



August 21, 2014
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Acting Director
California Department of Toxic Substances Control
P.O. Box 806
Sacramento CA 95812

(Sent via email to
SaferConsumerProducts@dtsc.ca.gov)

Dear Ms. Ingenito:

On behalf of Californians for a Healthy and Green Economy (the CHANGE coalition), thank you for the opportunity to respond to the Department of Toxic Chemical Control's proposals for priority products, released in March, 2014.

CHANGE is a growing coalition of 35 environmental health, policy, labor, environmental justice, reproductive justice, and other organizations, working to protect people from toxic chemical hazards in California. In the last six years, we have been a key public health and public interest voice in debates and discussions about the state's Green Chemistry Initiative (GCI). In particular, we have done our best to offset the barrage of industry misrepresentations, push-back, and stalling tactics, as we encouraged efforts to get the critical Safer Consumer Products (SCP) program up and running with a true and effective green chemistry approach.

SCP program implementation delays come with a price. For example, given the 500,000 babies born in California each year, and the delays to the GCI, approximately three million more babies have been unnecessarily exposed to products containing toxic chemicals. We believe that's three million babies too many, not to mention the millions of workers, families, and communities that also faced the hazards.

We support speedy and effective implementation of the SCP program and a broad sweep in selecting the first priority product-chemical combinations.

Beyond that, our response is divided into general comments about the proposals and the related process, followed by specific comments about the

individual product-chemical combinations and the principles behind choosing them.

Please let us know if you have questions about these comments.

Sincerely



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**CHANGE comments about
DTSC's draft Priority Product categories
for the
Safer Consumer Products ("green chemistry") Regulations**

1. General comments and recommendations

A robust, effective program will better protect all

The people of California need a robust and effective SCP program to protect public health. With more than 80,000 chemicals (and millions of products) in commerce, and the rate of environment-related diseases on the rise, DTSC should be bolder and more efficient, expanding the priority chemicals and product categories considered in this first round. That approach can be justified legally, scientifically, and ethically.

DTSC also needs to hold strong to keep these categories broad and effective; that is consistent with its mandate and responsibilities. Instead, the Department so far appears to be bending to pressure from the chemical industry and manufacturers in this process. For example, it is disheartening that DTSC immediately addressed industry pushback and limited the product categories for spray foam and paint thinners/removers, while ignoring the public outcry at each public workshop about its narrow focus on chlorinated Tris in children's foam sleeping products and opposition to changes for the other categories.

The short list of chemicals associated with the regulation gave fair notice to industries producing and using these hazardous materials in their products. This is especially true for all of the selected products, since the industries involved have been aware for years about the health hazards associated with these chemicals. After all, DTSC's lists are from authoritative bodies, some of which faced stiff industry opposition when listing chemicals of concern or classifying specific chemicals by hazard categories (e.g., carcinogenicity, genotoxicity, and persistent, bioaccumulative and toxic/PBT).

The SCP program goal is to prevent and reduce hazards

We also want to reiterate what industry representatives appear determined to undermine. The starting point for the GCI -- and the science behind it -- is about hazards, not risks or exposures.

Green chemistry is about the inherent properties of chemicals, the hazards they bring with them. It is not about controlling hazards or limiting harm by expecting workers or consumers to wear (often) ill-fitting and inappropriate protective gear. It is not about using ventilation to dilute hazardous vapours, dusts or fumes. The accurate and effective use of green chemistry is to eliminate hazards before they have a chance to affect people or their environments. That is what public health (and its occupational health and safety and other environmental components in particular) are really about too.

We want to remind the Department, and others concerned about the priority products, that people don't ask for the hazards they face at work, in their homes, or in other environments. In particular, workers don't choose what they work with or how. As the World Health Organisation says, "occupational exposures are avoidable hazards to which individuals are involuntarily exposed".¹ It is a kind of "toxic trespass", a phrase that others have used to describe chemicals getting into our bodies without our informed consent.²

Health and safety and other public health specialists are trained to deal with hazards using "prevention", not "controls". The "prevention triangle" in Appendix 1 (based on the Belgian health and safety law) explains that the best way to deal with hazards is to avoid using something, or get rid of them. "Controls", such as exposure limits, protective equipment and administrative methods, do not get rid of the hazard. They require people to give and get the right training and equipment, suppliers being transparent about the hazards in their products, and employers doing the right thing all the time (e.g., providing equipment, maintaining ventilation systems).

We know this does not happen in real life, and that it can be very difficult to get hazards controlled so that people don't get sick or hurt. As the prevention triangle shows, we need a firm foundation to effectively prevent illness, disease and death. If our focus is just on limiting harm, and not getting rid of the hazard, the pyramid falls over as it lacks a firm foundation.

The SCP regulations take this same tact, expressly stating in Section 69506(b) that inherent protection takes precedence over limiting exposure or harm ("avoidance or reduction of adverse impacts, exposures, and/or adverse waste and end-of-life effects that is achieved through the redesign of a product or process, rather than through administrative or engineering controls designed to limit exposure to, or the release of, a Chemical of Concern or replacement Candidate Chemical in a product").

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1. World Health Organization (2011) *Primary prevention of cancer through mitigation of environmental and occupational determinants*, available at: http://www.who.int/phe/news/events/international_conference/Background_interventions.pdf.
 2. National Film Board of Canada (NFB) (2007) *Toxic trespass*, available via <http://onf-nfb.gc.ca/en/our-collection/?idfilm=54100>.

Substitution with less toxic chemicals or processes is an effective prevention tool. Yet we have too many examples of regrettable choices and “late lessons from early warnings”, as the European Environment Agency tells us in two reports.³

That is why we need informed substitution based on alternatives analysis. For example, we need to find out if n-hexane really is a good substitute for methylene chloride in brake cleaners; as a serious neurotoxin, it does not pass muster.⁴ That California story is one of the important late lessons from early warnings behind the state’s green chemistry law and regulations.⁵

Alternatives analysis is not new or without precedent. Governments and companies already use tools such as the Green Screen⁶, BizNGO’s *Chemical Alternatives Assessment Protocol*⁷, the Interstate Chemicals Clearinghouse (IC2) guide⁸ and other materials, and materials from the federal Environmental Protection Agency’s Design for the Environment (DfE)⁹ and the Lowell Center for Sustainable Production.¹⁰

OSHA agencies do **not** require substitution

At public meetings and in discussions and comments, industry representatives have regularly said that the Occupational Safety and Health

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3. European Environment Agency (2002) *Late lessons from early warnings: the precautionary principle 1896-2000*, available at http://www.eea.europa.eu/publications/environmental_issue_report_2001_22; and European Environment Agency (2013) *Late lessons from early warnings: science, precaution, innovation*, available at: <http://www.eea.europa.eu/publications/late-lessons-2>.
 4. Hazard Evaluation System & Information Service/HESIS (2001) *n-Hexane use in vehicle repair. Health Hazard Advisory*, California Department of Public Health Services Occupational Health Branch, available at <http://www.cdph.ca.gov/programs/hesis/Documents/nhexane.pdf>.
 5. Centers for Disease Control and Prevention (2001) “n-Hexane--related peripheral neuropathy among automotive technicians -- California, 1999--2000”, *MMWR*, 50 (45): 1011 -1013.
 6. Clean Production Action, *GreenScreen® for Safer Chemicals*, available at: <http://www.greenscreenchemicals.org/method>.
 7. Rossi M, Peele C, Thorpe B (2012) *Chemical alternatives assessment protocol: How to select safer alternatives to chemicals of concern to human health or the environment*, BizNGO, available at <http://www.bizngo.org/alternatives-assessment/chemical-alternatives-assessment-protocol>.
 8. Inter-state Chemicals Clearinghouse (2013) *IC2 Alternatives Assessment Guide, Version 1*, available at <http://www.newmoa.org/prevention/ic2/aaguidance.cfm>.
 9. Design for the Environment, Environmental Protection Agency, *Alternatives Assessments*, available at http://www.epa.gov/dfE/alternative_assessments.html.
 10. Lowell Center for Sustainable Production (2006) *Alternatives Assessment Framework of the Lowell Center for Sustainable Production, Version 1*, available at <http://www.chemicalspolicy.org/downloads/FinalAltsAssess06.pdf>.

Administration (OSHA) takes care of regulating workplace chemicals, particularly for spray foam products. Partly true, this misses the key difference between the GCI and OSHA's activities.

The SCP regulations do clearly state that occupational health is part of public health, and that, in the life cycle approach of green chemistry and the regulations themselves, workers' health must be considered in determining priority products and alternatives. After all, they are consumers of a wide range of products, usually without any say about what they must use. And workers are involved at every stage of the life cycle of a consumer product, although they are often invisible in discussions about hazardous chemicals.

Therefore, we want to be clear about what Cal/OSHA and federal OSHA do when it comes to chemicals. (Cal/OSHA or the Division of Occupational Safety and Health/DOSH, is referred to as a state-run plan, that must have laws, regulations and procedures "at least as effective as" the federal agency's equivalents.)

OSHA and its state plan equivalents like Cal/OSHA do NOT require substitution of hazards or much primary prevention. They propose and/or set permissible exposure limits (PELs), work practices and protective equipment to control hazards. Prevention gets token acknowledgement but no regulatory teeth. With its own standard setting process, California has more PELs than any other jurisdiction in the US. (For a comparison, see federal OSHA's annotated table.¹¹) For example, this means that for most isocyanates and methylene chloride, Cal/OSHA PELs are more up-to-date and/or inclusive than others in the US.

Still, like all occupational exposure limits, those in California:

- cover only several hundred chemicals of concern of the tens of thousands of chemicals actually in commerce, most of which lack toxicity data;
- often are not consistent with current scientific knowledge or listings by authoritative sources like those used in the SCP regulations;
- are not health-based, as they reflect compromises about what is "reasonably practicable", politically acceptable, and/or negotiated (e.g., see the chart on pages 85 to 85 of reference number 64 for isocyanate OELs) ;
- list an eight-hour average, short-term limit or ceiling limit for air concentrations, usually ignoring other routes of entry, synergistic effects, and the effects of high concentrations in a short time; and
- say nothing about appropriate less and non-toxic substitutes.

11. Occupational Safety and Health Administration (2013) *Permissible Exposure Limits -- Annotated Tables*, available at <https://www.osha.gov/dsg/annotated-pels/index.html>.

