – 2011

**The New York Times**

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May 14, 2009

## Chicago Bans Bottles With BPA Plastic

By KAREN ANN CULLOTTA

**CHICAGO** — The City Council on Wednesday unanimously adopted a ban on baby bottles manufactured with a chemical that some studies have linked to disease.

The passage was driven by what officials here call federal regulators' failure to take action on a grave public health issue.

The chemical, bisphenol-A, or BPA, is commonly employed to harden plastics, among other uses. One use is in a microwave oven or cleaned in a dishwasher.

Some animal studies have found that BPA can interfere with the endocrine system and cause reproductive problems.



N14 NATION THE STAR, TUESDAY 15 MARCH 2011

## Ban on BPA milk bottles

The chemical carries potential health risk, says Liow

By LESTER KONG  
lester@thestar.com.my

**PUTRAJAYA:** Polycarbonate infant milk bottles containing the chemical Bisphenol A (BPA) will be outlawed from March 1 next year.

Health Minister Datuk Seri Liow Tiong Lai said the Cabinet had decided to ban such milk bottles due to BPA's risk to infant hormone systems.

"The enforcement will be made in stages and the industry is given one year to comply with the decision by making changes to their machines and buying new raw materials," he told a press conference yesterday.

Liow urged parents and guardians of infants and children to make the switch now to bottles marked "BPA-free" which were widely available in the local market.

He said the decision for the ban was made as there was no scientific evidence which proved that BPA bottles were safe for use by high-risk groups namely infants and children.

"This action was taken in case BPA could definitely affect the hormone and other body function systems," he said.

Enforcement against retailers selling milk bottles containing BPA will start from March 1 next year.

Liow said the move was in line with the World Health Organisation's recommendations, adding that the European Union (EU) had made a similar announcement earlier this month to make the ban effective in June for EU-member countries.

Other countries that have banned the chemical in milk bottles include Germany, France, Denmark, Canada, Australia, New Zealand and the state of New York in the United States.

BPA is used in polycarbonate to make baby milk bottles because it made the plastic translucent and stiffer while those without BPA had a less clear and dirtier look.

# BPA: MARKET RESPONSE

1. 1<sup>st</sup>: voluntary ban from baby products



2. Then: voluntary ban from water bottles



3. Still waiting: ban from food product containers  
*FDA decision by March 31, 2012*



4. Next: Heat treated paper

# BPA AND RETAIL WORKER EXPOSURES

- Cashiers handle hundreds of receipts daily
- Alcohol hand sanitizer may increase absorption
- Recycled paper contaminated



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USA TODAY Home News Travel Money Sports Life Your Life Tech Weather

## GREENHOUSE

Your home... your world

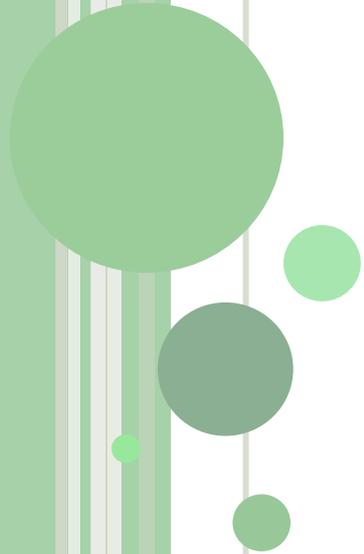
Home Archives Related topics Forum About

« Alaska Airlines cuts emissions with smoother landings BP announces huge quarterly loss and Tony Hayward's ouster »

Jul 27, 2010

### Chemical BPA found on cash register receipts

# **OCCUPATIONAL CASE STUDIES**



# ASBESTOS

## Dangers of Asbestos

Adverse effects associated with asbestos exposure have been revealed in many well-conducted studies of exposed workers, family contacts of workers, and persons living in close proximity to asbestos mines. The studies have shown a **clear correlation between asbestos exposure and lung cancer as well as mesothelioma** (a rare form of cancer that develops from the protective lining of the body's internal organs). Asbestos exposure has also been linked to increases in esophageal, kidney and laryngeal cancers. It generally takes **20 years following the first exposure for signs of disease to surface**.

### Asbestos Related to Vehicles

An estimated 155,000 automotive garage workers are potentially exposed to harmful asbestos materials with a total of 1.3 million American workers still subject to asbestos exposure.

