

TCE Sites Awaken

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One thing about working in “the environmental field” is that friends, relatives and even casual acquaintances often seem to imagine that we know everything about anything environmental. Well, we know some things, but of course we don’t all know all things, and what we “know” today can evolve as we learn more about it in the future. We all rely on the work of others more expert than ourselves in areas of chemistry, risk assessment, exposure pathways, human health effects, contaminant migration and so on. Every now and then new studies are published and new information comes to light that (hopefully) lead us to question things we thought were “settled.” We realize we might just have to revise our assumptions and make adjustments. This is the nature of “Science!” after all.

For example, we all know that if we’re going into the sun, we should slather on the sunscreen, right? Or should we? A few years ago, information began to move from scientific journals into articles into women’s magazines and alternative health blogs noting that certain components of sunscreen became carcinogenic when exposed to the same ultra-violet light we were trying to protect ourselves from, saying sunscreen “speeds UV-induced skin cancer.”^{i, ii, iii} What?! Other articles raised concerns that sunscreen prevents a person from making Vitamin D^{iv} (which has many positive health benefits). This new information changed the risk/benefit balance, and by 2012 most sunscreens were reformulated.

A few years ago, a friend asked me about triclosan, an antibacterial agent added to many soaps, hand gels, body washes, some cutting boards, toys and even toothpaste (to prevent gingivitis). Triclosan was almost impossible to avoid. Then new information emerged suggesting triclosan was linked to hormonal disruptions, bone malformation and even cancer. And as for its primary purpose - killing germs - at the strength it is used in personal care products, it’s not any more effective than ordinary soap and water.^{v, vi} It is being removed from most products as a result of the updated risk/benefit balance.

So when the U.S. EPA began revisiting the scientific literature for trichloroethylene (TCE), everyone held their breath and waited to see whether the review would identify previously unknown exposure pathways of concern or more sensitive health effects that had not originally been considered, leading to more stringent standards.

Circa 2011, EPA characterized TCE as “carcinogenic to humans” and published cancer risk toxicity values for oral and inhalation exposures. Then, due to certain non-carcinogenic health concerns, they also published a *non-cancer* toxicity value for inhalation.^{vii} That last change – the new Reference Concentration (RfC) – implied the need for even more stringent standards, possibly for even short-term exposures. VERY short-term exposures. So now what? How much lower? For whom? And in what situations? How would EPA and the states deal with it? And what about all those previously closed sites that met the old standard but might exceed the new standard? Well, we can’t speak for all the states, but here’s the approach Massachusetts is going to take.

The Bureau of Waste Site Cleanup has prepared fact sheets on trichloroethylene: one focusing on the changes to the TCE toxicity values^{viii} and others focused on residential^{ix} and workplace^x indoor air. The new information from EPA suggests a residential indoor air concentration of 2 micrograms per cubic meter (2 $\mu\text{g}/\text{m}^3$) or less would pose “No Significant Risk” of health effects for *any* receptors. While this

new No Significant Risk target concentration is somewhat below the previous target^{xi} of 14 µg/m³, that is not the big news.

Since the 2 µg/m³ RfC is based on TCE’s potential for causing developmental effects (specifically cardiac malformations), concentrations close to the RfC may be of concern for even for “a short period of time.” That’s the kind of exposure that raises questions about potential “Imminent Hazards” and the need to take action quickly.

There are two key potential Imminent Hazard concentrations where steps must be taken to eliminate the exposure.

First, a TCE concentration of 6 µg/m³ would be critical for women who are pregnant or looking to get pregnant. At concentrations at or above 6 µg/m³ fetal heart development may be affected particularly in the first eight weeks of pregnancy. While developmental effects will not necessarily occur at or above this concentration, they cannot be ruled out and steps to address the risk are required.

Next, a TCE concentration at or above 20 µg/m³ is identified as a potential Imminent Hazard for *everyone*, based on possible effects to the human immune system for short-term exposures of five years or less. Again, while effects will not necessarily occur, they also cannot be ruled out. The table below represents the concentration changes in residential situations:

	Levels of concern prior to 2011 revision	Current levels of concern
Indoor Air (residential)	85 µg/m ³	6 µg/m ³
Groundwater (near residence)	300 µg/m ³	5 µg/m ³
Health effect of concern	Longer-term cancer risk	Short-term fetal developmental effect

(For more information on these new findings and standards for TCE, see the BWSC web page at <http://www.mass.gov/eea/agencies/massdep/cleanup/regulations/site-cleanup-policies-guidance.html#4>.)