The only exception to this approach is in the federal OSHA cancer policy, a standard still on the books after thirty-plus years although it has not been used often.¹² A key provision encourages substitution, saying:

Where the Secretary determines that one or more suitable substitutes exist for certain uses of Category I Potential Carcinogens that are less hazardous to humans, a no occupational exposure level shall be set for those uses, to be achieved solely through the use of engineering and work practice controls to encourage substitution. In determining whether a substitute is suitable, the Secretary will consider the technological and economic feasibility of the introduction of the substitute, including its relative effectiveness and other relevant factors, such as regulatory requirements and the time needed for an orderly transition to the substitute. [45 FR 5282, Jan. 22, 1980, as amended at 46 FR 5881, Jan. 21, 1981]

Federal OSHA effectively relied on this approach when it officially recognized the limitations of its PELs and standards last year. It published an on-line toolkit about “transitioning to safer chemicals”.¹³

The related press release points out that OSHA’s PELs “are out-of-date and inadequately protective for the small number of chemicals that are regulated in the workplace.” At the time, Dr. David Michaels, assistant secretary of labor for occupational safety and health (i.e., the head of federal OSHA), said,

*We know that the most efficient and effective way to protect workers from hazardous chemicals is by eliminating or replacing those chemicals with safer alternatives whenever possible.*¹⁴

OSHA effectively says the right thing to do -- but it isn’t doing -- is exactly what the purpose of the green chemistry regulations: get manufacturers and suppliers to pay attention to less toxic or non-toxic alternatives and drive the elimination -- not just the management -- of harmful chemicals.

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12. Occupational Safety and Health Administration (1981) *Identification, Classification, and Regulation of Carcinogens*, 29 CFR 1910.1000, available at https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=11372.
 13. Occupational Safety and Health Administration (2013) *Transitioning to Safer Chemicals: A Toolkit for Employers and Workers*, available at https://www.osha.gov/dsg/safer_chemicals/index.html.
 14. US Department of Labor (2013) *OSHA releases new resources to better protect workers from hazardous chemicals*, OSHA Statement: 13-2026-NAT, available at https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=NEWS_RELEASES&p_id=24990.

Public access to information makes for a more effective program

There is a serious knowledge gap about which chemicals are used in which products, sectors or workplaces, particularly in the United States. Lack of adequate market information is a huge obstacle in the identification and selection of priority products for this program and other public health endeavours. It also leads to gross uncertainty for employers, workers, other consumers, and regulators.

DTSC should share with the public the market information that it obtains. This will avoid the Department of Public Health's experience a few years ago. Staff literally had to go through the phone book to make phone calls to ask who was using diacetyl for butter flavoring in popcorn, so they could warn employers and workers about the chemical's life-threatening health hazards. This is a huge drain and inefficient use of limited resources.

We need more inter-agency access to, and sharing of, critical information like the use of chemicals. Other federal or state government departments may have market information that would help DTSC with the SCP program.

Do not have closed door discussions with industry

Before naming priority products, DTSC does need some market information. However, the Department should NOT consult with industry behind closed doors before choosing priority products, as the American Chemistry Council and others have demanded at workshops and in comment letters.

As a public health initiative, the SCP program needs to be transparent and based on independent information. The voices and power of those with a financial stake in a chemical or product should not be allowed to drown out information and concerns from people and organizations whose only stake is their health and the health of their constituencies (e.g., occupational health, public health and/or environmental health perspectives, knowledge and experiences, and those with workplace experiences).

Without access to independent research, regulatory authorities are vulnerable to corporate influence on the scientific evidence made available to them. Clair Patterson noted the implications with some vehemence in evidence to the US Congress in 1966, in hearings about the long-known hazards of lead:

It is not just a mistake for public health agencies to cooperate and collaborate with industries in investigating and deciding whether public health is endangered; it is a direct abrogation and violation of the duties and responsibilities of those public health organisations.⁴

General recommendations

- 1.1 Be bolder and more efficient by expanding the priority chemicals and product categories considered in this first round.**
- 1.2 Hold strong to keep these categories broad and effective, to be consistent with DTSC's mandate and responsibilities.**
- 1.3 Be more forceful about the GCI and SCPR grounding in hazards, not "risk" or "exposure".**
- 1.4 Do not confuse DTSC's GCI role with the limited ones of OSHA agencies when it comes to substitutes for toxic substances.**
- 1.5 Make public the market information DTSC collects.**
- 1.6 Refuse industry's demands for prior closed-door consultations about choosing priority chemical-product combinations.**

2. Children's foam-padded sleeping products containing TDCPP

Background

Flame retardant chemicals (FRCs) are used extensively in a variety of furniture and children's products containing foam. Some can migrate out of these products into air and dust, making them a hazard to which people can be exposed. Young children have some of the highest FRC levels in their blood and California children have some of the highest levels in the world.¹⁵

The health outcomes linked to these chemicals run the gamut from cancer,¹⁶ decreased fertility,¹⁷ and hormone disruption,¹⁸ to lower IQs,¹⁹ and hyperactivity.²⁰ The hazards are so serious that a number of FRCs have made it through the notorious delays and hoops of the US chemical regulatory systems. For example, Tris(1,3-dichloro-2-propyl) phosphate (TDCPP) was banned as a flame retardant from children's pajamas in the 1970s because it is a carcinogen. Unfortunately, it wasn't banned in other products and has been used as a replacement for other FRCs in furniture and children's products and has been found extensively in the environment and in our bodies.

We know this game well. Whether called the "toxic shell game" or "regrettable substitution", it is one reason that the Legislature created the GCI -- to put an end to replacing known toxic chemicals with less studied other chemicals, leading to potentially poisonous substitutions. Just because

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15. Rose M, Bennett DH, Bergman A, et. al. (2010) "PBDEs in 2- 5-year-old children from California and associations with diet and indoor environment", *Environmental Science and Technology* 44(7): 2648 - 2653.
 16. Office of Environmental Health Hazard Assessment (2011) *A chemical listed effective October 28, 2011 as known to the State of California to cause cancer Tris (1,3-dichloro-2-propyl) phosphate (TDCPP) (CAS NO. 13674-87-8) [10/28/11]*, available at http://oehha.ca.gov/prop65/prop65_list/102811list.html.
 17. Harley KG, Marks AR, Chevrier J, et. al. (2010) "PBDE concentrations in women's serum and fecundability", *Environmental Health Perspectives*, 118(5): 699 -704; Meeker JD, Stapleton HM (2010) "House dust concentrations of organophosphate flame retardants in relation to hormone levels and semen quality parameters", *Environmental Health Perspectives*, 118: 318 - 323.
 18. Meeker JD, Stapleton HM (2010) "House dust concentrations of organophosphate flame retardants in relation to hormone levels and semen quality parameters", *Environmental Health Perspectives*, 118: 318 - 323; Chevrier J, Harley KG, Bradman A, et. al. (2010) "Polybrominated diphenyl ether (PBDE) flame retardants and thyroid hormone during pregnancy" *Environmental Health Perspectives*, 118(10): 1444 - 1449.
 19. Herbstman JB, Sjödin A, Kurzon M, et. al. (2010). "Prenatal exposure to PBDE and neurodevelopment", *Environmental Health Perspectives*, 118(5): 712 - 719.
 20. Chen A, Yolton K, Rauch S, et. al. (2014) "Prenatal polybrominated diphenyl ether exposures and neurodevelopment in U.S. children through 5 years of age: The HOME study." *Environmental Health Perspectives*, 122(8): 856 - 862.

we don't know the health effects of a chemical doesn't mean that it's healthier or less toxic -- it just means it hasn't been adequately tested for health or environmental effects.

For a glimpse into the extent of the flame retardant problem, see the 2011 study that found 80 percent of children's products tested contained TDCPP, and seven other FRCs.²¹ Some products had more than one FRC. Products tested included nursing pillows, car seats, changing table pads, sleep positioners, infant carriers and strollers. A study published this year found that all the children in the California day care centers investigated had been exposed to flame retardants.²²

In 2012, the Center for Environmental Health (CEH) -- a CHANGE member -- tested a variety of children's products for TDCPP. The results of looking at changing pads, walkers, child-sized furniture, nursing rockers, and nap mats were very concerning.²³ CEH found a number of FRCs in children's nap mats and child-sized furniture. Many products were treated with TDCPP, but even *more* of these products were treated with other FRCs, including TCPP and Firemaster 550,²⁴ a chemical compound including two flame retardant chemicals (TBB and TPP). The latter three chemicals are already on DTSC's candidate chemicals list, but are not currently being considered in their selection of priority products.

Recommendations

None of these chemicals belong in children's products. Given the extent of the health effects linked to these chemicals,²⁵ the lack of a fire safety problem from children's products, and their ubiquitousness in a child's environment,

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21. Stapleton HM, Klosterhaus S, et. al. (2011) "Identification of flame retardants in polyurethane foam collected from baby products" *Environmental Science and Technology* 45(12): 5323 - 5331.
 22. Bradman A, Castorina R, Gaspar F, et. al. (2014) "Flame retardant exposures in California early childhood education environments." *Chemosphere*, doi:10.1016/j.chemosphere.2014.02.072.
 23. Center for Environmental Health (2013) "Playing on poisons: Harmful flame retardants in children's furniture", available at: <http://www.ceh.org/wp-content/uploads/2013/11/Kids-Furniture-Report-Press.pdf>; and "Naptime nightmares: Toxic flame retardants in child care nap mats", available at: http://www.ceh.org/legacy/storage/documents/Flame_Retardants/nap_mat_report_2_19_2013.pdf.
 24. Firemaster 550 is a mixture of five chemicals: triphenyl phosphate, isopropyl phenyl diphenyl phosphate, di(isopropyl phenyl) phenyl phosphate, tetrabromodiethylhexyl phthalate and tetrabromobenzoate.
 25. Eastmond D, Bhat V, Capsel K (2013) "A screening level assessment of the health and environmental hazards of organohalogen flame retardants." Poster presentation at the Society of Toxicology 52nd Annual Meeting, San Antonio, Texas.

CHANGE strongly recommends the following amendments to the Department's proposed priority products.

2.1 Expand the product description to include other types of children's products that include flame retardants

2.1.1. Include the children's products that the Bureau of Electronic and Appliance Repair, Home Furnishings and Thermal Insulation (BEARHFTI) exempts from the TB117-2013 flammability standard, which are not subject to other flammability standards

The Bureau found that these 17 products pose no fire hazard (i.e., there is no need for manufacturers to add flame retardants to them): bassinets, booster seats, changing pads, floor play mats, highchairs, highchair pads, infant bouncers, infant carriers, infant seats, infant swings, infant walkers, nursing pads, nursing pillows, playpen side pads, playards, portable hook-on chairs, and strollers.

BEAR-HFTI exemptions for juvenile products are based on the finding that these items do not pose any fire hazard and do not need to meet a flammability standard,²⁶ a position reiterated in 2013²⁷.

2.1.2 Include children's furniture too

Children often sleep on products not necessarily designed for sleeping (e.g., children-sized furniture, yoga mats) that also contain TDCPP. The chemical is a hazard, period. In children's furniture, it has the same hazards as when the chemical is used in sleeping products; it is used additively and thus is easily released from the product, resulting in exposure via inhalation, dermal contact, and contact with contaminated dust.

The following evidence supports expanding the product definition to other types of children's products:

1. TDCPP is used in changing pads, nursing pillows, carriers, high chairs, and walkers (Stapleton, et. al., 2011);²¹
2. a recent report from Washington State's Department of Ecology, which found TDCPP in a booster seat, children's furniture, and changing pads;²⁸

26. BEARHFTI (2010) *Exemption of juvenile products from requirements of Technical Bulletin 117: Initial Statement of Reasons*. Sacramento, CA.

