Chemicals in Consumer Products are Draining Trouble into the Great Lakes Ecosystem

GreenScreen® Assessment Shows Triclosan and Triclocarban Should Be Avoided

Prepared for the
Canadian Environmental
Law Association

By Beverley Thorpe,
Clean Production Action

July 2014

Canadian Environmental Law Association
EQUITY. JUSTICE. HEALTH.

CLEAN PRODUCTION ACTION

Summary

Triclosan (CAS# 3380-34-5) and triclocarban (CAS# 101-20-2) are widely used as anti-bacterial/antimicrobial agents in many products including cosmetics, personal care consumer products, textiles and food contact materials. GreenScreen® for Safer Chemicals, a recognized tool for comparative chemical hazard assessment, was used to assess the environmental and human health profile of both of these chemicals. GreenScreen® classifies triclosan as a GreenScreen Benchmark 1 chemical of high concern and triclocarban as a GreenScreen Benchmark 2 chemical with very high aquatic toxicity. We recommend that companies, retailers, the Canadian and US federal, and all provincial and state governments in the Great Lakes-St. Lawrence River Basin (Great Lakes Basin) prohibit the use of triclosan and triclocarban in all consumer products and require alternative assessments for safer substitutes if biocides are shown to be necessary for specific applications.

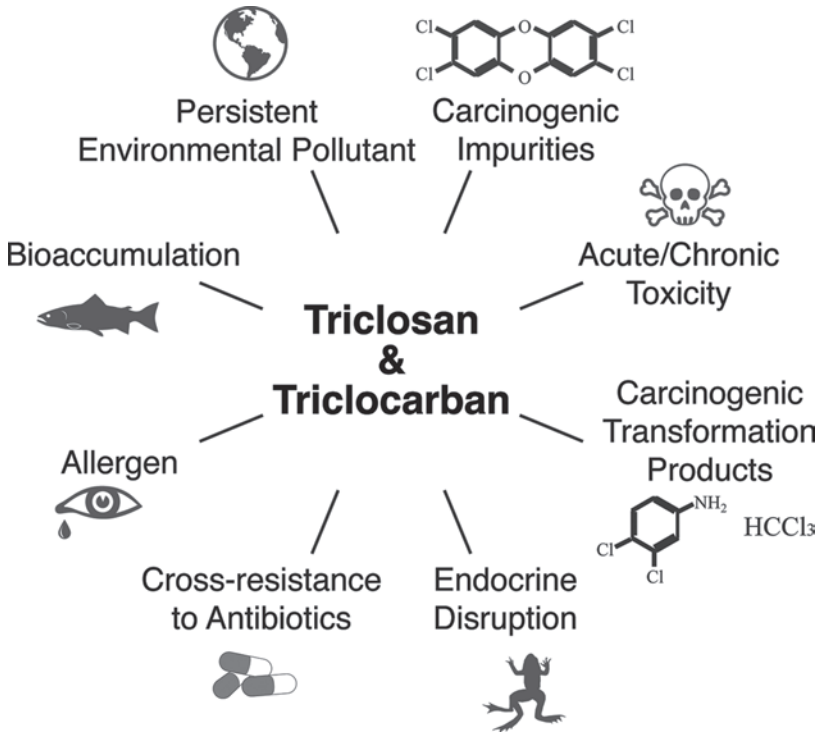


Image by Jason Drees, the Biodesign Institute at Arizona State University, produced for Rolf U. Halden's paper: On the Need and Speed of Regulating Triclosan and Triclocarban in the United States. *Environ. Sci. Technol.* 2014, 48, 3603–3611. Reproduced with permission.

Triclosan and Triclocarban are Found in a Wide Range of Personal Care and Consumer Products

Triclosan has been widely used as an antimicrobial in consumer products since it was first patented in the 1960s. By 2001, 76% of commercial liquid hand soaps in the US contained triclosan.[1] It is found in a wide variety of cosmetics, drugs and natural health products, as well as clothes, office and school products and kitchenware.[2] Plastic products such as toys, toothbrushes, shower curtains and cutting boards may contain triclosan, as well as mattresses, carpets, tents, garbage cans, insulation, and concrete mixtures.

In Canada, approximately 1600 cosmetics and natural health products containing triclosan were reported to be in commerce in 2011. In addition, approximately 130 personal care products that are regulated as drug products, including toothpaste, skin cleansers and moisturizers, were reported to Health Canada.[3]

Triclocarban is similar in structure and use to triclosan. Although less widely used than triclosan it can also be found in personal care products and 84% of all antimicrobial bar soaps sold in the United States contain triclocarban. Consumer products that contain triclosan or triclocarban are generally labelled as "antibacterial," "fights odours" or "kills germs."[4] A list of dozens of common consumer products containing triclosan or triclocarban is available from the US Department of Health and Human Services.[5]

Based on GreenScreen® for Safer Chemicals, Triclosan and Triclocarban Should be Avoided

To investigate the impact of triclosan and triclocarban on human health and the environment, GreenScreen® for Safer Chemicals (GreenScreen®)[6] was used to assess the hazards of these two chemicals. GreenScreen is a comparative chemical hazard assessment tool that is used to identify chemicals of high concern and safer alternatives. GreenScreen measures the inherent hazards of chemicals and is scientific, robust, and fully transparent. It is used by industry, governments and environmental and health non-governmental organizations to support product design and development, materials procurement, and as part of an alternatives assessment to meet regulatory requirements. It is used by businesses like Hewlett-Packard—the global leader in GreenScreen use, governments like Washington State, and it has been included by the US Green Building Council as a material credit for LEED certification.[7]

GreenScreen assesses the environmental and human health impacts of a chemical against 18 human health and environmental categories, or endpoints, using data collection and research coupled with expert judgment. Each hazard endpoint is scored from Very High (vH) to Very Low (vL).

GreenScreen includes a consideration of feasible and relevant chemical transformation products to further assess how a chemical breaks down in the environment. A data gap for an endpoint is only assigned after an exhaustive search has been completed and no hazard classification can be made.

Once the classifications are made, the level of confidence for each hazard classification is explained by using bold letters to indicate high confidence and italic letters to indicate lower confidence. This approach allows for an even better informed decision-making process if the classification is based on strong experimental evidence or weaker modelling data or screening lists.