**9,700**

people die each year from  
asbestos related cancer



#### Car Parts that Could Have Asbestos:

- \* Hood Liners
- \* Clutch Assembly
- \* Brake Pads
- \* Gaskets
- \* Valve Rings
- \* Valve Stem Packing

SOURCES:

[http://www.atsdr.cdc.gov/asbestos/asbestos/health\\_effects/index.html](http://www.atsdr.cdc.gov/asbestos/asbestos/health_effects/index.html)  
<http://minerals.usgs.gov/ds/2005/140/asbestos.pdf>  
<http://www.hse.gov.uk/foi/internalops/fod/oc/200-299/265-50.htm>  
<http://www.nbc12.com/story/12497463/asbestos-in-older-car-parts>  
<http://www.legislation.gov.uk/uksi/2006/2739/contents/made>  
<http://www.malignantmesothelioma.ws/Asbestos.htm>

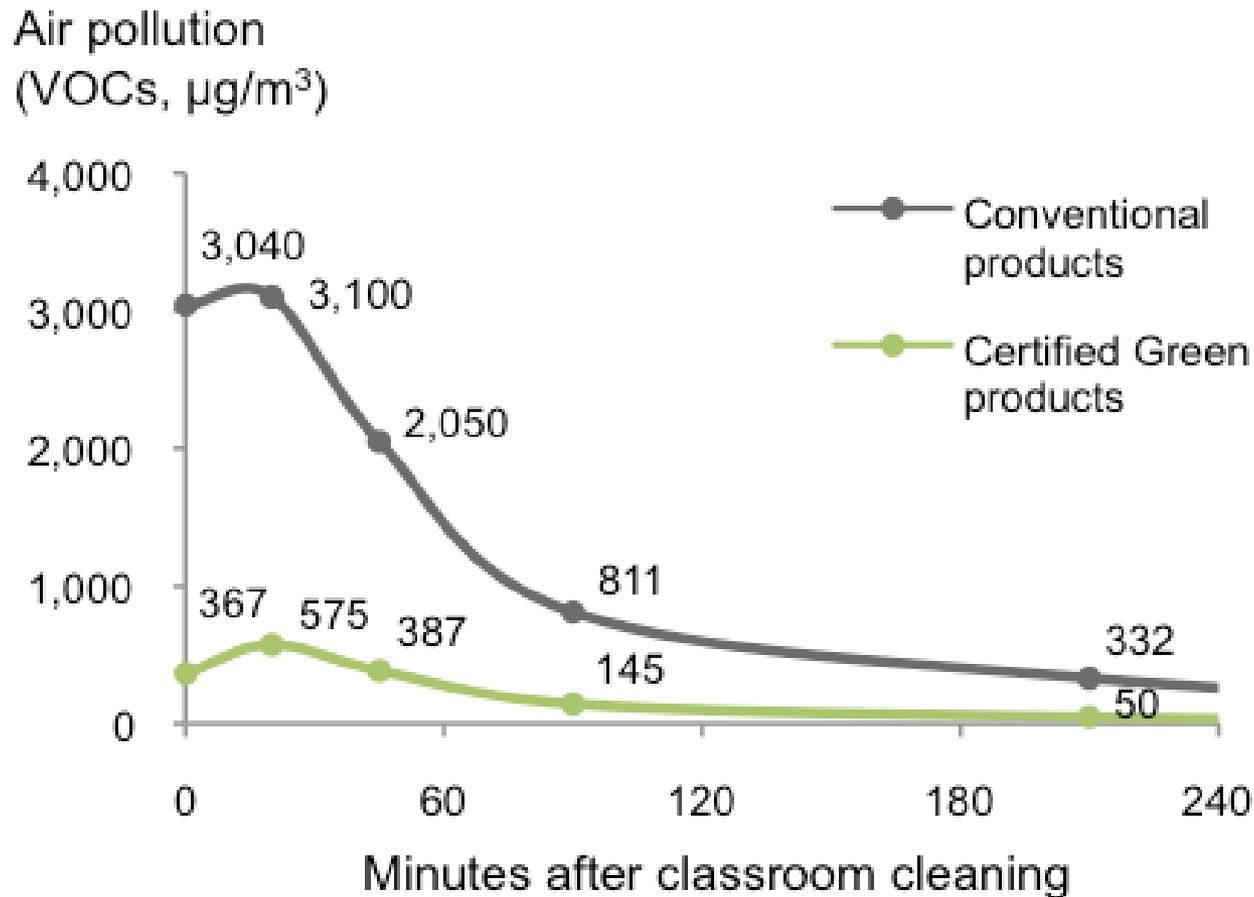
# CONSUMER CLEANING PRODUCTS: CLEAN HOUSE = DIRTY LUNGS?