27. BEARHFTI (2013) *New flammability standards for upholstered furniture and articles exempt from flammability standards: Initial Statement of Reasons*, Sacramento, CA, available at: <http://www.bhfti.ca.gov/about/laws/isr.pdf>.

28. Van Bergen S Stone A (2014) *Flame retardants in general consumer and children's products*, Olympia, Washington: Washington State Department of Ecology, <https://fortress.wa.gov/ecy/publications/SummaryPages/1404021.html>.

3. the Center for Environmental Health also found TDCPP in children's furniture;²⁹
4. infants often sleep in carriers and children-sized furniture, so these products present the same hazards as other listed sleeping products; and
5. exposure modeling by the Consumer Products Safety Commission found hazards to children from furniture foam, not just sleeping products.³⁰

It is within DTSC's jurisdictional authority – and consistent with its duty -- to adequately protect public health by expanding the category of children's products to include at least the 17 products exempted from meeting California's revised flammability standard. We urge you to go further.

2.1.3. Collaborate with BEARHFTI to release a joint statement about how children's products can maintain fire safety and be healthier by removing flame retardant chemicals.

2.2 Expand flame retardant chemicals under review beyond TDCPP

The fundamental question that DTSC repeatedly asks in its GCI activities is: "Is it necessary?" When it comes to FRCs in children's sleeping products, the answer is a resounding "No!" -- not just to TDCPP, but to all FRCs in children's products. Rather than limiting this product category to chlorinated Tris (TDCPP), DTSC should expand the focus to all FRCs on the candidate chemical list. That would better support the SCP program goals to protect vulnerable populations and avoid regrettable substitutions.

FRCs are a bigger hazard for infants and young children than adults because they breathe more air and crawl around on the floor where contaminated dust accumulates, have more hand-to-mouth motions, and have higher rates of metabolism. We also know that children are more vulnerable to the health hazards of toxic chemicals.

Therefore, the Department should take extra precautions to reduce the hazards that all candidate FRCs present to children during critical windows of development when their bodies, organs and brains are rapidly developing.

In 2011, TDCPP was added to the Prop 65 list, requiring companies to warn consumers that their products contain this carcinogen. After listing as a Prop 65 chemical, industry has started moving away from using chlorinated Tris.

29. Cox C, Levin J (2013) *Playing on poisons: Harmful flame retardants in children's furniture*, Center for Environmental Health, available at: <http://www.ceh.org/wp-content/uploads/2013/11/Kids-Furniture-Report-Press.pdf>.

30. Babich MA (2006) *CPSC staff preliminary risk assessment of flame retardant (FR) chemicals in upholstered furniture foam*. Bethesda, MD: US Consumer Product Safety Commission, available at www.cpsc.gov/library/foia/foia07/brief/ufurn2.pdf.

Unfortunately, Tris is currently being replaced with other harmful FRCs. For example, TCEP (CAS RN 115-96-8) and TBBPA (CAS RN 79-94-7) -- on DTSC's initial candidate chemicals list -- also are used in children's products. Given the number of alternative flame retardant chemicals on the market, most with little information about their health effects, it is critical that DTSC avoid regrettable substitutions.

DTSC can and should use the full extent of its authority to expand the number of FRCs under consideration in the category of children's products. To best meet the SCP program goals and use DTSC's limited resources, it makes sense to consider all other candidate FRCs being used in this category of products.

Other evidence to support expanding the chemicals of concern beyond TDCPP includes:

1. TCEP is used in changing pads, sleep positioners, portable mattresses, nursing pillows, and carriers as found by Stapleton, et al;²¹
2. A recent report from Washington Ecology found TCEP in a booster seat, children's furniture and carriers;²⁸ and
3. Washington's *Children's Safe Products Act* (CSPA) requires reporting about the use of certain chemicals used in children's products. According to information in the CSPA database,³¹ TBBPA is used in carriers, playpens, booster seats, and swings.

2.3 Clarify the Priority Product description to include any sleeping product that contains TDCPP and other FRCs

TDCPP added to any component or part of a children's sleeping product can result in exposure and adverse effects, as detailed in DTSC's product profile. Thus, any children's sleeping product with TDCPP in any component or part should be a Priority Product. Yet, it is unclear from the current description whether a children's sleeping product with TDCPP in a component or part, other than the polyurethane foam, will be a Priority Product.

The best alternative is to remove flame retardants from all components, or parts, of children's sleeping products.

Children's sleeping products without polyurethane foam still may contain TDCPP. Although it is most commonly added to polyurethane foam, it also can be added to other open cell foams such as latex, and to textiles. So it's not surprising that a recent report from Washington Department of Ecology found TDCPP at high levels in tent textiles.²⁸ Other FRCs are widely used in the textiles of children's products, according to the CSPA database.³⁰

31. State of Washington Department of Ecology, *Children's Safe Products Act*, available at <http://www.ecy.wa.gov/programs/swfa/cspa/search.html>.

Most studies evaluating the presence of FRCs in children's products focused on analysis of polyurethane foam, so they lack information about the chemicals in other components.

To account for the above factors, and better protect children from the hazards of TDCPP, we recommend these changes to the product description:

This Priority Product includes the following sleeping products containing tris (1,3-dichloro-2-propyl) phosphate (TDCPP):

- nap mats
- juvenile product pads in soft-sided portable cribs
- infant travel beds
- portable infant sleepers
- playards
- play pens
- bassinets
- nap cots
- car bed pads
- sleep positioners

3. Paint and varnish strippers, and surface cleaners with methylene chloride

Background

Methylene chloride (MeCl) appears on many of DTSC's hazard trait lists, including those classifying it as a carcinogen, neurotoxic substance, and skin and eye hazard. It also is an acute hazard for those working in confined spaces (and therefore linked to worker and consumer deaths).

We agree with the Department's listing of sensitive sub-populations that can be affected by this acute and chronic hazardous chemical. Workers are the "canaries" among these groups (although the DTSC provides little information in this section about how that occurs). Including workers in these groups emphasizes the need for a life cycle approach to identifying and assessing hazards and alternatives/substitutes. Data from the federal Environmental Protection Agency's 2012 Toxics Release Inventory (TRI) indicates the chemical has a significant presence in California:

- Total pounds of releases: 76,623
- Total pounds of waste: 1,392,583
- Total number of facilities: 22
- Total number of TRI submissions: 22
- Total number of TRI Form A submissions: 5³²

MeCl's hazards have been known for years. The National Institute of Occupational Safety and Health (NIOSH) issued a *Current Intelligence Bulletin* about it being carcinogenic (in line with the OSHA cancer policy mentioned above) in 1986.³³ This followed an in-depth hazard document published 10 years earlier.³⁴ California listed MeCl as a carcinogen under Proposition 65 in April 1988³⁵ and its Air Resources Board proposed it as a Toxic Air Contaminant in 1989.³⁶ California's Dr. Katy Wolf reported the results of her investigation about high ventilation rates and lower concentrations of MeCl

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32. RTKNet TRI 2012 data about methylene chloride in California, accessed July 18, 2014 via <http://www.rtknet.org/db/tri/search>.
 33. National Institute for Occupational Safety and Health (1986) *Current Intelligence bulletin 46: Methylene chloride*, available at <http://www.cdc.gov/niosh/docs/86-114/>.
 34. National Institute for Occupational Safety and Health (1976) *Criteria for a Recommended Standard Occupational Exposure to Methylene Chloride*, (NIOSH) publication no. 76-138, available at <http://www.cdc.gov/niosh/docs/1970/76-138.html>.
 35. Office of Environmental Health Hazard Assessment (2014) *Chemicals known to the state to cause cancer or reproductive toxicity, June 6, 2014*, available at http://oehha.ca.gov/prop65/prop65_list/files/P65single060614.pdf.
 36. State California Air Resources Board, Stationary Source Division, Staff Report (1989) *Proposed identification of methylene chloride as a toxic air contaminant*, available at http://oehha.ca.gov/air/toxic_contaminants/html/Methylene%20Chloride.htm.

in furniture stripping chemicals in 2001.³⁷ The state Department of Public Health's Occupational Health Branch has warned employers, workers and the public about methylene chloride hazards on various occasions, including a fact sheet in 2006³⁸ and, in 2013, a variety of materials about preventing deaths from methylene chloride-based paint strippers and less toxic choices.³⁹

Elsewhere, as DTSC notes, the EU has taken action to ban MeCl in consumer use paint strippers. Massachusetts also accepted the 2013 recommendation from the Toxic Use Reduction Institute (TURI) at UMass Lowell to classify the chemical as a higher hazard substance, with a reporting threshold of 1,000 pounds. Companies using it beyond that threshold had to track and report usage as of January 1, 2014.⁴⁰

Experience with MeCl also provides evidence about the effectiveness of public listing of chemicals considered hazardous to health. The first comes from the state's Prop 65 activities:

*Proposition 65's warning requirement has provided an incentive for manufacturers to remove listed chemicals from their products. For example, ... reformulated paint strippers do not contain the carcinogen methylene chloride; ..*⁴¹

There's a similar message about this chemical from the TURI, writing about the state's Toxics Use Reduction Act (TURA):

From 1990 to 2011, use of methylene chloride by facilities subject to TURA declined by 56% (from 7.8 million lb to 3.4 million lb). This reduction is due in part to a significant number of facilities that have redesigned their processes

37. Wolf K, Morse M (2001) *Investigation of technologies to reduce emissions of methylene chloride from furniture stripping operations. Final Report*. Prepared for: California Air Resources Board and the California Environmental Protection Agency under Contract Number 98-334.

38. Hazard Evaluation System & Information Service (2006) *Methylene chloride*, California Department of Public Health Occupational Health Branch, available at <http://www.cdph.ca.gov/programs/hesis/Documents/methylenechloride.pdf>.

39. Occupational Health Branch, California Department of Public Health (2013) *Preventing worker deaths from paint strippers containing methylene chloride*, available at <http://www.cdph.ca.gov/programs/ohb/Pages/methylenechloride.aspx>.

40. Toxic Use Reduction Institute (2013) *Massachusetts chemical use officials designate new higher hazard substance*, December 20, 2013, available at <http://www.turi.org/content/download/8819/158479/file/pr-eea-methylene-chloride.pdf>.

