

Quick Summary

What is it and why is it a concern?

Triclosan is an antimicrobial chemical used in a variety of consumer products including:



Triclosan is frequently detected in the environment and some laboratory studies suggest it can act as an endocrine disrupting chemical.

THIS RMP FACT SHEET summarizes information presented in a more detailed profile of triclosan: Klosterhaus, S., R. Allen, and J. Davis. 2010. Contaminants of Emerging Concern in the San Francisco Estuary: Triclosan and Triclocarban. A Report of the Regional Monitoring Program for Water Quality in the San Francisco Estuary. SFEI Contribution #627. San Francisco Estuary Institute, Oakland, CA.

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Is it really needed?

The American Medical Association has not endorsed the necessity or efficacy of triclosan and other antimicrobial agents in personal care products. Physicians indicate that the best germ fighting measure continues to be hand washing with regular soap, or if extra assurance is needed, hand washing with alcohol or peroxide-based hand sanitizers. Personal choice is an important avenue for reducing triclosan concentrations in the environment.

How is it getting into San Francisco Bay?

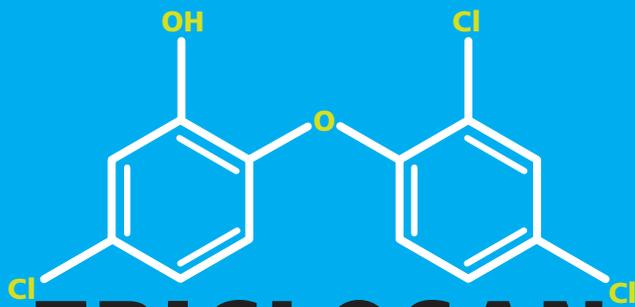
Antimicrobials are entering the Bay in municipal wastewater. More information is needed on other potential pathways.

Is triclosan harming San Francisco Bay?

Triclosan has been detected in treated wastewater effluent discharged into the Bay and in Bay sediment in limited pilot-scale sampling. The triclosan concentrations in those samples were generally much lower than those currently known to cause toxicity to wildlife. But scientists remain concerned about possible impacts to the food web from long-term exposure to triclosan and other persistent antimicrobial compounds. Laboratory studies have suggested that triclosan can act as an endocrine disruptor in fish and mammals, but concentrations in Bay effluent and sediment were below known thresholds for effects. Concentrations have not yet been measured in areas most influenced by municipal wastewater outfalls, where they are anticipated to be highest.

What management actions are underway?

The US Food and Drug Administration and US Environmental Protection Agency are the two federal agencies regulating the use of triclosan. In January 2011 both agencies were reviewing the uses of triclosan. In January 2011 two major manufacturers announced that they are phasing triclosan out of many products. Colgate-Palmolive announced they are phasing triclosan out of Softsoap liquid soaps. It will remain in toothpaste (Colgate Total). Johnson and Johnson is phasing triclosan out of all their products.



TRICLOSAN FACTS

Synthetic chlorinated chemical that is a broad-spectrum antimicrobial agent.

Kills or inhibits the growth of harmful microorganisms, including bacteria and fungi.

Structurally similar to triclocarban, another popular antimicrobial that is found in bar soaps and is also a concern in aquatic environments.

Uses

- Antimicrobial used since the early 1960s in thousands of consumer and industrial products, including antibacterial hand soaps (0.1-0.3% by weight), body washes, cosmetics, mouthwash, toothpaste, detergents, deodorants, and other products including furniture, cutting boards, sports equipment, floors, and carpets.
- Microban®, a slow release triclosan product, is also incorporated into plastics used in children's toys, kitchen utensils, and other consumer and industrial products, and Biofresh® another triclosan product, is embedded in some clothing.
- Estimated annual use of more than 300,000 kg/yr in the US (Halden and Paull 2005).
- The American Medical Association has not endorsed the necessity or efficacy of triclosan and other antibacterial agents in personal care products (WMI 2006). Physicians indicate that the best germ fighting measure continues to be hand washing with regular soap, or for extra assurance, hand washing with alcohol or peroxide-based hand sanitizers.
- According to the US Food and Drug Administration, the only evidence of effectiveness is in toothpaste in preventing gingivitis (<http://www.fda.gov/forconsumers/consumerupdates/ucm205999.htm>).

Pathways to the Bay

- Municipal wastewater treatment plant effluent is probably the major pathway to the Bay, although more information is needed on other potential pathways.
- Over 95% of triclosan uses are in consumer products that are disposed of in residential drains, resulting in transport to municipal wastewater treatment plants.
- Removal efficiencies in treatment plants typically range from 60% to >99.5%, depending on the type of treatment used.
- Given the incomplete removal in treatment plants, triclosan is commonly detected in treatment plant effluent.
- Concentrations in effluent from a Bay Area treatment plant in 2006 (ranging from <500 to 900 ng/L) (Jackson and Sutton 2008) were comparable to effluent concentrations observed in other studies.
- Average concentrations in sewage sludge from two Bay Area treatment plants in 2008 (15 - 20 ppm) were similar to the nationwide average of 16 ppm (USEPA 2009 Targeted National Sewage Sludge Survey).
- Urban stormwater, which flows directly into the Bay untreated, is another potential pathway due to the use of triclosan-containing products for activities such as exterior cleaning and car washing.