Typically, Imminent Hazard conditions are triggered under the MCP by exposures that are of concern after several months, or even a year or two. The need to implement response actions within a couple weeks poses unique communication, contracting and logistical issues. The Department has been gaining experience and working out an effective approach while addressing active TCE sites in each Region.^{xii}

DEP is now prepared to address the potential for continuing exposures of concern at sites that were previously closed with significant concentrations of TCE remaining in soil or groundwater. Given the new information about the toxicity of TCE, the risk/benefit balance has changed and additional work to mitigate site conditions may be necessary.

Bureau of Waste Site Cleanup (BWSC) staff have screened over 900 closed sites where TCE was a contaminant of concern to determine whether any residual TCE is likely to pose an Imminent Hazard

based on the new understanding of health effects even if the site was properly closed under the original standards.

BWSC identified 179^{xiii} sites where follow-up will be conducted. Regions will prioritize sites to initiate follow-up, starting with those that pose the greatest potential risk. BWSC personnel will contact the owners of the potentially affected properties by telephone and letter, providing information and contacts where affected parties may get additional information. If property owners cannot conduct required follow-up work to evaluate current site conditions and potential human health risks, MassDEP will conduct the evaluation as a compliance assistance effort (using state contractors or staff). The goal is to identify any continuing exposures of concern, regardless of who actually does the assessment work.

At sites where the need for additional work is indicated by the preliminary assessment, MassDEP will issue a new Release Tracking Number (RTN) for this newly discovered condition, with fresh new timelines, deadlines and response actions.

Of course DEP would encourage anyone that may have an old TCE site to review the information that is available in the files and not necessarily wait for a call from DEP! (Go to the online Release Lookup: <http://public.dep.state.ma.us/SearchableSites2/Search.aspx>.)

ⁱ <http://www.webmd.com/beauty/sun/sunscreen-safety-labels-ingredients>

ⁱⁱ <http://www.sciencedaily.com/releases/2013/09/130925130656.htm>

ⁱⁱⁱ <http://blogs.webmd.com/breaking-news/2011/06/fdas-new-sunscreen-rules-faq.html>

^{iv} <http://www.livestrong.com/article/227336-does-spf-block-the-vitamin-d-from-the-sun/>

^v <http://www.herbs-info.com/blog/5-urgent-reasons-why-you-need-to-stop-using-antibacterial-soap-immediately/?c=resistance>

^{vi} http://cid.oxfordjournals.org/content/45/Supplement_2/S137.long

^{vii} http://cfpub.epa.gov/ncea/iris2/chemicalLanding.cfm?substance_nmbr=199

^{viii} <http://www.mass.gov/eea/docs/dep/cleanup/laws/tcestat.pdf>

^{ix} <http://www.mass.gov/eea/docs/dep/cleanup/laws/tceresin.pdf>

^x <http://www.mass.gov/eea/docs/dep/cleanup/laws/tcewkin.pdf>

^{xi} 14 µg/m³ was the pre-2011 TCE concentration in residential indoor air associated with an Excess Lifetime Cancer Risk of 1-in-one hundred thousand. The actual No Significant Risk level would be site-specific – and possibly higher or lower than 14 µg/m³ under the MCP's Method 3 Risk Characterization.

^{xii} See John Fitzgerald's excellent presentation at the October 2015 Waste Site Cleanup Advisory Committee meeting for examples: <https://youtu.be/ELyqxz7d2Xg?list=PLJn2AKOcYr7kMQyKSup4sjIvtyZWCB0nc> and <https://youtu.be/6utfRk7D8q0?list=PLJn2AKOcYr7kMQyKSup4sjIvtyZWCB0nc>.

^{xiii} With a universe of over 45,000 notifiable releases in Massachusetts, it is likely that additional sites requiring screening will be identified. The number of sites identified in this article is merely a snapshot in time.