41. Office of Environmental Health Hazard Assessment (2013) *Proposition 65 in Plain Language!*, available at <http://www.oehha.ca.gov/prop65/background/p65plain.html>

*to eliminate or use less methylene chloride, or have substituted it with safer alternatives.*⁴²

Alternatives to MeCl have been on the market for a while, their use advocated by several government agencies. For example, Wolf and Morse reported to DTSC in 2006 that products with benzyl alcohol were the most effective substitute for, and generally less toxic and comparable or less expensive than, MeCl ones.⁴³ A few years later, the federal EPA required businesses using the toxic chemical for paint stripping to notify the Agency and investigate alternative products/processes. (This requirement is unclear in the DTSC profile.) The European Union ban of the chemical in paint strippers was preceded by a 2007 report with very detailed information about alternatives.⁴⁴

Recommendations

3.1 Stay the course with methylene chloride in paint strippers

Methylene chloride is on its way out as an ingredient in paint strippers in North America and Europe. There are alternatives available that are less toxic, just as effective, and comparatively the same cost, especially with a life cycle view of hazards and their effects. It is long past time to protect workers and do-it-yourselfers from the carcinogen and acutely-life-threatening chemical.

3.2 Be wary of toxic alternatives

3.2.1. Toluene, methanol and n-methyl pyrrolidone (NMP) are not appropriate replacements for methylene chloride. Name them as unacceptable options in this product/chemical combination.

Long used as a solvent -- and touted as an alternative to carcinogenic benzene -- toluene is a neurological toxicant with neuropsychological (e.g., difficulty learning numbers and recognizing words) and neurobehavioral

42. Toxics Use Reduction Institute (2014) *Massachusetts Chemical Fact Sheet: Methylene chloride*, available at

http://www.turi.org/TURI_Publications/TURI_Chemical_Fact_Sheets/Methylene_Chloride_Fact_Sheet/Fact_Sheet_Methylene_Chloride.2014.

43. Wolf, K, & Morse, M (2006) *Methylene chloride consumer product paint strippers: Low-VOC, low toxicity alternatives*, Prepared for: Cal/EPA's Department of Toxic Substances Control, available at <http://www.irta.us/Methylene%20Chloride%20Consumer%20Product%20Paint%20Strippers%20REPORT%20ONLY.pdf>.

44. European Commission Directorate-General Enterprise and Industry (2007) *Impact assessment of potential restrictions on the marketing and use of dichloromethane in paint strippers*, available at http://ec.europa.eu/enterprise/sectors/chemicals/files/markrestr/j549_dcm_final_report_en.pdf.

effects (e.g., difficulty concentrating and loss of short term memory).⁴⁵ Also a developmental toxicant on the state's Prop 65 list,⁴⁶ it is on DTSC's Initial Candidate Chemical List.

Methanol also is on that list for its adverse developmental properties. Other studies also link it to acute central nervous system (CNS) toxicity and chronic effects including blindness, Parkinson-like symptoms and cognitive impairment, headaches, sleep disorders, gastrointestinal problems, optic nerve damage, and respiratory problems. When it reacts with other volatile organic carbon substances in air, methanol also can contribute to the formation of photochemical smog.⁴⁷

N-Methylpyrrolidone (NMP) is a toxic substance that should not be allowed to replace methylene chloride, or any other chemical. DTSC must make this clear in whatever guidance, public presentations, or other materials it prepares or presents about this priority product and alternatives analysis of options.

The chemical is toxic to the reproductive system of male and female test animals.⁴⁸ In 2013, the state's Occupational Safety and Health Standards Board set the only standard in the US for the chemical. It and Cal/OSHA recognized NMP's hazards with a PEL of 1 ppm with a skin notation; the rationale is provided in the Final Statement of Reasons from the California Occupational Safety and Health Standards Board.⁴⁹ (Federal OSHA does not have a standard for this chemical.) The toxicological evidence also got it on DTSC's Candidate Chemical List.

The Hazard Evaluation System & Information Service (HESIS), part of the Occupational Health Branch in the California Department of Public Health,

45. US Environmental Protection Agency (2005) *Toxicological review of toluene (CAS No. 108-88-3) In support of summary information on the Integrated Risk Information System (IRIS)*, available at <http://www.epa.gov/iris/toxreviews/0118tr.pdf>.

46. State of California Environmental Protection Agency (2014) *Chemicals known to the State to cause cancer or reproductive toxicity, June 6, 2014*, available at http://www.oehha.ca.gov/prop65/prop65_list/files/P65single060614.pdf.

47. US Environmental Protection Agency (2013) *Toxicological review of methanol (non-cancer) (CAS No. 67-56-1) In support of summary information on the Integrated Risk Information System (IRIS)*, available at ; New Jersey Department of Health (2011) *Methyl Alcohol (Hazardous Substance Fact Sheet)*, available at <http://nj.gov/health/eoh/rtkweb/documents/fs/1222.pdf>.

48. Hazard Evaluation System & Information Service (2014) *N-Methylpyrrolidone (NMP)*, California Department of Public Health Occupational Health Branch, available at <http://www.cdph.ca.gov/programs/hesis/Documents/nmp.pdf>.

49. Occupational Safety and Health Standards Board (2013) *Airborne Contaminants: N-Methylpyrrolidone: Modifications and responses to comments resulting from the 45-day public comment period*, available at http://www.dir.ca.gov/oshsb/Airborne_contaminants_N_-_Methylpyrrolidone_ISOR.pdf.

just revised its 2006 alert about NMP, with the new PEL and information about alternatives.⁴⁸ And TURI's MeCl fact sheet carries a similar warning to avoid using the chemical as a substitute for MeCl, pointing to its 2013 report about alternatives for different uses; for paint stripping, it names six other chemicals (not NMP) and several process changes.⁴²

Beyond paint thinners and strippers, NMP and toluene have a similar function in some personal care products, particularly nail polish remover and polish thinner.⁵⁰ The possible repercussions for nail salon workers and other consumers makes it even more important that neither chemical is considered a viable alternative for methylene chloride in DTSC's priority products. (Alternatives assessments could lead to less toxic cosmetic products and better protection for the workers and others using them.)

A little on-the-ground recent market research in an Oakland hardware store makes this point. Asked about paint strippers, a sales person directed the CHANGE representative to two products. *Jasco Paint and Epoxy Remover* contained methylene chloride. Pointing to the other product, the salesperson said it was supposed to be better for the environment but it took longer to work -- 30 minutes instead of 15. *Back to Nature Multi-Strip's* label described the product as "safer to use," biodegradable, and "contains no Methylene chloride or caustics." However, it did contain NMP.

It is disconcerting that manufacturers and retail stores already characterize products as "safer" and "back to nature" if they contain NMP -- a hazardous chemical. This underscores the importance of alternatives analyses and being clear about unacceptable substitutes in the priority product process. If NMP is not targeted with MeCl in this process, DTSC will have to revisit the issue soon, especially if research confirms NMP's negative health effects. The department needs to be clear that relying on the same old chemicals that are already known to be hazardous is not acceptable.

3.2.2 Go for functionally acceptable and available alternatives

There are functionally acceptable and available substitutes for MeCl that do not make DTSC's lists. They include benzyl alcohol, dimethyl glutarate, dimethyl adipate, formic acid, soy-based strippers and dibasic esters. Non-chemical or mechanical means such as steam stripping, baking soda, and dry ice are also functionally acceptable alternatives.^{39,47} Also see the reports referred to earlier.

50. Occupational Safety and Health Administration, *Health Hazards in Nail Salons*, available at <https://www.osha.gov/SLTC/nailsalons/chemicalhazards.html>; Environmental Working Group (2014) *Skin Deep* (searching for methyl pyrrolidone), available via <http://www.ewg.org/skindeep/>.

4. Spray polyurethane foam (SPF) systems with unreacted diisocyanates

Background

Spray polyurethane foam products are not “green”

Spray polyurethane foam (SPF) systems use is widespread and increasingly common, as regulatory, business and social demands for higher energy efficiencies in various application increase. They also are increasingly touted as “green” methods (e.g., Icynene⁵¹, Foam it Green⁵²) to achieve this.

Yet there’s a darker side to these insulation products -- one that’s often hidden deep or glossed over within websites and documents promoting energy efficiency and the value of SPF. Isocyanates are respiratory sensitizers, with other important hazards. Made from petroleum-based materials, their usually-low vapor pressure has even allowed them to be ignored in indoor air quality (IAQ) testing protocols. One result is that isocyanate-laden products get IAQ certifications from programs including:

- the GreenGuard program, which certifies a flooring finishing system containing 1,6-HDI;
- spray foam insulation systems that routinely pass California 01350 tests;
- FloorScore, which certifies recycled rubber floors with isocyanate binders; and
- the Carpet and Rug Institute’s Green Label Plus program, which has certified hundreds of polyurethane-backed carpets.⁵³

Most SPF systems these days contain one or more isocyanates, plus other hazardous ingredients. A hand-out prepared for the state’s Worker Occupational Safety and Health Training and Education Program (WOSHTEP) explains this in clear language for workers and employers. They also raise the important question about the differences between energy efficiency and worker health and safety.⁵⁴

NIOSH raises the same issues about worker health hazards in a 2012 posting on its website:

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51. ICYNENE, *Green Your Next Building Project*, available at <http://www.icynene.com/builders/sustainability/green-your-next-building-project>
 52. Guardian Energy Technologies, *Foam it Green*, available at http://www.sprayfoamkit.com/land/home_long_compare.html
 53. Healthy Building Network (2013) *Full disclosure required: A strategy to prevent asthma*, available at <http://www.healthybuilding.net/content/asthma-report>.
 54. Commission on Health and Safety and Workers’ Compensation (2013) *SPF insulation is energy-efficient, but is it safe for workers?*, available at www.dir.ca.gov/chswc/WOSHTEP/.../Spray_Polyurethane.pdf.

Environmentally friendly doesn't necessarily mean worker friendly. In many cases, new "green" technologies and products have reached the market without being adequately evaluated to determine whether they pose health or safety risks to workers in manufacture, deployment, or use. Spray polyurethane foam—commonly referred to as SPF—is a case in point. Its use as insulation has been on the upswing because of the laudable aim of builders and property owners to improve energy efficiency. As popular as it has become, however, much remains unknown about spray polyurethane foam—specifically the health implications of its amines, glycols, and phosphate upon workers.⁵⁵

The other main hazardous ingredients are flame retardants, particularly the Tris (1-chloro-2-propyl) phosphate (TCPP)⁵⁶ on DTSC's "Informational 'Initial' Candidate Chemicals List". The typical types of ingredients (some of which may be declared "trade secrets", and which often are listed in broad percentage ranges, based on the data sheets and other industry information reviewed for these comments) are shown in this industry graphic:⁵⁷

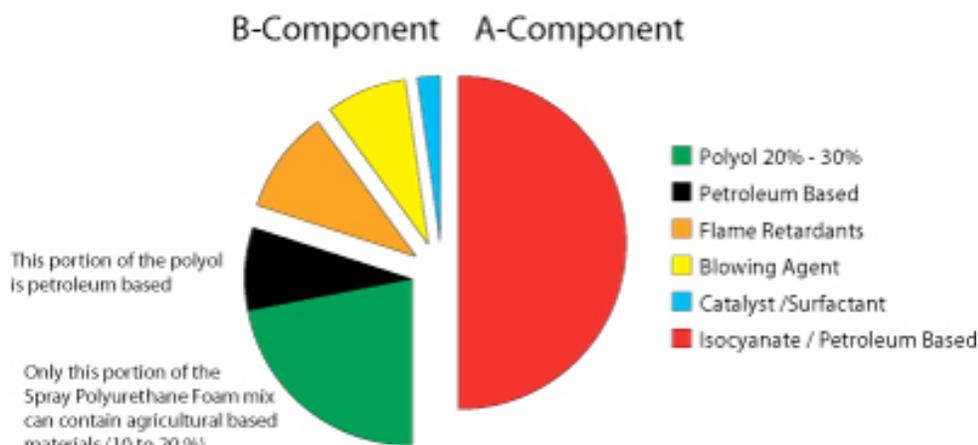


Chart Provided Courtesy of NCFI®

SPF products do not contain TDI now, industry reps have said emphatically at DTSC workshops and in their letters to the Department. However, according to older NIOSH documents, they did contain that isocyanate in the past.⁵⁸ Like others,⁵⁹ it is difficult for us to know if there are traces of TDI or

55. Marlow, DA (2012) "Help wanted: Spray polyurethane foam insulation research," NIOSH Science Blog, March 21, 2012, available at <http://blogs.cdc.gov/niosh-science-blog/2012/03/21/sprayfoam/>.