BOX 1. **GreenScreen® for Safer Chemicals Classifies the Hazards of a Chemical Against 18 Human Health and Environmental Categories, or Endpoints**

Group 1 Human

C Carcinogenicity
M Mutagenicity/Genotoxicity
R Reproductive Toxicity
D Developmental Toxicity
E Endocrine Activity

Group II Human

AT Acute Mammalian Toxicity
ST Systemic Toxicity incl. Immunotoxicity
N Neurotoxicity
SnS Skin Sensitization
SnR Respiratory Sensitization
IrS Skin Irritation/Corrosivity
IrE Eye Irritation/Corrosivity

Ecotox

AA Acute Aquatic Toxicity
CA Chronic Aquatic Toxicity

Environmental Fate

P Persistence
B Bioaccumulation

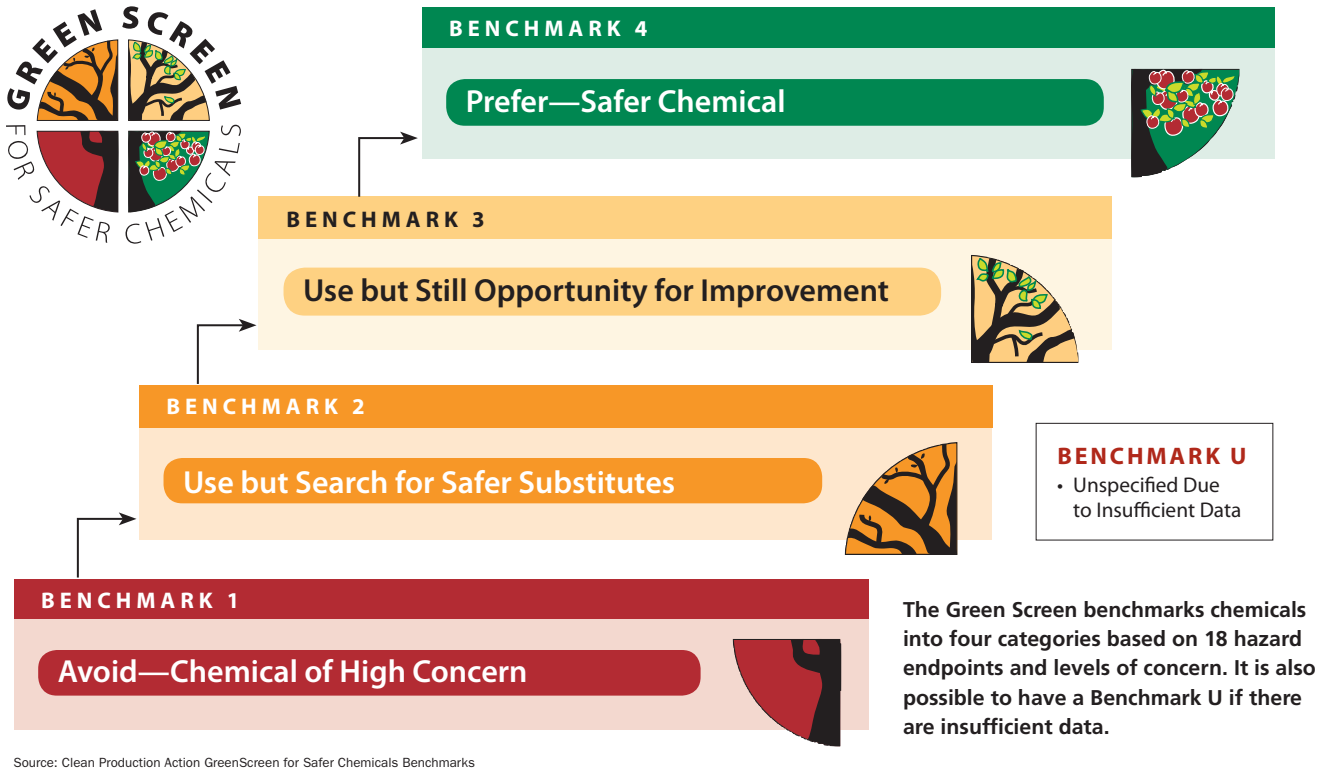
Physical Hazards

R Reactivity
F Flammability

Benchmarks are unique to GreenScreen and are a major strength of the method. Each Benchmark is determined by analyzing specific combinations of hazard classifications. The Benchmarks were developed to reflect hazard concerns that have been established by governments both nationally and internationally. For example, the Benchmark 1 Criteria align with the definition of a substance of very high concern (SVHC) under Europe's Regulation on Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH).

Each hazard classification for each endpoint is used in applying the Benchmark Criteria to determine the final Benchmark score. Only certain numbers and types of data gaps are allowed for each Benchmark level; it is possible that a Benchmark cannot be assigned at all if the data are insufficient.

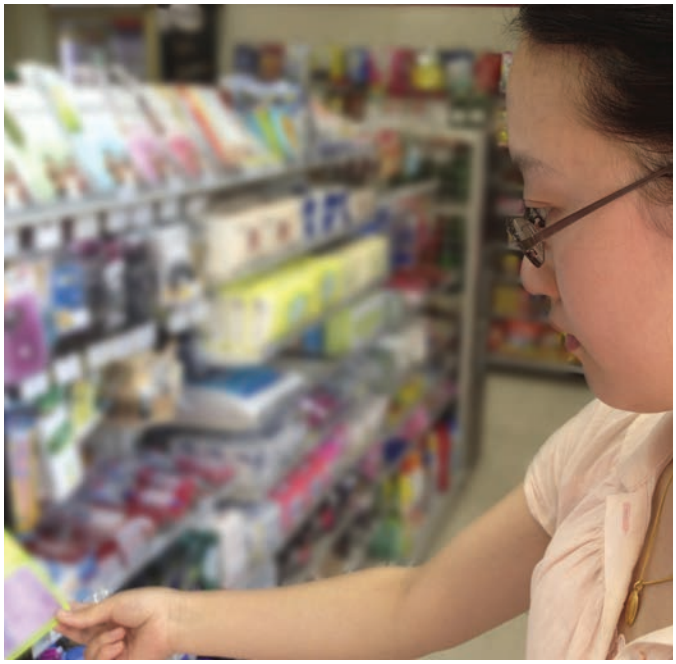
FIGURE 1. **GreenScreen for Safer Chemicals: Benchmarks**



Source: Clean Production Action GreenScreen for Safer Chemicals Benchmarks

The Green Screen benchmarks chemicals into four categories based on 18 hazard endpoints and levels of concern. It is also possible to have a Benchmark U if there are insufficient data.