Fate in the Bay

- The fate of triclosan in the Bay has not been studied, but predictions can be made based on information from other studies.
- Upon entry into the Bay, triclosan is expected to be quickly removed from the water column through binding to sediment particles, photodegradation, and biodegradation.
- Triclosan is expected to accumulate primarily in sediment (due to its high affinity for organic matter and sediment particles) where it can be taken up by sediment-dwelling organisms and passed up the food chain.
- Triclosan can persist in sediments with a half-life as long as 540 days and resists biodegradation under low oxygen conditions when it is associated with sediments (Halden and Paull 2005).

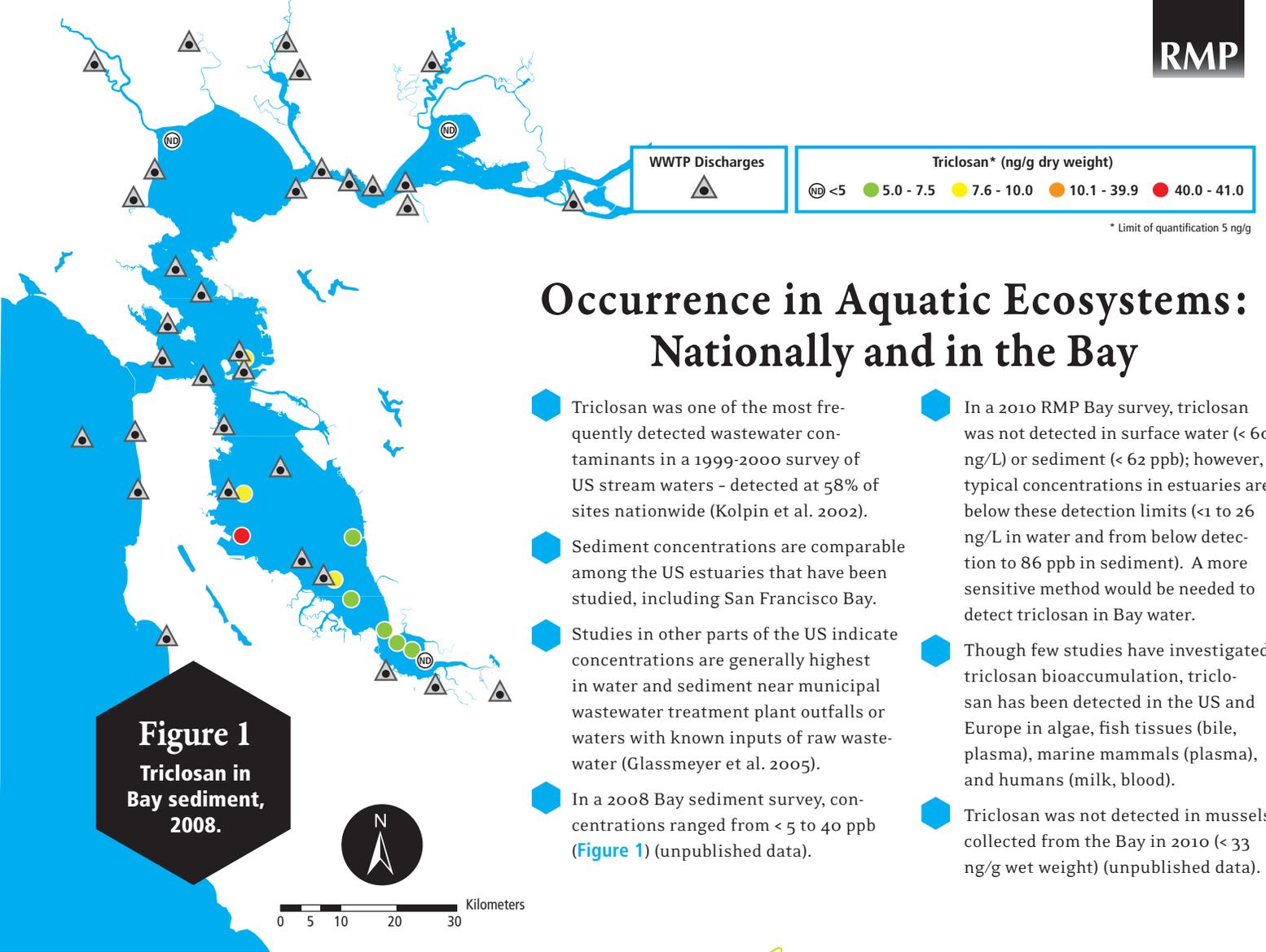


Figure 1
Triclosan in Bay sediment, 2008.