56. Babrauskas V, et. al. (2013) Flame retardants in building insulation: a case for re-evaluating building codes, *Building Research & Information*, 40(6): 738 - 755.

57. Sprayfoam.com (2008) *Is spray foam "GREEN" insulation?*, available at <http://www.sprayfoam.com/npps/print.cfm?nppage=187>.

58. National Institute for Occupational Safety and Health (1973) *Criteria for a recommended standard Occupational exposure to toluene diisocyanate*, U. S. Department of Health,

other isocyanates in SPF products, without independent testing or other sources, which we could not find easily. The only such source that we found about the products in which different isocyanates can be found is a 2012 report by Perkins+Will for the National Institutes of Health Division of Environmental Protection. It lists a wide variety of isocyanates, jobs in which people use them, and reference lists on which the chemicals appear as asthmagens; isocyanates individually and collectively are on more than six such reference lists.⁶⁰

Delaying and casting doubt do not deal with SPF 's real hazards

Industry representatives at those workshops, and in testimony before the Assembly Committee on Environmental Safety and Toxic Materials (ESTM),⁶¹ insisted that the hazards of isocyanates are adequately recognized and dealt with by their work practices (e.g., training, protective equipment). In doing so, they ignored the inherent nature of the hazards. Referring to the odds of getting asthma from SPF products, they said that MDI cannot be detected within 30 minutes to two hours after application (implying it therefore has little effect, although applicators face the hazard during application and curing processes). This “risk based” approach is inconsistent with the green chemistry principles of, and SCP statement about, inherent hazards.

Rather than advocating for delays and casting doubt on the science and process, we emphasize the hazards of isocyanates and recommend some important independent sources that DTSC should consult about what happens during and after SPF insulation work.

First, health and safety agencies in the US and many other countries recognize the serious hazards of isocyanates and their use in SPF products. They are a hazard throughout their life cycle -- from production to application, and after that when they are burned, cut or otherwise disturbed

Education, And Welfare, Public Health Service HSM 73-11022, available at <http://www.cdc.gov/niosh/pdfs/7311022b.pdf>.

59. Chameides, N (2011) “Chemical Marketplace: Rage Against the Foam?”, at the Duke Nicholas School of the Environment “Green Grok”, available at <http://blogs.nicholas.duke.edu/thegreengrok/mdi-tdi/>

60. Perkins+Will (2012) *Healthy environments: A compilation of substances linked to asthma*, available at http://transparency.perkinswill.com/assets/whitepapers/NIH_AsthmaReport_2012.pdf.

61. California State Assembly Committee on Environmental Safety and Toxic Materials (2014) *Oversight Hearing on Green Chemistry: Regulations on Priority Products*, available at <http://aesm.assembly.ca.gov/oversighthearings>.

or disposed of. The federal EPA and OSHA recent initiatives about SPF products and isocyanates demonstrate this.^{62,63}

In Europe, both MDI and TDI are classified under the European Union's Classification, Labelling and Packaging (CLP) regulations (to implement the Globally Harmonized System of Classification and Labelling of Chemicals/GHS) as possible carcinogens, dermal and respiratory sensitizers, acutely toxic on inhalation, and as eye, skin, and respiratory irritants. MDI is classified as a potential liver and kidney toxicant and it may affect fertility. There are other assessments going on, reports for which should be out soon.⁶⁴

The Danes prohibit most spray applications, and require curing times to be stated on data sheets. Their law prohibits those with asthma, eczema, chronic pulmonary diseases or reported skin or respiratory allergies to work with isocyanates. There are other restrictions on the use of isocyanates. These restrictions may spread beyond that country because:

*TDI and MDI are currently undergoing REACH substance evaluation and further risk management considerations in the EU, which might lead to further action at EU level.*⁶⁴

In California, OEHHA just released a draft document about reference exposure levels for MDI.⁶⁵ Besides recommending an eight-hour reference exposure limit (REL) of 0.16 $\mu\text{g}/\text{m}^3$ (0.015 ppb) and 0.076 $\mu\text{g}/\text{m}^3$ (0.0074 ppb) for a chronic effects REL, OEHHA says it should be considered a toxic air contaminant (TAC):

In view of the potential of MDI to exacerbate asthma and the differential impacts of asthma on children including higher prevalence rates, OEHHA recommends that MDI be identified as a TAC that may disproportionately impact children pursuant to Health and Safety Code, Section 39669.5(c).

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62. Occupational Safety and Health Administration (2013) *OSHA Instruction: National Emphasis Program – Occupational exposure to isocyanates*, available at [osha.gov/OshDoc/Directive_pdf/CPL_03-00-017.pdf](https://www.osha-slc.gov/OshDoc/Directive_pdf/CPL_03-00-017.pdf).
 63. Environmental Protection Agency (2011) *Methylene Diphenyl Diisocyanate (MDI) and related compounds action plan summary*, available at <http://www.epa.gov/oppt/existingchemicals/pubs/actionplans/mdi.html>.
 64. Christensen F, Nilsson NH, Nyander Jeppesen C, Clausen AJ (2014) *Survey of certain isocyanates (MDI and TDI), part of the LOUS-review*, Danish Environmental Protection Agency, available at <http://prodstoragehoeringspo.blob.core.windows.net/56f59e7c-82d5-4086-86f1-39e1e1f2a831/LOUS%202013%20Hoering%20%20Certain%20isocyanates.pdf>.
 65. Office of Environmental Health Hazard Assessment (2014) *Methylene Diphenyl Diisocyanate Reference Exposure Levels, Technical Support Document for the Derivation of Noncancer Reference Exposure Levels Appendix D1*, available at oehha.ca.gov/air/hot_spots/pdf/July2014MDI_publicreview.pdf.

(The agency behind Prop 65 listings also produced a similar document about TDI.⁶⁶)

Isocyanates are the subject of a National Emphasis Program at federal OSHA, which has been copied (as required) by state plans including Cal/OSHA.⁶⁷ In their materials, the health and safety agency talks about the well-known hazards of these chemicals.

Industry's own presentations show that SPF application often leads to airborne isocyanates levels above the regulated permissible exposure limits (PELs), which do not necessarily reflect current science when it comes to protecting workers or others.⁶⁸

Independent sources have the same evidence. A Yale University professor's presentation about the health effects of isocyanates at a 2013 conference showed a chart indicating that three workers got asthma working with or around SPF products, despite wearing respirators.⁶⁹ Two occupational hygienists who have measured these levels during typical applications told CHANGE that they often find levels above the PELs; in one case, this was an important contributor to federal OSHA deciding to pay special attention to isocyanates.⁷⁰

Their experiences are backed up by the Québec Institut de recherche Robert-Sauvé en santé et en sécurité du travail (IRSST), which did measurements of indoor and outdoor spray foam operations. They found airborne levels about 2.3 times Québec occupational exposure values in the spray zone and 1.3 times the values outside the spraying zone (where assistants work).

The risk of exposure to MDI in monomer form (aerosols) for workers performing spraying operations is high, particularly when such operations are performed indoors where the average of the concentrations in the spraying zone reach 288 µg/m³. In addition to these characteristics, individual and team (team

66. Office of Environmental Health Hazard Assessment (2014) *Toluene Diisocyanate Reference Exposure Levels*, available at http://oehha.ca.gov/air/hot_spots/pdf/July2014TDIPubReview.pdf.

67. Cal/OSHA (2014) *OSHA Instruction CPL 03-00-017 & Inspection Procedures for Isocyanates*, available at www.dir.ca.gov/dosh/Inspection-Procedures-for-Isocyanates.pdf.

68. Ecoff S (2012) *High pressure spray foam application air monitoring data*, Bayer MaterialScience.

69. Redlich CA (2013) *Human Health Effects Isocyanates*, Presented at Isocyanates and Health: Past, present and future, available at http://isocyanates2012.org/content/media/plenary_slides/03_Redlich.pdf.

70. Marvin Lewiton, Industrial Hygiene Supervisor, Massachusetts Department of Labor Standards on-site consultation program, whose "Safe spray foam presentation" about the Massachusetts consultation program is at <http://www.mass.gov/eea/docs/eea/ota/01-safe-spray-foam-presentation-marvin-lewiton.pdf>. NIOSH's David Marlow's report about his experiences in the last year is expected out this fall.

consisting of an installer (or applicator) and his assistant) work practices explain certain variations in the data collected.

*Despite the training program for installers (or applicators) offered by an accreditation authority, **nothing indicates that occupational health and safety practices are being completely followed** on Québec construction sites. In the context of competency training, occupational health and safety practices as well as respiratory and skin protection need to be rigorously addressed and should be part of the workers' continuing training process.⁷¹ (emphasis added)*

Applicators and their co-workers are not the only workers facing hazards from the isocyanates in SPF products. Firefighters worry about what happens to burning SPF insulation (the isocyanates, flame retardants, or other ingredients) and the possibilities of fires as a result of spray foam insulation installation (which also are an example of poor work practices, lack of training).⁷² (A Massachusetts worker died in a 2008 fire.)

At the same time, studies show that “thermal degradation” presents a hazard for other workers. For example, MDI in foam insulation can affect those who deal with the in-place product, particularly when it is heated during cutting or other activities.

In summary, as in other groups of workers, exposure to thermal degradation products from MDI based polyurethane among these PUR pipelayers was related to adverse effects.⁷³

The situation for do-it-yourselfers/DIYers is so serious that the Canadian government is taking action. On August 15, 2014, it released a notice and request for comments that could lead to severe restrictions on the use of SPF products with MDI and diamine. (Occupational hazards are rarely considered in the Chemicals Management Plan; neither do they take a green chemistry approach to alternatives.)⁷⁴

71. Roberge B, Gravel R, Drolet D (2009) *4,4'-Diphenylmethane diisocyanate (MDI) Safety practices and concentration during polyurethane foam spraying*, Montreal: Institut de recherche Robert-Sauvé en santé et en sécurité du travail (IRSST), Report R-629, available at <http://www.irsst.qc.ca/en/-irsst-publication-4-4-diphenylmethane-diisocyanate-mdi-safety-practices-and-concentration-during-polyurethane-foam-spraying-r-629.html>.