## **Common cleaning products found to generate hazardous air pollutants:**

- **Benzene**, a carcinogen  
(Comet Disinfectant Powder Cleanser)
- **Chloroform**, a carcinogen & developmental toxin  
(Comet Disinfectant Powder Cleanser)
- **Formaldehyde**, a carcinogen  
(Simple Green Concentrate, Pine-Sol Original, Comet Disinfectant Powder Cleanser, Super Cleaner Concentrate)
- **Dibutyl phthalate**, a reproductive toxin  
(Shineline Seal Floor Sealer/Finish)

# GREEN CLEANING PRODUCTS RELEASED 15% LESS AIR POLLUTANTS



# AFTER THE FACT TOXICITY STUDIES: TRICLOSAN

- Found in anti-bacterial soaps, detergents & toothpaste
- Endocrine disruptor
- In tap water, lakes & streams, it forms chemicals linked to cancer
- Found in human blood & breast milk, and in the environment
- Not regulated as pesticide by EPA, minimally covered by FDA

Source: Environmental Working Group, 2012



# PERIPHERAL NEUROPATHY IN AUTO MECHANICS HEXANE BRAKE CLEANERS

## n-Hexane Use in Vehicle Repair

**Long-term overexposure to n-hexane can damage the nerves** in the feet, legs, hands, and arms. The damage can last a long time and may become permanent. The symptoms include numbness, tingling, weakness (sometimes even paralysis), and reduced ability to feel touch, pain, vibration, and temperature. Short-term overexposure can cause headache, dizziness, loss of appetite, giddiness, and drowsiness. Health effects have only been reported when exposure levels were above California's workplace Permissible Exposure Limit—but people working with n-hexane can easily be exposed to levels that high. This Health Hazard Advisory was prompted by cases of nerve damage identified among auto mechanics using spray brake cleaner that contains n-hexane.

**Health  
Hazard  
Advisory**

### How to know if you are working with n-Hexane

Hexane is a solvent. It's used mainly in vegetable oil extraction and in cleaners, degreasers, glues, and spray paints. n-Hexane is one kind of hexane. Commercial hexane usually contains 20% to 80% n-hexane, so you should treat all hexane as if it's n-hexane. Pure n-hexane is a colorless, very fast-evaporating liquid with a faint disagreeable odor.

In addition to the recent cases among auto mechanics, nerve damage from hexane exposure has been reported among workers making jet engine parts, furniture, shoes, sandals, and vegetable oil, and doing printing press proofing. Other workers likely to be exposed to hexane include laboratory workers, construction workers, and artists. Pure n-hexane is used in laboratories.

If you may be exposed to hexane at work, ask to see the Material Safety Data Sheet (MSDS) for each brake and parts cleaning product in your work area. Your employer must have an MSDS for any workplace product that contains a hazardous substance, and must make the MSDS available to you on request. If a product contains n-hexane, the MSDS should identify it in section 2 by the CAS number 110-54-3.

### Do you use any of these products?

Amrep Brake Parts Cleaner  
Berryman 8-12 Chemtool Carb and Choke Cleaner  
Berryman Chemtool Air-intake Cleaner  
Berryman Non-Chlorinated Brake Cleaner  
Certified Labs Dylek PS Aerosol  
Continental Research Brake Master  
Drummond American Corp. Strafe  
Loctite Disc Brake Quiet  
Loctite Flam Brake Clean  
Loctite ODC-Free Cleaner and Degreaser  
Loctite Pro Strength Degreaser  
Malco Brake and Parts Wash  
Malco Carb, Choke and Injection Cleaner  
Mantek DJC PS Aerosol  
Penray Non-Chlorinated Brake Gard  
Seymour of Sycamore Non-Chlorinated Brake Cleaner  
Sherwin Williams Automotive Cleaners  
Sherwin Williams Brake Parts Wash  
Sherwin Williams Cleaner/Degreaser  
Sherwin Williams Non-Chlorinated Brake Cleaner  
Sherwin Williams Parts Wash  
Taylor Made Non-Chlorinated Brake Cleaner  
Technical Chemical Non-Chlorinated Brake Cleaner  
Winzer Brake Cleaner, Non-Chlorinated  
Würth Brake and Parts Cleaner (liquid and aerosol)  
Zep Aerosol Brake Parts Cleaner  
Zep Brake Wash (liquid)  
Zep Parts Cleaner (aerosol)