Benchmarks range from Benchmark 1 (Avoid: Chemical of High Concern) to progressively safer Benchmarks—Benchmark 4 (Prefer: Safer Chemical). The hazard table results for each chemical show each endpoint and its hazard score. A GreenScreen analysis is particularly important because it allows for informed decision-making by regulators and product manufacturers who can now identify how to best create a chemical formula for inherently safer chemical design, or why a chemical should not be used for a particular application. For example, if a chemical has a high hazard score for aquatic ecotoxicity, it would signal specific concern for products that are designed to be flushed down the drain. Regulators concerned with protecting water basins and drinking water sources, such as the Great Lakes, can have a better understanding of a chemical's hazard by viewing its GreenScreen hazard table results.



Triclosan is Ranked as a GreenScreen Benchmark 1—Chemical to be Avoided

As presented in the hazard table below and discussed at length in the publicly available full "GreenScreen® Assessment of Triclosan,"[8] triclosan is ranked as a chemical of high concern. The hazard table below shows the hazard ratings against each of the 18 endpoints. See Table 1 for key to hazard labels. This assessment of triclosan's inherent hazards against this range of human health and environmental impacts reveals specific concern for the chemical's environmental fate, particularly for receiving water bodies.

GreenScreen also examines the environmental degradation products of a chemical. Triclosan is transformed into methyl-triclosan upon exposure to chlorine, the common disinfectant for wastewater and drinking water. Methyl-triclosan is present in surface waters over wide areas associated with triclosan and bioaccumulates in aquatic organisms. Available data suggest that methyl-triclosan is less toxic to aquatic organisms than triclosan, but is nonetheless of high inherent toxicity, according to Health Canada/Environment Canada.[9]

Note that GreenScreen does not address bacterial resistance, which is an additional priority concern for triclosan.

TABLE 1. **GreenScreen® Hazard Ratings for Triclosan**
GreenScreen® Benchmark Score 1 ("Avoid: Chemical of High Concern")

Group I Human					Group II and II* Human									Ecotox		Fate		Physical	
C	M	R	D	E	AT	ST		N		SnS*	SnR*	IrS	IrE	AA	CA	P	B	Rx	F
						SINGLE	REPEATED*	SINGLE	REPEATED*										
L	L	M	M	M	vH	vH	M	DG	*M*	L	DG	H	H	vH	vH	H	H	L	L

BOX 2. **Benchmark 1—Summary of GreenScreen Assessment for Triclosan**

The following is a short summary of the details provided in the full GreenScreen assessment. Reading from left to right and in order of highest hazard rankings:

Triclosan scores as a very high (vH) hazard for:
- Human Acute Toxicity (AT)
- Human Systemic Toxicity (single dose) (ST)
- Acute Aquatic Toxicity (AA)
- Chronic Aquatic Toxicity (CA)

Triclosan scores as a high (H) hazard for:
- Human Skin Irritation/Corrosivity (IrS)
- Human Eye Irritation/Corrosivity (IrE)
- Persistence in the Environment (P)
- Bioaccumulation in the Environment (B)

Triclosan scores as a moderate (M) hazard for:
- Reproductive Toxicity (R) based on decreased sperm production and other impacts associated with endocrine disruption
- Developmental Neurotoxicity (D)
- Endocrine Activity (E)—GreenScreen criteria classify chemicals as a moderate hazard for evidence of endocrine activity such as when they are listed on the SIN/TEDX lists,[10] or when there is evidence of endocrine activity in animals.
- Human Systemic Toxicity (repeated dose) (ST)
- Neurotoxicity (repeated dose) (N)

Triclosan has data gaps (DG) for:
- Neurotoxicity (single dose) (N)
- Respiratory Sensitization (repeated dose) (SnR)

Triclosan scores as a low hazard (L) for:
- Carcinogenicity (C)
- Mutagenicity/Genotoxicity (M)
- Skin Sensitization (repeated dose) (SnS)
- Physical Reactivity (Rx)
- Flammability (F)

Triclocarban is Ranked as a GreenScreen Benchmark 2 with Very High Aquatic Toxicity

Triclocarban was assessed using the GreenScreen method to determine its inherent hazards because both triclosan and triclocarban are added alone or together to a wide range of personal and consumer care products. GreenScreen is particularly useful for assessing alternatives to chemicals of concern in order to avoid replacing one chemical of concern with another. A GreenScreen comparison of alternatives allows more informed decision-making and minimizes the likelihood of unintended consequences. Since more than 95% of triclosan[11] and the vast majority of triclocarban in consumer products eventually goes down the drain, the impact on receiving waters must be a priority concern. Triclosan and triclocarban are highly toxic to organisms living in the aquatic environment.

As shown in the hazard table results below, although triclocarban is assessed as a Benchmark 2, with comparatively lower hazards than triclosan for some endpoints, it presents very high hazards to receiving waters as well as being persistent in the environment and endocrine active. These properties make it a particularly unacceptable chemical in consumer products designed to be flushed down the drain. The GreenScreen assessment of triclocarban, is discussed in more detail in the full "GreenScreen Assessment of Triclocarban."[12]

TABLE 2. **GreenScreen® Hazard Ratings for Triclocarban**
GreenScreen® Benchmark Score 2 ("Use but Search for Safer Substitutes")

Group I Human					Group II and II* Human									Ecotox		Fate		Physical	
C	M	R	D	E	AT	ST		N		SnS*	SnR*	IrS	IrE	AA	CA	P	B	Rx	F
						SINGLE	REPEATED*	SINGLE	REPEATED*										
L	L	M	L	M	L	L	M	DG	DG	L	DG	M	M	vH	vH	H	L	L	L

BOX 3. **Benchmark 2—Summary of GreenScreen Assessment for Triclocarban**

The following is a short summary of the details provided in the full GreenScreen assessment. Reading from left to right and in order of highest hazard rankings:

Triclocarban scores as a very high (vH) hazard for:
- Acute Aquatic Toxicity (AA)
- Chronic Aquatic Toxicity (CA)

Triclocarban scores as a high (H) hazard for:
- Persistence (P) and is listed on Environment Canada's Domestic Substance List as substances that are persistent.