72. Holladay M (2011) *Three Massachusetts home fires linked to spray-foam installation*, available at <http://www.greenbuildingadvisor.com/blogs/dept/green-building-news/three-massachusetts-home-fires-linked-spray-foam-installation>.

73. Jakobsson K, et. al. (1997) “Airway symptoms and lung function in pipelayers exposed to thermal degradation products from MDI-based polyurethane”, *Occupational and Environmental Medicine*, 54: 873-879

74. Chemicals Management Plan (Government of Canada) (2014) *Methylenediphenyl Diisocyanates and Diamine (MDI/MDA) Substance Grouping*, available at <http://www.chemicalsubstanceschimiques.gc.ca/group/diisocyanate-eng.php>.

Asthma from isocyanate sensitization makes SPF products a priority

Sensitization is a serious hazard. Isocyanate sensitization has killed people.⁷⁵ The chemicals cause asthmatic reactions at levels below what the best instruments can measure in the air.

A curious thing about isocyanates is that studies show that respiratory allergic reactions can follow getting the chemical on one's skin.⁶³ OSHA also gave this warning in its National Emphasis Program materials:

*Cross-sensitization, in which a worker is exposed to one isocyanate but reacts adversely to others as well, can occur. Studies indicate that dermal exposure is a significant cause of respiratory sensitization. Thus, workers with skin contact to isocyanates may develop sensitivity, resulting in asthma attacks with subsequent exposures. Sensitization can occur at very low levels of exposure. Dermal sensitization may also result in rash, itching, hives and swelling of the extremities. Because isocyanates are not relatively water soluble, they cannot be easily washed off skin or clothing.*⁶²

The American Chemistry Council also appears to acknowledge this in its training materials:

*MDI has a potential risk of irritation and sensitization through inhalation and skin contact. Exposure can affect skin, eyes, and lungs. Once sensitized, continuing exposure can cause persistent or progressive symptoms and even life-threatening asthmatic reactions, so remove sensitized people from potential exposure activities.*⁷⁶

Sensitization has other serious consequences for workers in particular. It drives people working around and with the chemicals to leave their job⁷⁷ or to take their chances of reacting to very low levels in the air. California researchers say that US regulatory authorities do not have consistent evidence-based methods to deal with asthmagens, which should include

75. National Institute for Occupational Safety and Health (1996) *Preventing Asthma and Death from Diisocyanate Exposure*, DHHS (NIOSH) Publication Number 96-111, available at <http://www.cdc.gov/niosh/docs/96-111/>

76. American Chemistry Council, Spray Foam Coalition of the ACC Center for the Polyurethanes Industry (2012) *Guidance on best practices for the installation of spray polyurethane foam. Guidance for residential homes and commercial buildings*, available at <http://www.ncfi.com/uploads/Guidance-on-Best-Practices-for-the-Installation-of-Spray-Polyurethane-Foam3.pdf>.

77. Gannon PFJ, et. al. (1993) "Health, employment and financial outcomes in workers with occupational asthma", *British Journal of Industrial Medicine*, 50: 491 - 496.

research and identification of the efficacy and cost effectiveness of less toxic alternatives.⁷⁸

The costs of work-related asthma (WRA) are expensive and extensive. In the United States, they are at least \$19.7 billion annually, including health care costs, lost productivity, (e.g., absenteeism, disability and presenteeism).⁷⁹

From the occupational health angle, UC Davis economist Paul Leigh calculated estimates of the national number and costs of job-related injury and illness among civilian workers in US low-wage jobs for 2010. The laborers category he used likely includes many of those installing SPF products. The total costs of fatal and non-fatal injuries and illnesses in their group was \$575.5793 million in productivity costs and \$400.9200 million for medical costs for an estimated total of \$976.4993 million. The overall costs of non-fatal diseases -- like work-related asthma (WRA) -- was \$1.53201 billion.⁸⁰

Table 4 Estimated present value lifetime total costs for new cases of occupational asthma in 2003 by gender and sensitising agent (£000, 2004 prices)

	Taxpayer	Employer	Individual	Society
Latex or glutaraldehyde				
Male	387–416	38–53	890–919	1314–1387
Female	1213–1323	48–74	1022–1113	2301–2510
Isocyanates				
Male	5980–6406	343–489	6977–7408	13300–14303
Female	241–258	8–11	139–157	388–426
Flour and grain				
Male	2619–2803	131–185	2560–2746	5309–5734
Female	1700–1820	50–70	892–1011	2642–2901

Looking specifically at isocyanates WRA, British researchers said their work showed that the costs of occupational asthma in the UK were “high and significantly greater” than the Health and Safety Executive’s 2010 estimates. Table 4 from their 2011 paper (above) shows that isocyanate-linked WRA is much more expensive over a lifetime for men than those with the disease

78. Quint J, Beckett WS, Campleman SL, et. al. (2008) “Primary prevention of occupational asthma: Identifying and controlling exposures to asthma-causing agents”, *American Journal of Industrial Medicine*, 51: 477 - 491.

79. *Asthma: A Business Case for Employers and Health Care Purchasers*

80. Leigh P (2012) *Numbers and costs of occupational injury and illness in low-wage occupations*, prepared for George Washington University School of Public Health and Health Services (SPHHS), available at http://defendingscience.org/sites/default/files/Leigh_Low-wage_Workforce.pdf.

when it was linked to latex/glutaraldehyde or flour and grain, two other common asthmagens.⁸¹

Like the US and other countries, most of the burden falls on individual workers (49% of the total cost for all occupational asthma) compared to employers (three to four percent). Given this, Ayres and colleagues made this relevant conclusion:

*In summary, this pattern of cost burdens for occupational asthma suggests that employers are imposing a large 'external' cost on the rest of society, where costs borne by the individual and the state are not necessarily taken into account by the employer when making decisions that affect the health of the workforce. **The presence of such external costs provides a justification for public interventions to reduce the incidence of occupational asthma or to improve health and safety in the workplace generally.** ... New strategies involving government and employers need to be developed to reduce the financial and health burden from occupational asthma. (emphasis added)*

Small businesses in the SPF business can calculate some of their direct and indirect costs using the federal OSHA *Safety Pays Program*.⁸² Based on work by Leigh and others, it is important to know that such things as the suffering of workers and their families is not taken into account.

WRA is seriously under-reported so surveillance data provide limited help

Under-reporting of work-related asthma (WRA) is very common. For example, Ayres and colleagues say it likely is under-estimated by at least one third.⁸¹ The UK's Health and Safety Executive's 2013 report about occupational asthma says only 10 percent of all new WRA (i.e., cases caused, or made worse, by work) may be reported; isocyanates are the top cause of occupational asthma in Great Britain.⁸³

In California, the Occupational Health Branch of the Department of Public Health runs a Work-Related Asthma Prevention Program (WRAPP). Program staff produced a report in 2013 about asthma in California, including a chapter about WRA.⁸⁴ Using data from several sources, they reported:

81. Ayres JG, Boyd R, Cowie H, Hurley JF (2011) "Costs of occupational asthma in the UK", *Thorax* 66: 128 - 133.

82. Occupational Safety and Health Administration, *Safety Pays Program*, available at <https://www.osha.gov/dcsp/smallbusiness/safetypays/index.html>.

83. Health and Safety Executive (2013) *Occupational Asthma in Great Britain 2013*, available at www.hse.gov.uk/statistics/causdis/asthma/

84. Milet M, Lutzker L, Flattery J (2013) *Asthma in California: A surveillance report*. Richmond, CA: California Department of Public Health, Environmental Health Investigations Branch, available at www.cdph.ca.gov/programs/ohsep/Documents/Asthma_in_California2013.pdf.

- the most common hazards behind WRA in California are latex, formaldehyde, glutaraldehyde, diisocyanates, sulfuric acid, rat antigens, epoxies, and California Redwood dust;
- 40% of adults with current asthma (estimated at 974,000 people) report that their asthma has been either caused or aggravated by a job;
- more than half of those with WRA could not do their usual work and 37% were fired or left work due to the hazard;
- just over 50% had filed a workers' compensation claim; and
- only 28% of adults reporting WRA ever discussed work-relatedness with their doctor.

Asked about the prevalence and incidence of WRA linked to isocyanates and to SPF work, one of the authors responded:

A preliminary evaluation of the Doctor's First Reports of Occupational Injury and Illness component of our surveillance system demonstrated that the system did not receive 2/3 of the reports submitted by a major HMO.

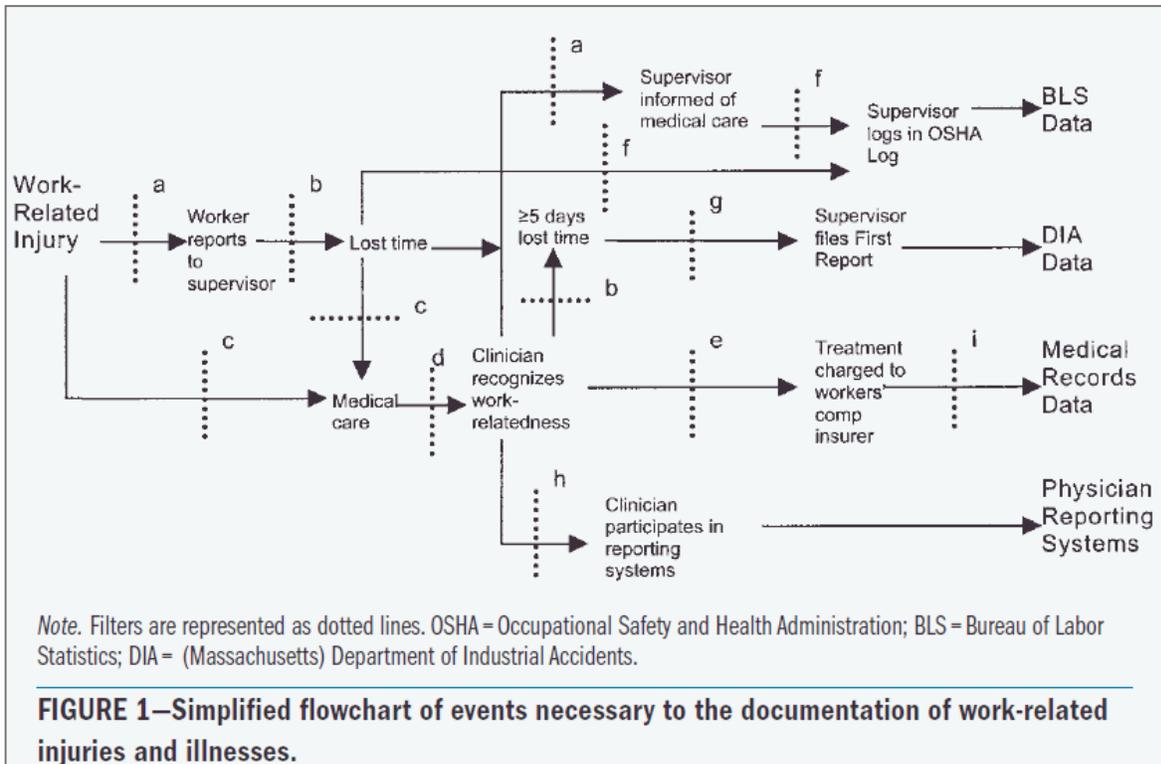
In addition to an undercount of reports that have been submitted, underreporting may be greater for certain subsectors of the working population, as low-wage immigrant and other workers may not recognize their asthma symptoms as work-related, may not seek medical care due to lack of access, and may not want the medical provider to connect their asthma to their work for fear of retribution in the workplace. Any of those factors would prevent us from receiving a report of a worker with work-related asthma.