(These are some products reported to contain hexane in a recent survey. However, products like these can change their ingredients quite often. Be sure to check the MSDS for whatever products you're using.)



JUNE 2001

California Department of Health Services • California Department of Industrial Relations

HAZARD EVALUATION SYSTEM & INFORMATION SERVICE  
California Department of Health Services  
Occupational Health Branch  
1515 Clay Street, Suite 1901, Oakland, CA 94612  
510-622-4300 • [www.dhs.ca.gov/ohb](http://www.dhs.ca.gov/ohb)

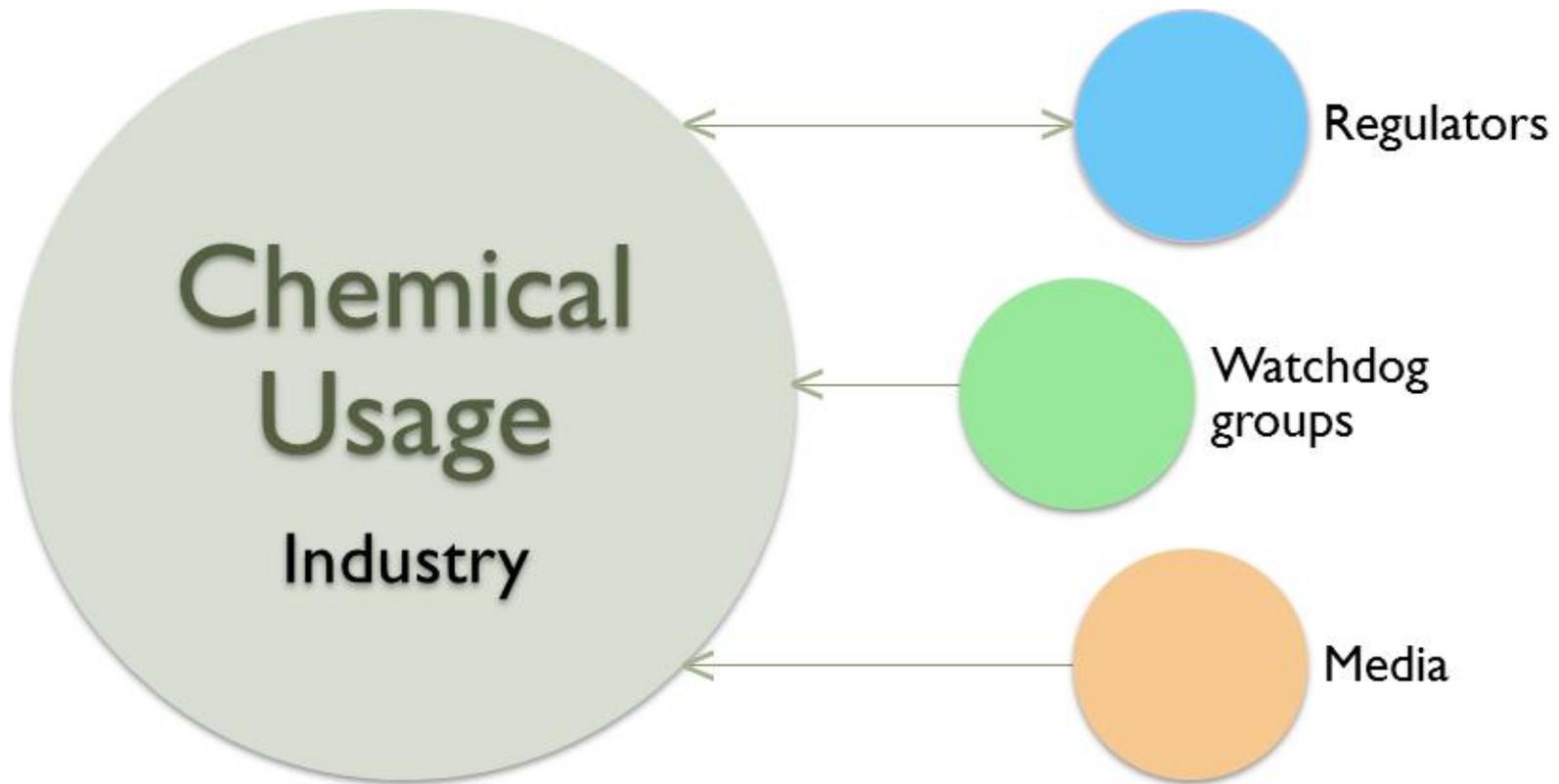
# WHY HEXANE?