Triclocarban scores as a moderate (M) hazard for:
- Reproductive Toxicity (R)
- Endocrine Activity (E)—The TEDX list[13] considers triclocarban a potential endocrine disruptor and it is also listed as a potential endocrine disruptor on the OSPAR List of Substances of Possible Concern[14]
- Human Systemic Toxicity (repeated dose) (ST)
- Human Skin Irritation (IrS)
- Human Eye Irritation (IrE)

Triclocarban has data gaps (DG) for:
- Neurotoxicity (single and repeated) (N)
- Respiratory Sensitization (repeated dose) (SnR)

Triclocarban scores as a low hazard (L) for:
- Carcinogenicity (C)
- Mutagenicity/Genotoxicity (M)
- Developmental Toxicity (D)
- Human Acute Toxicity (AT)
- Human Systemic Toxicity (single dose) (ST)
- Skin Sensitization (repeated dose) (SnS)
- Bioaccumulation (B)
- Reactivity (Rx)
- Flammability (F)

Environment Canada and Health Canada Need to Adopt a Comprehensive Phase Out Approach for Triclosan and Triclocarban

Both Environment Canada and Health Canada assessed triclosan as a priority chemical under the *Canadian Environmental Protection Act*, 1999, (CEPA 1999) federal law that addresses chemicals management.[15] Triclosan is one of 4,500 chemicals listed under the Domestic Substances List under CEPA 1999 to be identified as a chemical for assessment. No assessment of triclocarban has been conducted.

The recent report on human biomonitoring in Canada[16] shows triclosan and triclocarban to be wide ranging contaminants in the Canadian population. The federal government notes that Canadians are potentially exposed to triclosan through consumer products, treated textiles and food contact materials, drinking water contaminated with triclosan, breast milk and contaminated household dust.[17] However Health Canada affirms that "Canadians can continue to safely use products such as toothpaste, shampoo and soap containing triclosan."[18]

The 2012 preliminary assessments of triclosan by Environment Canada and Health Canada differ in their conclusions. Environment Canada's preliminary assessment of triclosan states that "triclosan is entering or may enter the environment in a quantity or under conditions that constitute a danger to the environment."[19] It was proposed that triclosan meets the criterion of 'CEPA toxic' and could be added to the CEPA 1999 List of Toxic Substances for a range of possible risk management measures.[20] Health Canada, in contrast, proposes that "Triclosan is not entering the environment in a quantity or concentration or under conditions that constitute or may constitute a danger in Canada to human life or health."[21]

Health Canada's risk assessment approach has been criticized for not addressing the potential effect of triclosan as an endocrine disruptor;[22] not using actual patterns of consumer use for products containing triclosan; not addressing the cumulative effect of exposure with other substances that share a similar mechanism of toxicity; and not addressing the human health and ecological effects of impurities such as dioxins in the product itself.[23]

Assessing human health impacts separately from environmental impacts with no overarching life cycle approach results in a piecemeal and disjointed set of recommendations. Furthermore, the disparity between Health Canada and Environment Canada's draft conclusions for triclosan does not provide a comprehensive regulatory signal to the marketplace. The Canadian government needs to adopt a comprehensive and clear phase out approach for triclosan—and triclocarban—and require alternative assessments for safer substitutes if biocides are shown to be necessary for specific applications.

Proposed substitutes for triclosan and triclocarban, if biocides are necessary, should be assessed for their inherent chemical hazards across a wide spectrum of endpoints, as demonstrated in the GreenScreen method.[24] Using hazard assessment allows one to assess and compare alternatives and provides an effective means to reduce risks associated with a product or process, particularly if the potentials for exposure are similar.[25] Because triclosan and triclocarban are used for similar functions, in similar product categories, and with the same probable environmental fate, the presence of ecotoxicity and persistence hazards associated with triclocarban indicate why this chemical is not a good substitute for triclosan. This type of comparative chemical hazard assessment enables informed decision making and action by regulators and companies.

BOX 4. **Overview of Triclosan (TCS) and Triclocarban (TCC)**

The need for good aggregate exposure data is underscored by a recently published overview of triclosan (TCS) and triclocarban (TCC) which notes that:

> *Today, TCS and TCC rank in the list of top contaminants of concern worldwide. For example, US streams have a 60–100% likelihood of containing detectable quantities of TCS and TCC. TCS has been detected in drinking water resources, 75% of urine samples representative of the US population, 97% of representative US breast milk samples, and combined TCS and TCC constitute over 60% of the total mass of 96 pharmaceuticals detectable in municipal sludge. Indeed the environmental ubiquity of both chemicals has escalated such that TCS, TCC or both compounds are now detectable in house dust worldwide, in ocean water, and locations as remote as the water loop of spacecraft.*[26]

More Cause for Concern: Triclosan Impurities in Products Include the Most Toxic Form of Dioxin

Health Canada's Cosmetic Ingredient Hotlist[27] declares triclosan to be a restricted substance (not a prohibited substance) with allowable limits up to 0.03% in mouthwashes and concentrations equal to or less than 0.3% in other cosmetic products. Recently, the European Scientific Committee on Consumer Safety has revised its opinion on triclosan; it now considers that the continued use of triclosan as a preservative at the current maximum concentration limit of 0.3% in all cosmetic products is not safe for the consumer because of the magnitude of aggregate exposure.[28] Triclocarban is not on Health Canada's Cosmetic Ingredient Hotlist.

Triclosan contains a range of impurities including 2,3,7,8 Tetrachlorodibenzo-p-dioxin (TCDD) and furans (TCDF), dichlorophenols, mercury, antimony, lead and other heavy metals.[29] 2,3,7,8 TCDD is the most toxic form of dioxin known. Health Canada's Cosmetic Ingredient Hotlist further establishes limits for polychlorinated dibenzo-p-dioxin (PCDD) and polychlorinated dibenzofuran (PCDF) impurities and recommends that manufacturers of oral cosmetic products containing triclosan must ensure that these impurities should not exceed 0.1 part per billion for 2,3,7,8-TCDD and 10 parts per million for total other PCDD/PCDF impurities.[30] It should be noted that 2,3,7,8-TCDD is a known carcinogen[31] as well as an endocrine disruptor for which no safe level of exposure can be established.[32]

Triclosan Also Forms Dioxins in Water

Ninety-five percent of products containing triclosan are washed down the drain into receiving waters,[33] where they undergo photo-transformation in aqueous solutions to form 2,8-dichlorodibenzo-p-dioxin (2,8-DCDD).