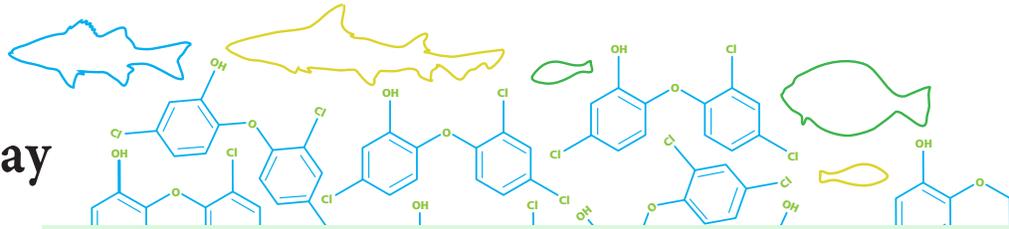
Occurrence in Aquatic Ecosystems: Nationally and in the Bay

- Triclosan was one of the most frequently detected wastewater contaminants in a 1999-2000 survey of US stream waters - detected at 58% of sites nationwide (Kolpin et al. 2002).
- Sediment concentrations are comparable among the US estuaries that have been studied, including San Francisco Bay.
- Studies in other parts of the US indicate concentrations are generally highest in water and sediment near municipal wastewater treatment plant outfalls or waters with known inputs of raw wastewater (Glassmeyer et al. 2005).
- In a 2008 Bay sediment survey, concentrations ranged from < 5 to 40 ppb (Figure 1) (unpublished data).
- In a 2010 RMP Bay survey, triclosan was not detected in surface water (< 60 ng/L) or sediment (< 62 ppb); however, typical concentrations in estuaries are below these detection limits (<1 to 26 ng/L in water and from below detection to 86 ppb in sediment). A more sensitive method would be needed to detect triclosan in Bay water.
- Though few studies have investigated triclosan bioaccumulation, triclosan has been detected in the US and Europe in algae, fish tissues (bile, plasma), marine mammals (plasma), and humans (milk, blood).
- Triclosan was not detected in mussels collected from the Bay in 2010 (< 33 ng/g wet weight) (unpublished data).

Trends: Nationally and in the Bay

Data from other parts of the US suggest that sediment concentrations were highest in the 1960s and 1970s, declined significantly with the adoption of activated sludge wastewater treatment, but may have recently been rising (Cantwell et al. 2010).

No trend data are available for the Bay.



Risks to Aquatic Life

- Laboratory studies have suggested that triclosan can act as an endocrine disruptor in fish and mammals, but concentrations in the environment are generally much lower than the exposure concentrations used in these studies.
- Algae appear to be the most sensitive to triclosan exposure (acute toxicity threshold 200 ng/L) (Chalew and Halden 2009).
- Most of the toxicity threshold data currently available are from acute effects studies, which are not indicative of the potential effects due to long-term exposure (chronic toxicity) to concentrations that are typically found in aquatic environments.
- In chronic toxicity studies, effects on the endocrine system in amphibians and the structure and function of algal communities have been observed at concentrations occurring in the environment (Veldhoen et al. 2006; Wilson et al. 2003).
- Additional concerns include the potential for indirect effects on algal and aquatic plant grazers due to the toxicity of triclosan to algae, and the combined effects of persistent antimicrobial compounds, such as triclosan and triclocarban, on microbial communities.

Transformation Products of Potential Concern

Methyl triclosan is a transformation product of primary concern. It is more persistent than triclosan and has been found to accumulate in fish (Leiker et al. 2009).

Other transformation products include chloroform, chlorophenoxyphenols, chlorophenols (e.g., 2,4-dichlorophenol and 2,4,6-trichlorophenol), and 2,8-dichlorodibenzo-*p*-dioxin; some are probable human carcinogens.

Management Timeline

2006
The Bay Area Pollution Prevention Group encourages their member agencies to adopt an environmentally preferable purchasing policy to stop purchasing triclosan-containing hand soaps.

January 2011
The U.S. Food and Drug Administration regulates the consumer uses of triclosan in antimicrobial hand soaps, body washes, toothpastes, and some cosmetics. The U.S. Environmental Protection Agency also regulates the use of triclosan as an antimicrobial in a variety of products including industrial equipment uses. Both federal agencies are engaged in reviewing the uses of triclosan.

Regionally, the focus is on encouraging less consumer usage of triclosan-containing antimicrobial hand soaps and other consumer products and other source control measures.

Two major manufacturers announce that they are phasing out triclosan from many products. Colgate-Palmolive announced they are phasing triclosan out of Softsoap liquid soaps. It will remain in toothpaste (Colgate Total). Johnson and Johnson is phasing triclosan out of all their products.

Key Information Gaps

- Potential chronic effects on algae and microbes due to long-term exposure to concentrations of triclosan and other antimicrobials that are typically found in aquatic environments.
- The potential for transfer of triclosan and methyl triclosan through the food web to act as a source of exposure to wildlife.
- Concentrations in sediment and biota influenced by Bay Area treatment plant outfalls, where exposures are anticipated to be highest.
- Potential development of widespread antimicrobial resistance due to the presence of triclosan in aquatic environments.
- The identity, extent of use, and potential environmental health impacts of chemicals used as replacements for triclosan.
- Confirm the anticipated small contribution of stormwater runoff relative to municipal wastewater as a pathway of triclosan to Bay surface waters.

Key References

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