*If workers in the spray foam insulation industry are subject to these barriers, they would not be represented in our surveillance system. **The presence of certain occupations, industries and exposures in our surveillance system documents work-related asthma, but the absence of them may be a function of underreporting instead.*** (emphasis added)⁸⁵

A 2002 article⁸⁶ published in the *American Journal of Public Health* expands on her explanation, providing many of the recognized factors behind the well-recognized under-reporting of occupational illnesses, diseases and injuries. Figure 1 from that paper (below) is helpful in pointing out the many points (i.e., filters) at which people's illnesses like WRA do not make it through the system.

85. Flattery J (2014) Personal communication.

86. Azaroff LS, Levenstein C, Wegman DH (2002) "Occupational injury and illness surveillance: Conceptual filters explain underreporting", *American Journal of Public Health*, 92(9): 1421 - 1429.



SPF products are falling out of favour with some, leading to court cases

Green building advocates are raising questions about the use of SPF products, partly because, and in spite, of their growing popularity across the United States and Canada.⁸⁷ The federal EPA has an MDI “action plan” because of the concerns.⁸⁸

Lawyers are finding cases of people affected by in-place SPF.⁸⁹ For example, an Atlanta firm says they can deal with the “finger pointing back and forth between manufacturers, mixers, installers and others in an effort to avoid responsibility for injuries caused by spray foam insulation application.”⁹⁰ In

87. Badore M (2013) *Greener alternatives to spray foam insulation*, available at <http://www.treehugger.com/green-architecture/greener-alternatives-spray-foam-insulation.html>; Roberts, T. (2011) *EPA raises health concerns with spray foam insulation*, available at <http://www2.buildinggreen.com/blogs/epa-raises-health-concerns-spray-foam-insulation>

88. Environmental Protection Agency (2011) *Methylene Diphenyl Diisocyanate (MDI) and related compounds action plan summary*, available at <http://www.epa.gov/oppt/existingchemicals/pubs/actionplans/mdi.html>.

89. Gibson S (2013) *Lawsuits name makers of spray foam insulation*, available at <http://www.greenbuildingadvisor.com/blogs/dept/green-building-news/lawsuits-name-makers-spray-foam-insulation>.

90. Winston Briggs Law Firm, available at <http://www.winstonbriggslaw.com/chemical-toxic-exposure/spray-foam-insulation/>

Canada, CBC Television had a series about these reports.⁹¹ One US expert they interviewed wrote EPA in 2012, with another indoor air specialist, saying:

EPA professionals working on this problem are already aware of PUF applications that have caused residents to vacate their homes due to chemical exposures and subsequent development of sensitivities. ...

Given the enormous problems for homeowners of failed sprayed PUF applications, there are some people who think that PUF should be prohibited for inside use because the consequence of failure is catastrophic.

.. American spray foam contractors are the weak link in the safety chain. Often, these folks lack the knowledge, discipline, and intent to carry out such processes properly. Insulation contractors are not generally inclined (for financial and other reasons) to avoid spraying inside attics and walls where the practice might be unwise or in violation of manufacturer requirements. It is true that the chemical industry is actively educating its customers. At the same time it is also true that the chemical industry has also taken a hands-off position with respect to failures.⁹²

Physicians rarely speak up about these kinds of incidents in their journals. In 2011, however, Duke University doctors reported two people developed asthma after re-entering their home four hours after SPF installation, as they were told to do.⁹³ This reflects the lack of evidence about health-protective re-entry times that several people brought up in discussions with CHANGE members about the use of these products, and is mentioned in the NIOSH call for help to find locations at which to do air monitoring.⁴⁸ We also note that the Healthy Building Network has raised this issue with DTSC, concluding:

.. that the curing of SPF is poorly understood and poorly controlled and hence highly likely to lead to exposures for workers and occupants alike with serious health effects, including potentially to unborn children.⁹⁴

Alternatives do exist

Given that SPF is more expensive than other insulation materials (according to many sources) and the reported difficulties -- to protect workers, DIYers

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91. CBC Marketplace (2012) *Spray foam insulation can make some homes unlivable*, available at <http://www.cbc.ca/news/spray-foam-insulation-can-make-some-homes-unlivable-1.2224287>.
 92. Bloom B, Miller R (2012) Letter to Steve Owens, Assistant Administrator, Office of Chemical Safety and Pollution Prevention, EPA, available at http://sprayfoamsucks.com/wp-content/uploads/2012/01/Letter-to-S.-Owens_EPA-re-PUF-SPF.pdf.
 93. Tsuang W, Huang Y-CT (2012) "Asthma induced by exposure to spray polyurethane foam insulation in a residential home", *Journal of Occupational and Environmental Medicine*, 54(3): 272 - 273.
 94. Lent T. (2014) Healthy Building Network letter to Miriam B. Ingenito, DTSC, July 2, 2014.

and homeowners, the inconsistent worker training and work practices, and the expenses involved for employers and workers (whether at work or when people are sensitized or otherwise affected by SPF product ingredients) -- prevention is the most effective method to deal with SPF products.

In 2010, the Lowell Center for Sustainable Development made the economic case for reducing asthma, including work-related causes. In the latter case, they advocate for informed substitution:

*A priority goal in developing strategies for reducing use of and exposure to asthma-related substances is the elimination of the job hazard, especially if there are safer alternatives.*⁹⁵

The recommendation is not new. Almost 20 years ago, NIOSH was recommending substitutes for isocyanates because of their sensitizing properties.⁹⁶ This year, the Danish Environmental Protection Agency “identified a range of emerging alternative substances and technologies (in particular for specific applications, including consumer applications)” and a lack of information about the alternatives, perhaps because they come from different chemical systems (e.g., a silan base).⁶⁴

There are several ways to look at alternatives. First, the specific toxic substance in a product can be replaced. Second, the way the product is made can be changed, eliminating all or most toxics, including by-products. Third, other methods (e.g., other products, materials, processes) can be used for the product’s function.

There are alternatives for isocyanates in SPF products, either on the market or under development. A quick internet search and some personal enquiries found:

- Crey Bioresins CEO and University of Delaware’s Dr. Richard Wool got the 2013 EPA’s Presidential Green Chemistry Award for his work that included bio-based alternatives to isocyanates in foams;⁹⁷
- a soy-based option, being studied by Virginia Tech chemistry professor Tim Long, and his students, and brought into commercial production by a Chicago company;⁹⁸

95. Lowell Center for Sustainable Production and Asthma Regional Council (2010) *Asthma: A business case for employers and health care purchasers*, available at <http://www.sustainableproduction.org/downloads/AsthmaBusinessCaseforEmployersFeb2010.pdf>.

96. National Institute for Occupational Safety and Health (1996) *Preventing asthma and death from diisocyanate exposure*, DHHS (NIOSH) Publication Number 96-111, available at <http://www.cdc.gov/niosh/docs/96-111/>

97. Environmental Protection Agency (2013) *Green chemistry academic award*, available at <http://www2.epa.gov/green-chemistry/2013-academic-award>.

- Hybridsil, described as NanoSonic's "two-part spray foam, low-VOC, non-halogenated, fire-resistant, silicon-based insulation coating designed to replace polyurethane spray coatings that can pose environmental hazards and are extremely flammable with toxic combustion byproducts";⁹⁹
- San Francisco's Hybrid Coating Technologies says it is "in the process of developing spray foam insulation based on its non isocyanate platform technology"¹⁰⁰, a product called Green Polyurethane™;¹⁰¹
- the Europe-based Soudal company makes its European version of Soudafoam SMX without isocyanates, reportedly because of Swedish occupational health regulations;¹⁰²
- Owens Corning has a made-in-US product called EnergyComplete Sealant it describes as "two-part, non-allergenic, high performance latex-based foam used to seal cracks and penetrations through a building envelope and from floor to floor in a building"¹⁰³ and a December, 2013 patent for a non-isocyanate spray foam;¹⁰⁴
- the federal EPA's MDI action plan says:

However, a new class of non-isocyanate polyurethanes that offers potentially safer alternatives to conventional polyurethanes has been reported by two research groups (Figovsky & Shapovalov, 2006; Javni et al., 2008). Other reported technologies include an isocyanates-free expanding foam product (Soudal, 2010) and a faster curing "isocyanates-free" flexible food packaging adhesive that reportedly prevents potential migration of isocyanates into non-dry food.⁶³

Furthermore, in personal communications with CHANGE members, one of the two "fathers" of green chemistry, John Warner, said that, with a commission, the Warner Babcock Institute for Green Chemistry could deliver

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98. Virginia Tech News (2007) *Soy-based product explored as non-toxic substitute for important but toxic reactive compound*, available at <http://www.vtnews.vt.edu/articles/2007/03/2007-114.html>
 99. Nano Sonic, *HYBRIDSHIELD Foam Insulation*, available at <http://www.nanosonic.com/80/20/product.html>
 100. *Hybrid enters into the \$35 billion insulation market*, available at <http://globenewswire.com/news-release/2014/05/09/635053/10081037/en/Hybrid-Enters-Into-the-35-Billion-Insulation-Market.html>.
 101. Hybrid Coating Technologies (2014) *Green Polyurethane™ - Zero Isocyanates*, available at <http://www.hybridcoatingtech.com/technology.html>
 102. Soudal, *Soudafoam SMX*, available at <http://www.soudal.com/soudalweb/productDetail.aspx?w=9&p=410&ID=1984>.
 103. Owens Corning, *EnergyComplete® Sealant*, available at <http://www2.owenscorning.com/literature/pdfs/10013809%20EnergyComplete%20Product%20Data%20Sheet.pdf>
 104. US Patent and Trademark Office (2013) *Non-isocyanate spray foam*, available at <http://www.uspto.gov/web/patents/patog/week50/OG/html/1397-2/US08604091-20131210.html>.

a scalable, commercially-viable, green chemistry alternative to industry's existing toxic formula in a relatively-short time. (We have more details that we could share with DTSC and others.)