Environment Canada and Health Canada acknowledge that dioxins are thus formed, but "the relative importance of triclosan as an environmental source of polychlorinated dibenzodioxins and dibenzofurans is expected to be less than other sources on a national scale. Additionally, those polychlorinated dioxins associated with triclosan are not on the list of 17 dioxins and furans that are of the greatest concern based on International Toxicity Equivalency Factors."[34]

However, recent research notes that three other dioxin congeners, 2,3,7-trichlorodibenzo-p-dioxin (2,3,7-TriCDD), 1,2,8-TriCDD, and 1,2,3,8-TCDD, which are known photo-transformation products of chlorinated derivatives of triclosan, were also detected with similar trend profiles. The authors of this research state that "The dioxin products from the chlorinated triclosan derivates are potentially of greater concern than 2,8-DCDD formed directly from triclosan and that triclosan and the wastewater produced transformation products could serve as an important, yet unrecognized, source for polychlorinated dioxins in the environment."[35]A potentially much larger source of dioxins from triclosan is the incineration of triclosan-containing municipal sludge.[36]

Triclosan is Suspected in Widespread Development of Antimicrobial Resistance

In August 2009, the Canadian Medical Association (CMA) called upon the federal government to ban the sale of household antibacterial products due to the risk of bacterial resistance and to recognize that regular soap and alcohol-based solutions are as effective in preventing household infection. In January 2010 the CMA further wrote a letter to the Health Minister outlining its concerns.[37]

The Canadian Paediatric Society recommended that antimicrobial use in the home is unnecessary and further recommended their use only in higher risk situations, such as with home-based medical care.[38] The American Medical Association has concluded that consumer antimicrobial products that can cause bacterial resistance should be discontinued "unless data emerge to conclusively show that such resistance has no effect on public health and that such products are effective at preventing infection."[39]

Health Canada has not directly referred to the concerns of the CMA in its online response. Rather it states that it will continue to monitor the scientific literature and will take further action if warranted.[40] But to delay may be unwise. In contrast the European Union Scientific Committee on Consumer Safety (SCCS) recommends caution in the use of triclosan pending further research on antibacterial resistance:

> *Although triclosan resistance was not observed in situ, this is not sufficient to conclude that there is no risk. Information is still lacking to provide a risk assessment on the use of triclosan in cosmetic products… Due to the limited number of in situ studies of resistance induced by triclosan to date, SCCS can only recommend the prudent use of triclosan, for example in applications where a health benefit can be demonstrated. However, conclusions from in vitro studies cannot be ignored, notably the role of triclosan (and other biocides) in triggering resistance.*[41]

European and US Measures Against Triclosan Grow; Canada Needs to Act

Environment Canada, in its proposed risk management for triclosan, intends to use the life cycle management concept to prevent or minimize the release of triclosan into the environment. As they point out, triclosan primarily enters the Canadian environment via discharge of wastewater system effluents and application of biosolids to agricultural fields. Therefore, the overall risk management strategy for triclosan will focus on reducing levels of triclosan in wastewater systems by reducing inputs from products and/or industrial effluents.[42] Just how it intends for this strategy to be implemented is still unknown. Both the Preliminary Draft Assessment and the Risk Management Preliminary reports were released on March 31, 2012 for a 60-day comment period, but to date no details have been announced.

Meanwhile on 28 April 2014, the European Commission published its decision to reject 22 biocidal active substance/product-type combinations in the review programme. Triclosan will be phased out of use in three product types: disinfectants and algaecides; film preservatives and fibre, leather, rubber and polymerised materials preservatives. The ban will enter into force 15 May 2015.[43]

Triclosan safety is also being evaluated under the EU REACH program and it is a possible candidate for the Water Framework Directive's priority list.

The US Food and Drug Administration issued a proposed rule on 16 December 2013 that would require manufacturers to provide more substantial data to demonstrate the safety and effectiveness of antibacterial soaps. Industry has one year to submit data. The proposed rule covers only those consumer antibacterial soaps and body washes that are used with water. It does not apply to hand sanitizers, hand wipes, or antibacterial soaps that are used in health care settings, such as hospitals.[44]

On May 16, 2014 Minnesota became the first US state to ban the retail sale of any cleaning product that contains triclosan and is used by consumers for sanitizing or hand and body cleansing. The ban comes into effect January 1, 2017.[45]

Protection of the Great Lakes Must Be a Priority

The fact that triclosan and triclocarban are highly toxic to receiving waters is of particular concern in the Great Lakes, which holds about 20 percent of the world's supply of fresh surface water. The Great Lakes receive the bulk of wastewater effluent from the 40 million people living within the basin. A review of chemicals of emerging concern in the Great Lakes Basin published in 2010, confirmed the widespread presence of triclosan in the Great Lakes where it was detected in 89.7% of surface water samples.[46]

Triclocarban is also now considered a chemical of concern in US water resources.[47] The Alliance for the Great Lakes reviewed the research on emerging contaminants in the Great Lakes[48] and found that triclosan and triclocarban are ubiquitous contaminants. As researchers in the Great Lakes point out, increased population and increased sewage discharges to receiving waters continue to impact water quality in the near shore, an area that is essential for the survival of a healthy fish population, plus where most human recreational activity takes place.[49] Triclosan and methyl-triclosan were detected in the blood plasma of pelagic and benthic fish (13 species) that were collected from the Detroit River during 2001 and 2002.[50] Shallow sediments in surface waters receiving treated wastewater inputs are known to

contain levels of triclosan and triclocarban that make impossible the survival and activity of many different species.[51]

It is time for action if we are to reverse the ongoing input of these chemicals and the future input of different chemicals with similar hazard attributes into the Great Lakes Basin. To protect human health and wildlife will require a truly preventive product based chemicals policy that integrates hazard assessment, alternatives assessment and informed substitution at its core.

Recommendations

1. Canada must prohibit the use of triclosan and triclocarban in all consumer products with a comprehensive strategy for informed substitution.

Canada must take urgent action and officially declare Triclosan (CAS# 3380-34-5) to be toxic and add this chemical to the Toxic Substances List (Schedule 1) under CEPA, 1999. Canada should develop a prohibition strategy for triclosan and triclocarban with a comprehensive strategy for informed substitution. The strategy would require alternative assessments for safer substitutes if chemical biocides are shown to be necessary in specific cases.