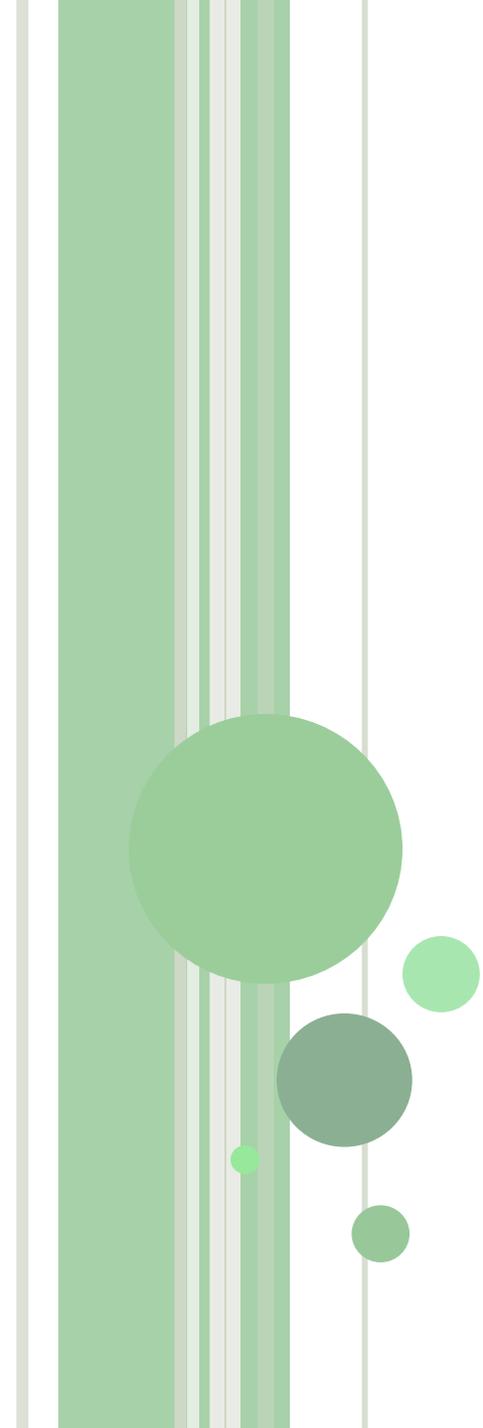
Unintended consequence of California phase-out of chlorinated solvents



## Serial Phase-outs & Substitutions

1970:	Stoddard solvent	Fire hazard
1978:	CFCs	Ozone depletion
1980:	Methylene chloride	Carcinogen
1985:	1,1,1-Trichloroethane	Ozone depletion
1990:	Perchloroethylene	Dioxin emissions
2002:	Hexane/acetone blends	Neurotoxicant
Next:	1-Bromopropane	Reproductive toxicant





# **MODULE 7: TAKING ACTION**

# BE AN INFORMED CONSUMER:

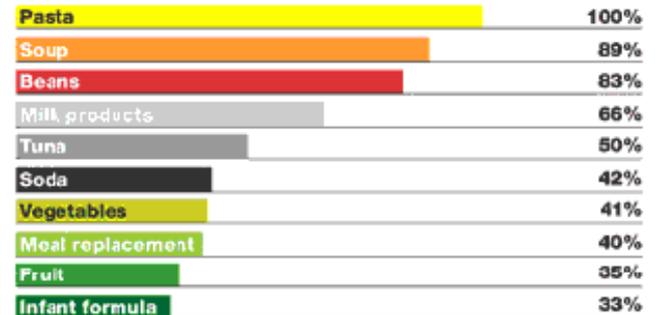
- Read labels
- Do your homework! Stay informed
- Exercise your power as a consumer
- Tell your friends