This is all about opportunities to protect workers and other consumers, while innovating to deal with a public health hazard. As the Hybrid Coating Technologies president and CEO said May 9, 2014, in announcing the company's entry into the insulation market:

*We have a tremendous opportunity with our non isocyanate polyurethane technology as we enter the polyurethane spray foam industry. As the regulatory environment is starting to change quickly, forcing the industry to seek out non isocyanate polyurethane solutions, our technology is well positioned to be at the forefront of these solutions.*¹⁰⁰

Others also have pointed to other methods to use for insulation. This responds to the question: Is it necessary? In this regard, we follow the expertise of the Healthy Building Network's recommendations for the many options available, depending on the purpose.⁹⁴ Of particular interest are the new mycelium-based rigid board insulation product just coming onto the market and products that do not contain FRCs.

Recommendations

- 4.1 Resist industry's self-interested efforts to cast doubt about, and remove, the naming of isocyanates in SPF products as priority products. Resist their demands for consultation behind closed doors ahead of announcing priority product recommendations.**
- 4.2 At a minimum, include all isocyanates possible and flame retardants known to be included in these products on the list of chemicals for which alternatives must be assessed in SPF products. Require evidence of all ingredients, down to at least 0.1%. Consider adding the amines and amides to the list.**
- 4.3 Pursue the Danish reference to REACH investigations of TDI and MID, and plans for possible further restrictions on the chemicals.**
- 4.4 Learn more from the Massachusetts and NIOSH representatives who are knowledgeable about the use of SPF products because of their on-the-ground experiences.**
- 4.5 Encourage interested companies to take advantage of interest in SPF alternatives the Warner Babcock Institute and to look for other green chemists who also would take a life cycle approach that includes the important role of workers and their health.**

4.6 Learn more from the Healthy Building Network about their important points about alternative materials for SPF products.

5. A final reminder: make clear and intentional decisions despite uncertainty

As we attended workshops and prepared these comments, we were regularly reminded of two things: the need for DTSC to make decisions in the face of uncertainty, and the need for it to be intentional and clear in those decisions. The latter is reflected in our recommendations about children's products and SPF products.

The former needs to be reiterated, given the response to the SPF product recommendation in particular. We do so by referring DTSC to important recommendations from the European Union's Environment Agency (EEA) about early warnings of a public health problem, in the context of incomplete toxicity data.

'The precautionary principle provides justification for public policy and other actions in situations of scientific complexity, uncertainty and ignorance, where there may be a need to act in order to avoid, or reduce, potentially serious or irreversible threats to health and/or the environment, using an appropriate strength of scientific evidence, and taking into account the pros and cons of action and inaction and their distribution.' This definition is explicit in specifying situations of uncertainty, ignorance and risk, as contexts for considering the use of the PP. It is expressed in the affirmative rather than the triple negatives found in, for example, the Rio Declaration. It explicitly acknowledges that the strength of scientific evidence needed to justify public policy actions is determined on a case-specific basis, and only after the plausible pros and cons, including their distribution across groups, regions, and generations, have been assessed.¹⁰⁵

The lessons led them to criteria for precautionary action (see box on next page), which are quite applicable to DTSC's priority product activities:¹⁰⁶

105. European Environment Agency (2013) *Late lessons from early warnings: science, precaution, innovation*, EEA Report No 1/2013 (page 649), available at <http://www.eea.europa.eu/publications/late-lessons-2>.

106. European Environment Agency (2013) *Late lessons from early warnings: science, precaution, innovation*, EEA Report No 1/2013 (page 653), available at <http://www.eea.europa.eu/publications/late-lessons-2>.

Box 27.4 Criteria for precautionary action: some features of evidence about the hazardous potential of agents that may justify precautionary action

1. intrinsic toxicity/ecotoxicity data
2. novelty (i.e. where there is a low 'knowledge/ignorance ratio')
3. ecological or biological persistence
4. potential for bio-accumulation
5. large spatial range in the environment e.g. potential for global dispersion
6. seriousness of potential hazards
7. irreversibility of potential hazards
8. analogous evidence from known hazards
9. inequitable distribution of hazardous impacts on particular regions, people and generations
10. availability of feasible alternatives
11. potential for stimulating innovation
12. potential and time scales for future learning

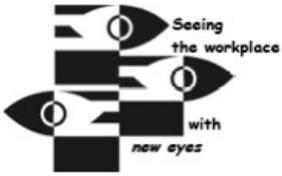
We believe that all three DTSC chemical-product recommendations meet these criteria for action. With clearer statements about the specific chemicals of concern to address in alternatives assessments, and expanded priority chemicals and product categories, California will be taking action that is long overdue and ground-breaking.



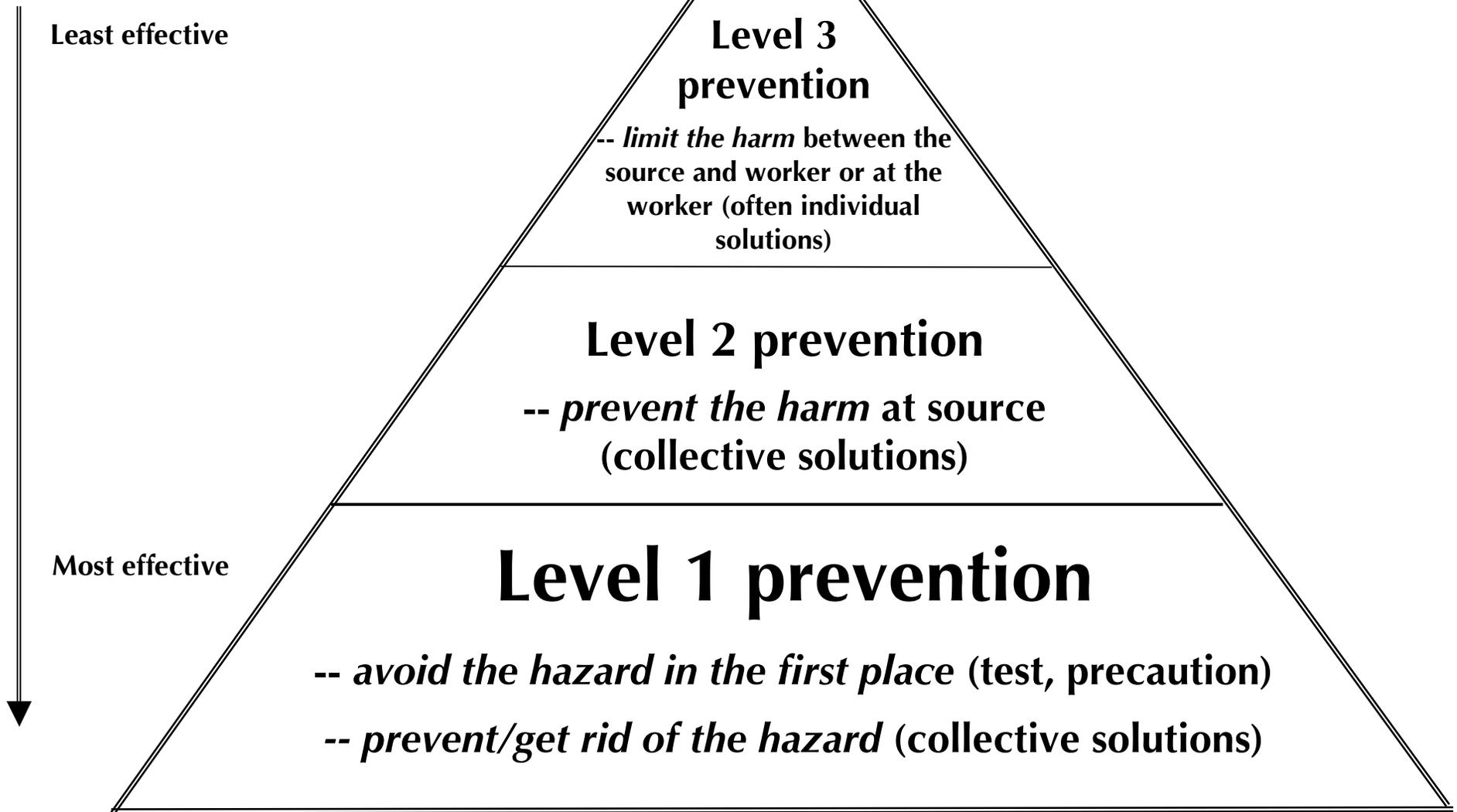
Appendix 1

to CHANGE comments about DTSC's
recommendations for priority products

The prevention triangle



The prevention triangle -- *principles for solving health and safety problems*



* *What happens if it's upside down (and you just limit the harm)? It falls over!*

What's behind the prevention triangle?

The triangle borrows two concepts from the environmental movement.

Informed substitution is the principle about getting rid of toxic substances whenever a healthier and/or safer substance is available. Replacements are non-toxic or much less hazardous materials. It also describes changes about how things are done, using a different technology or re-organising the task to reduce or get rid of hazards. For more, see www.cleanproduction.org and www.turi.org.

The **precautionary principle** -- "better safe than sorry" -- is part of several environment and health and safety laws. The idea is that there must be proof that something is not harmful before it is used, rather than using workers or the community as guinea pigs and only taking action when problems appear. For more information, see the European Environment Agency's <http://latelessons.ew.eea.europa.eu/>.

Health and safety specialists have used the word "controls" to describe changes or solutions that reduce exposure but don't get rid of the hazard. But their language is changing to emphasise prevention as opposed to putting up with a hazard. The Belgians offer a very useful way to do this, with levels of prevention (see <http://www.meta.fgov.be>).

Level 1 prevention is best. It gets rid of a hazard or avoids introducing a new one (when you use the precautionary principle). This is where substitution using non-toxic alternatives is most effective. Public health practitioners would call this primary prevention.

Level 2 prevention (a.k.a. engineering solutions or controls at the source) limits the hazard at its source (reducing its spread). The hazard is still there but ways to prevent harm include:

- ventilation enclosing the hazard, taking it all out of the workplace (without damaging the environment);
- enclosures to reduce noise levels;
- isolating the hazard or the people who may be exposed to it; and
- wet methods (with dusts).

Level 3 prevention only limits or reduces harm by putting something between the worker and the hazard source.

Changes or "controls" along the path between the hazard and workers, include:

- local ventilation that does not enclose the hazard;
- general ventilation;
- mechanical guards/devices; and
- some administrative controls (e.g. breaks).

At the worker (controls at the worker), Level 3 prevention includes personal protective equipment/clothing (PPE) and:

- some administrative activities (e.g. rotating workers, because it just spreads the hazard around and may even make it worse for some, especially if hazards to back are involved);
- work procedures, training and supervision, emergency plans;
- housekeeping, repair and maintenance programmes, and hygiene practices/facilities; and
- things to take care of yourself (especially when you're stressed).

These solutions are the least acceptable way to try to fix a problem, although there are times when they're needed.