The GreenScreen hazard assessment for triclocarban clearly demonstrates why triclocarban is not a good replacement for triclosan. Without a requirement for alternatives assessment it is possible that the market will simply replace triclosan with triclocarban, or the increased use of different chemicals with similar hazard profiles such as very high toxicity to aquatic life. The Commons Principles for Alternatives Assessments[52] must guide any consideration of substitute biocides for such specific applications in order to prevent the use of equally hazardous replacements where replacements are considered necessary.

The Canadian government could support chemicals innovation in the marketplace by requiring comprehensive alternatives assessments for all chemicals of high concern used in Canada. Indeed, leading US states are now doing this along with comprehensive guidance for how to develop safer products.[53]

2. Canadian and US federal, and all provincial and state governments in the Great Lakes Basin, should prohibit triclosan and triclocarban and assess alternatives, if biocides are shown to be necessary for specific applications.

The fact that triclosan and triclocarban are highly toxic to aquatic life in receiving waters is of particular concern in the Great Lakes Basin. Regulatory bodies in the Great Lakes Basin must prohibit the use of triclosan and triclocarban in all consumer products and require alternative assessments for safer substitutes if chemical biocides are shown to be necessary for specific applications. Minnesota's recent ban on the use of triclosan in personal care and cleaning products demonstrates that action can be taken. The Great Lakes Water Quality Agreement 2012 and the Canada-Ontario Agreement on Great Lakes Water Quality and Ecosystem Health, 2014 (Proposed) are key policy commitments that present opportunities to target triclosan, triclocarban and other chemicals of concern to the Great Lakes Basin for elimination.

3. In advance of this needed regulatory action, companies and retailers should eliminate triclosan and triclocarban in all consumer products.

Many personal care brands and retailers are at the forefront of eliminating triclosan in their formulations. Avon announced they have eliminated triclosan from their beauty and personal care products.[54] Procter & Gamble is eliminating triclosan from products sold in North America by 2014,[55] and will disclose on all labels until eliminated. Johnson & Johnson is phasing out triclosan in beauty and baby care products and is committed to working towards phase outs in all other products by 2015.[56] Companies who wish to mitigate their business risk and future costly replacements are now adopting comprehensive chemicals policies to phase out chemicals of concern with transparently safer substitutes.[57]

4. If biocides are shown to be necessary in a product, retailers should require their vendors to conduct an assessment of alternatives in order to ensure that any substitute to triclosan or triclocarban is safe for both our health and the environment.

It is imperative that companies do alternatives assessment of substitutes if biocides are shown to be necessary for specific applications. In this age of increasing transparency and consumer demands for safer chemicals, alternatives assessment for informed substitution is essential if companies wish to avoid replacing a chemical of concern with another hazardous replacement.

5. Invest in consumer education to avoid triclosan and triclocarban.

All regulatory bodies in the Great Lakes Basin must actively educate consumers about the threats of triclosan and triclocarban to the aquatic environment and the availability of safer alternatives. The good news is that the use of triclosan and triclocarban is not necessary in consumer products, particularly in personal care and cleaning products.

Even the Canadian Government's own Risk Management Scope for Triclosan acknowledges that

> *…the Public Health Agency of Canada and the US Food and Drug Administration (US FDA) have indicated that soaps with added antibacterial ingredients, such as triclosan, are no more effective than the mechanical action of washing with plain soap and water to remove bacteria from hands. Alcohol based hand sanitizers (for use without water) that do not contain triclosan are also available. This indicates that, for at least some categories of personal care products, there are available and acceptable alternatives to products containing triclosan as an antibacterial ingredient.*[58]

Endnotes

1 Jeffrey M Buth, et al. Dioxin Photoproducts of Triclosan and Its Chlorinated Derivatives in Sediment Cores. Environ. Sci. Technol, 2010, 44 (12), pp 4545–455

2 Government of Canada. What is Triclosan? Retrieved May 20, 2014. *http://healthycanadians.gc.ca/environment-environnement/home-maison/triclosan-eng.php*

3 Environment Canada/Health Canada. Risk Management Scope for Triclosan. *Chemical Abstracts Service Registry Number (CAS RN):3380-34-5*. March 2012. Retrieved May 20, 2014. *http://www.ec.gc.ca/ese-ees/default.asp?lang=En&n=613BAA27-1*

4 Rodale News. Antibacterial Chemicals: The Most Pointless Stuff in Your Home. Retrieved May 2, 2014. *http://www.rodalenews.com/antibacterial-chemicals*

5 US Department of Health and Human Services. Household Products Database. Triclosan. Retrieved May 22, 2014. *http://hpd.nlm.nih.gov/cgi-bin/household/brands?tbl=chem&id=75&query=triclosan&searchas=TblChemicals*. Triclocarban. *http://hpd.nlm.nih.gov/cgi-bin/household/brands?tbl=chem&id=89&query=triclocarban&searchas=TblChemicals1&prodcat=all*

6 Clean Production Action. GreenScreen® for Safer Chemicals. Retrieved May 15, 2014. *http://www.greenscreenchemicals.org*

7 US Green Building Council. LEED. Building product disclosure and optimization—material ingredients. *http://www.usgbc.org/node/2616399*

8 Triclosan (CAS# 3380-34-5) GreenScreen® for Safer Chemicals (GreenScreen®) Assessment. Prepared by ToxServices LLC. February 7, 2014. Available at: *http://www.cela.ca/triclosan-and-triclocarban; http://www.greenscreenchemicals.org* and *http://www.newmoa.org/prevention/ic2/projects/resource/hazassess-tool.cfm*

Note: Black and white version available at *http://www.cela.ca/triclosan-and-triclocarban.*

9 Environment Canada/Health Canada. Risk Management Scope for Triclosan. March 2012. *Op cit*.

10 The International Chemicals Secretariat's Substitute It Now (SIN) List is available at *www.sinlist.org*; The Endocrine Disruption Exchange (TEDX) List of Potential Endocrine Disruptors is available at *http://endocrinedisruption.org/endocrine-disruption/tedx-list-of-potential-endocrine-disruptors/overview*

11 Great Lakes Science Advisory Board to the International Joint Commission (IJC), 2010. Groundwater in the Great Lakes Basin, 2010. IJC, Windsor, Ontario, Canada.