## plastic by the numbers

PLASTIC	FOUND IN	HEALTH RISKS	TIP
 <b>PETE</b> (polyethylene terephthalate ethylene)	Soda, juice, and water bottles, as well as some containers of peanut butter and salad dressing	Although they don't contain BPA, PETE plastics can leach other toxic chemicals when scratched or heated.	Use once and then recycle, says Patricia Hunt, PhD, a professor in the School of Molecular Biosciences at Washington State University.
 <b>HDPE</b> (high-density polyethylene)	Opaque water and milk bottles, yogurt and butter containers, and soft plastic sports bottles	Same deal as PETE: Generally safe unless scratched or heated	"Heat is an invitation for chemicals to migrate out," says Hunt. "Never wash any plastics in the dishwasher or use them in the microwave."
 <b>PVC</b> (polyvinyl chloride)	Some plastic wraps, squeeze bottles, and peanut-butter containers	The most toxic of all plastics	Avoid at all costs
 <b>LDPE</b> (Low-density polyethylene)	Grocery-store bags, plastic wrap, sandwich bags, and many squeeze bottles	Generally safe, except when microwaved, which triggers the release of chemicals	"Foods high in fat and acid increase leaching from these plastics," says Kathleen Schuler of the Institute for Agriculture and Trade Policy.
 <b>PP</b> (polypropylene)	Cloudy plastic baby bottles, sippy cups, some food-storage containers, and many takeout containers	Mostly safe, except when heated or scratched	Treat like #2 (HDPE) plastics
 <b>PS</b> (polystyrene)	Styrofoam food containers and clear plastic takeout containers and cups	Can leach styrene, a possible carcinogen and known neurotoxin that can cause depression and loss of concentration	Avoid at all costs
 <b>Other</b> (usually polycarbonate)	Hard plastic water and baby bottles, canned foods, sippy cups, and stain-resistant food-storage containers	Leaches BPA, increasing the risk of heart disease, diabetes, decreased testosterone, enlarged prostate, and impaired immune function	Upgrade to BPA-free "Everyday" water bottles (\$11.50, <a href="http://nalgene-outdoor.com">nalgene-outdoor.com</a> ) and Klean Kanteen sippy cups (\$18, <a href="http://kleankanteen.com">kleankanteen.com</a> ).

## kick the can

Know which canned foods to avoid



Source: Bisphenol A: Toxic Plastics Chemical in Canned Food, the Environmental Working Group

Percent of canned foods in each category with unsafe levels of BPA.

# BE AN EMPOWERED WORKER: COMMUNICATING WITH DECISION MAKERS

## Did you know?

Cleaning products can create indoor air pollution that can affect your health.

We spend 90% of our time indoors. This is why indoor air quality is one of the top 5 health priorities of the EPA.

Sampling conducted by the CDC indicates that chemicals associated with cleaning products in over 90% of the population.

Mixing these products and adding water causes chemical reactions that can create toxic gases, some of which cause cancer.



## Not all cleaning products are created equal

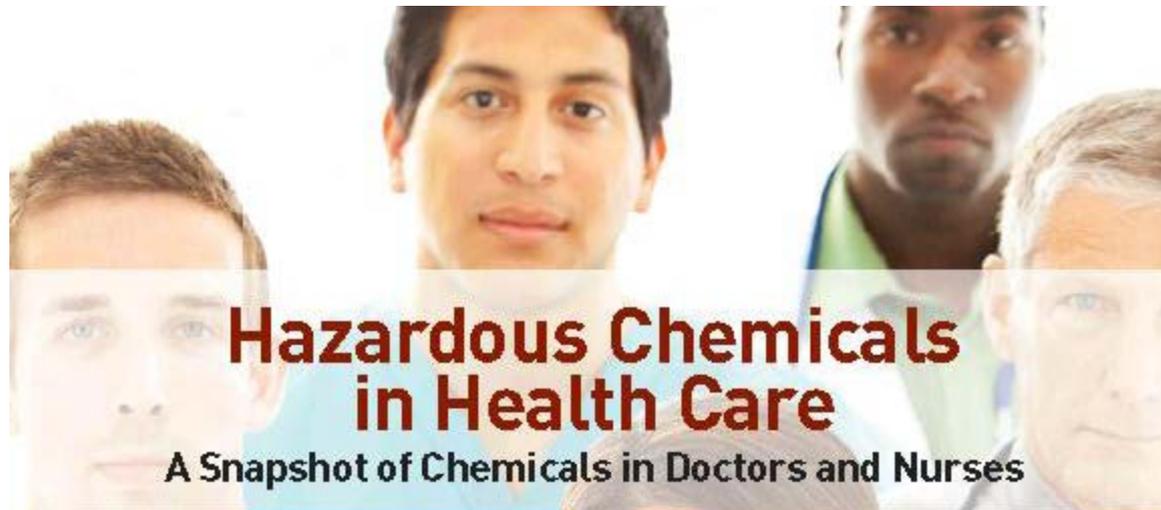
The terms 'green', 'natural' and 'non-toxic' are not regulated. Studies have shown that products making safety claims are not always accurate. That is why it is important to be an informed shopper. Using a third party evaluator to help select your products is the best way to be an informed consumer.



# WORKER LOBBY INITIATIVES ON CHEMICAL SAFETY

Telling your story about chemical exposure:

- How and where you use it
- Why you can't use something safer
- How it has made you feel
- How has it affected your life (and your family's)

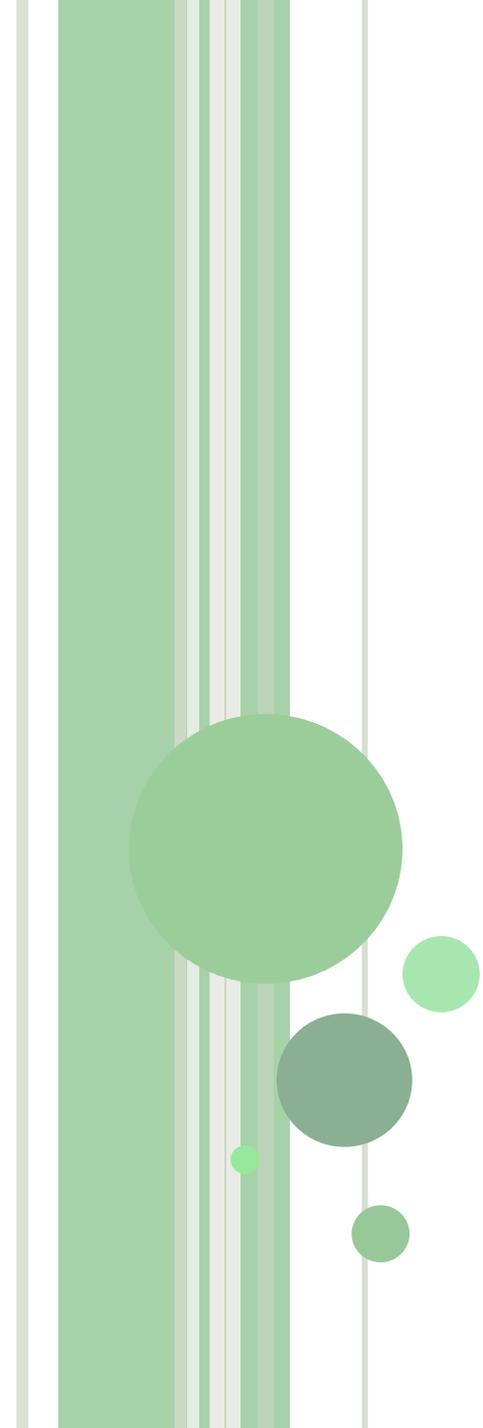


# CA STATE GC INITIATIVES

## PUBLIC REVIEW AND COMMENT

- AB 1879 – Safe Consumer Products (& alternatives assessment)
- SB 509 – Toxics information clearing house
- SB 289 – Chemical information call-in





**KNOWLEDGE IS POWER:  
PLUM ACTIVITY**