12 Triclocarban (CAS# 101-20-2) GreenScreen® for Safer Chemicals (GreenScreen®) Assessment. Prepared by ToxServices LLC. February 7, 2014. Available at: *http://www.cela.ca/triclosan-and-triclocarban*; *http://www.greenscreenchemicals.org* and *http://www.newmoa.org/prevention/ic2/projects/resource/hazassess-tool.cfm*

Note: Black and white version available at *http://www.cela.ca/triclosan-and-triclocarban.*

13 Endocrine Disruption Exchange (TEDX) List of Potential Endocrine Disruptors. Retrieved May 20, 2014. *http://endocrinedisruption.org/endocrine-disruption/tedx-list-of-potential-endocrine-disruptors/overview*

14 OSPAR Commission. OSPAR List of Substances of Possible Concern. Retrieved May 15, 2014. *http://www.ospar.org/content/content.asp?menu=00950304450000_000000_000000*

15 Health Canada/Environment Canada. Preliminary Assessment Report for Triclosan. March 2012. Retrieved May 20, 2014. *http://www.ec.gc.ca/ese-ees/default.asp?lang=En&n=6EF68BEC-1*

16 Health Canada. Second Report on Human Biomonitoring of Environmental Chemicals in Canada. 2013. Retrieved May 20, 2014. *http://www.hc-sc.gc.ca/ewh-semt/pubs/contaminants/chms-ecms-cycle2/index-eng.php*

17 Environment Canada/Health Canada. Risk Management Scope for Triclosan. March 2012. *Op cit*.

18 Health Canada. Canada Concludes Preliminary Assessment of Triclosan. March 30, 2012. Retrieved May 20, 2014. *http://www.hc-sc.gc.ca/ahc-asc/media/nr-cp/_2012/2012-48-eng.php*

19 Health Canada/Environment Canada. Preliminary Assessment Report for Triclosan. March 2012. *Op cit*.

20 ibid

21 Environment Canada/Health Canada. Risk Management Scope for Triclosan. March 2012. *Op cit*.

22 Office of the Auditor General. Federal research on hormone disrupting substances as required under the Canadian Environmental Protection Act, 1999. Environmental Petition No. 340 submitted by Ecojustice and Canadian Environmental Law Association (Received by OAG: 17 July 2012). Retrieved May 30, 2014. *http://www.oag-bvg.gc.ca/internet/English/pet_340_e_37607.html*

Note: Response by Environment Canada and Health Canada to petition 340 notes that "hormone disruption is but one potential mechanism by which adverse effects may be induced. Environment Canada and Health Canada scientists consider "hormone disruption" or "endocrine disruption" to be attributable to numerous and diverse mechanisms within an organism, which may include those involving estrogen, androgen, progestrogen, glucocorticoid, mineralcorticoid and a myriad of peptide hormone effects, among others. A key consideration is that, although a substance has the potential to interact with a particular component of the endocrine system, it should not be interpreted as evidence that the substance causes adverse health/ecological effects."

23 Ecojustice. Comments on the Preliminary Assessment and Risk Management Scope of Triclosan. May 30, 2012. Retrieved May 20, 2014. *http://www.ecojustice.ca/media-centre/media-release-files/ecojustice-triclosan-comments-may-30-2012*

24 It is worth noting that Canada's Chemical Management Plan (CMP) criteria does not consider triclosan to meet the criteria for persistence, as defined by the Persistence and Bioaccumulation Regulations made under CEPA 1999. This seeming disagreement with the GreenScreen ranking of high persistence for triclosan is due to the differences used to classify a chemical as persistent, bioaccumulative, or toxic under CMP compared to other jurisdictions. A comparison study found that the CMP criteria are set higher than the Great Lakes Water Quality Agreement, Europe's REACH, the Stockholm Convention on Persistent Organic Pollutants and the US Environmental Protection Agency's criteria. For example, the Great Lakes Water Quality Agreement classifies a chemical as persistent if its half life in water is 8 weeks, compared to the 26 weeks under CMP. In this regard, GreenScreen considers a substance to be high for persistence based on the wider accepted definition of persistence. See Canadian Environmental Law Association and Lowell Center for Sustainable Production. *The Challenge of Substances of Emerging Concern in the Great Lakes Basin.*

June 2009. Retrieved May 20, 2014. *http://www.cela.ca/publications/challenge-substances-emerging-concern-great-lakes-basin-full-report*

25 Toxics Use Reduction Institute. The Commons Principles for Alternatives Assessment. 2013. Retrieved May 20, 2014. *http://www.turi.org/Our_Work/Research/Alternatives_Assessment/Commons_Principles_for_Alternatives_Assessment*

26 Rolf U. Halden. On the Need and Speed of Regulating Triclosan and Triclocarban in the United States. Environ. Sci.Technol. 2014, 48, 3603-3611. American Chemical Society. Retrieved May 20, 2014. *http://pubs.acs.org/doi/abs/10.1021/es500495p*

27 Health Canada. Cosmetic Ingredient Hotlist: Prohibited and Restricted Ingredients. Retrieved May 15, 2014. *http://www.hc-sc.gc.ca/cps-spc/cosmet-person/hot-list-critique/index-eng.php*

28 EU Scientific Committee on Consumer Safety. Addendum to the SCCP Opinion on Triclosan (SCCP/1192/08) from January 2009. Adopted 22 March 2011. Retrieved May 20, 2014. *http://ec.europa.eu/health/scientific_committees/consumer_safety/docs/sccs_o_054.pdf*

29 Rolf U. Halden. On the Need and Speed of Regulating Triclosan and Triclocarban in the United States. 2014. *Op cit*.

30 Health Canada/Environment Canada. Preliminary Assessment Report for Triclosan. March 2012. Op.cit.

31 National Institute Environmental Health. *Report on Carcinogens, Twelfth Edition* (2011). Retrieved May 20, 2014. *http://ntp.niehs.nih.gov/ntp/roc/twelfth/profiles/tetrachlorodibenzodioxin.pdf*

32 TEDX List of Potential Endocrine Disruptors. See wide range of dioxins. Retrieved May 20, 2014. *http://endocrinedisruption.org/endocrine-disruption/tedx-list-of-potential-endocrine-disruptors*

33 Great Lakes Science Advisory Board to the International Joint Commission (IJC), 2010. *Op cit*.

34 Environment Canada/Health Canada. Risk Management Scope for Triclosan. March 2012. *Op cit*.

35 Jeffrey M Buth, et al. Dioxin Photoproducts of Triclosan and Its Chlorinated Derivatives in Sediment Cores. 2010. *Op cit*.

36 K. D. Doudrick, D.B. Jones, T. Kalinowski, E. M. Hartmann, and R. U. Halden. Assessment of the Contribution of Triclosan to Dioxin Emissions from Sludge Incineration in the U.S. Using a Mathematical Model. In Contaminants of Emerging Concern in the Environment: Ecological and Human Health Considerations; Halden, R.; ACS Symposium Series; American Chemical Society: Washington, DC, 2010.

37 Canadian Medical Association. Public Health Issue Briefing Antimicrobial /Antibacterial Products. March 2010. Retrieved May 20, 2014. *http://www.cma.ca/multimedia/CMA/Content_Images/Inside_cma/Office_Public_Health/HealthPromotion/Antimicrobial-IssueBriefing_en.pdf*

38 Canadian Paediatric Society. Infectious Diseases and Immunization Committee. Antimicrobial products in the home: The evolving problem of antibiotic resistance. Paediatrics & Child Health. 11(3):169–173. Cited in Canadian Medical Association Public Health Issue Briefing. March 2010. *Op cit*.

39 Tan, L. et al. for the Council on Scientific Affairs, American Medical Association. Use of antimicrobial agents in consumer products. *Archives of Dermatology.* 138:1082-1086. Cited in Canadian Medical Association Public Health Issue Briefing. March 2010. *Op cit*.

40 Government of Canada. Triclosan: Questions and Answers. Retrieved May 20, 2014 *http://www.chemicalsubstanceschimiques.gc.ca/fact-fait/triclosan-eng.php#a17*.

41 Europa. DG Health and Consumer Protection. Triclosan and Antibiotics Resistance. Retrieved May 20, 2014. *http://ec.europa.eu/health/scientific_committees/opinions_layman/triclosan/en/l-3/2-uses-cosmetics-disinfectant.htm#4p0*

42 Environment Canada/Health Canada. Risk Management Scope for Triclosan. March 2012. *Op cit*.

43 Chemical Watch. EU authorities back triclosan ban in various products. March 20, 2014. Full text in *Official Journal of the European Union.* Volume 57. 25 April 2014. Retrieved May 30, 2014. *http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=OJ:L:2014:124:FULL&from=EN*

44 US Food and Drug Administration. FDA Taking Closer Look at 'Antibacterial' Soap. Retrieved May 15, 2014. *http://www.fda.gov/ForConsumers/ConsumerUpdates/ucm378393.htm*

45 Minnesota House of Representatives. House Passes Triclosan Retail Ban. May 8, 2014. Retrieved May 20, 2014. *http://www.house.leg.state.mn.us/sessiondaily/SDView.aspx?StoryID=5284*

46 Gary Klecka, Carolyn Persoon, and Rebecca Currie. Chemicals of Emerging Concern in the Great Lakes Basin: An Analysis of Environmental Exposures. 2010. *Rev Environ Contam Toxicol.* 2010;207:1-93. doi: 10.1007/978-1-4419-6406-9_1. Retrieved May 20, 2014. *http://www.ncbi.nlm.nih.gov/pubmed/20652664*

47 Rolf Halden and Daniel Paull. Co-Occurrence of Triclocarban and Triclosan in US Water Resources. *Environ. Sci. Technol.* 2005, 39, 1420–1426

48 Alliance for the Great Lakes. Emerging Contaminant Threats and the Great Lakes: Existing science, estimating relative risk and determining policies. 2011. Retrieved May 20, 2014. *http://www.greatlakes.org/Document.Doc?id=1072*

49 ibid

50 Gary Klecka, Carolyn Persoon, and Rebecca Currie. Chemicals of Emerging Concern in the Great Lakes Basin: An Analysis of Environmental Exposures. *Op cit*.

51 Rolf U. Halden. On the Need and Speed of Regulating Triclosan and Triclocarban in the United States. *Op cit*.

52 Toxics Use Reduction Institute. The Commons Principles for Alternatives Assessment. 2013. *Op cit*.

53 NEWMOA. IC2 Alternatives Assessment Guidance. Retrieved May 5, 2014. *http://www.newmoa.org/prevention/ic2/aaguidance.cfm*

54 Avon. Avon Products, Inc and Consumer Safety: Triclosan. Retrieved May 15, 2014. *http://www.avoncompany.com/corporatecitizenship/corporateresponsibility/resourcecenter/policies_and_procedures/triclosan.html*

55 Proctor & Gamble. Triclosan. Retrieved May 12, 2014. *http://www.pg.com/en_US/sustainability/safety/ingredients/triclosan.shtml*

56 Johnson & Johnson. Our Safety and Care Commitment: Triclosan. Retrieved May 5, 2014. *http://www.safetyandcarecommitment.com/ingredient-info/other/triclosan*

56 Clean Production Action. BizNGO Principles for Safer Chemicals. See list of endorsing companies. Retrieved May 20, 2014. *http://www.biznGO.org/safer-chemicals/principles-for-safer-chemicals*

57 Environment Canada/Health Canada. Risk Management Scope for Triclosan. March 2012. *Op cit*.

Chemicals in Consumer Products are Draining Trouble into the Great Lakes Ecosystem

GreenScreen® Assessment Shows Triclosan and Triclocarban Should Be Avoided

ACKNOWLEDGEMENTS

The Canadian Environmental Law Association (CELA) would like to thank the Salamander Foundation and Legal Aid Ontario whose generous support made possible the production of our GreenScreen Assessments, this report and on-going efforts to protect and restore the Great Lakes–St. Lawrence River Basin from the impacts of toxic chemicals and advance discussions on alternative assessments for safer substitutes. CELA would like to thank Fe de Leon, Nina Mazze, Kathleen Cooper, and Theresa McClenaghan for their thoughtful contributions to the production of this report.

The views and recommendations presented in this report are those of the Canadian Environmental Law Association and Clean Production Action and not those of its funders.

ISBN # – 978-1-77189-017-5 • CELA Publication # – 997

DESIGN: DAVID GERRATT/NONPROFITDESIGN.COM

Canadian Environmental Law Association
EQUITY. JUSTICE. HEALTH.

Canadian Environmental Law Association
130 Spadina Avenue, Suite 301
Toronto, ON M5V 2L4
Tel.: 416-960-2284 • Fax: 416-960-9392
http://www.cela.ca